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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document specifies the measurement procedures for the conformance test of the user equipment (UE) that contain requirements for support of RRM (Radio Resource Management) as part of the 5G New Radio (5G-NR). The present document covers NR Range 1, NR Range 2 and Interworking.

The requirements are listed in different clauses only if the corresponding parameters deviate. More generally, tests are only applicable to those mobiles that are intended to support the appropriate functionality. To indicate the circumstances in which tests apply, this is noted in the "*test applicability*" part of the test.

For example, only Release 15 and later UE declared to support NR shall be tested for this functionality. In the event that for some tests different conditions apply for different releases, this is indicated within the text of the test itself.

# 2 References

The following documents contain provisions, which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[3] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[4] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[5] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".

[6] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[7] 3GPP TS 38.211: "NR; Physical channels and modulation".

[8] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[9] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[10] 3GPP TS 38.215: "NR; Physical layer measurements".

[11] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

[12] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[13] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[14] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".

[15] 3GPP TS 38.508-2: "5GS; User Equipment (UE) conformance specification; Part 2: Common Implementation Conformance Statement (ICS) proforma".

[16] 3GPP TS 38.509: "5GS; Special Conformance Testing Functions for UE".

[17] 3GPP TS 38.521-1: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Range 1 Standalone".

[18] 3GPP TS 38.521-2: " NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Range 2 Standalone".

[19] 3GPP TS 38.521-3: " NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[20] 3GPP TS 38.521-4: "NR; User Equipment (UE) conformance specification; Part 4: Performance".

[21] 3GPP TS 38.522: "NR; User Equipment (UE) conformance specification; Applicability of radio transmission, radio reception and radio resource management test cases".

[22] 3GPP TS 38.903: "NR; Derivation of test tolerances and measurement uncertainty for User Equipment (UE) conformance test cases".

[23] 3GPP TS 36.133: "E-UTRA requirements for support of radio resource management".

[24] 3GPP TS 36.211: "E-UTRA Physical Channels and Modulation".

[25] 3GPP TS 36.508: "Common test environments for User Equipment (UE)".

[26] 3GPP TS 36.521-3: "E-UTRA; UE conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing".

[27] 3GPP TS 36.101: "E-UTRA UE radio transmission and reception".

[28] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[29] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC) Protocol Specification".

[30] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".

[31] 3GPP TS 38.212 "NR; Multiplexing and channel coding".

[32] 3GPP TR 38.810: "Study on test methods for New Radio".

[33] 3GPP TR 36.213: "E-UTRA; Physical layer procedures".

[34] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[35] 3GPP TS 38.300: "NR; NR and NG-RAN Overall description; Stage-2".

[36] 3GPP TS 37.106: "User Equipment (UE) requirements for shared spectrum channel access".

[37] 3GPP TS 37.213: “LTE; 5G; Physical layer procedures for shared spectrum channel access”.

[38] 3GPP TS 37.355: "LTE Positioning Protocol (LPP) ".

[39] 3GPP TS 38.101-5: "NR; User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**1 Rx RedCap: RedCap UE for which requirements are derived assuming 1 Rx branch.**

**2 Rx RedCap: RedCap UE for which requirements are derived assuming 2 Rx branches.**

**Active DL BWP:** Active DL bandwidth part as defined in 3GPP TS 38.213 [8].

**Blackbox Approach:** Testing methodology, in which the UE internal implementation of certain specific UE functionality involved in the test, is unknown.

**Control Resource Set:** As defined in 3GPP TS 38.213 [8].

**DL BWP:** DL bandwidth part as defined in 3GPP TS 38.213 [8].

**EN-DC:** E-UTRA-NR Dual Connectivity as defined in clause 4.1.2 of 3GPP TS 37.340 [34].

**en-gNB:** As defined in 3GPP TS 37.340 [34].

**FR1:** Frequency range 1 as defined in clause 5.1 of 3GPP TS 38.104 [28].

**FR2:** Frequency range 2 as defined in clause 5.1 of 3GPP TS 38.104 [28].

**gNB:** as defined in 3GPP TS 38.300 [35].

**Master Cell Group:** As defined in 3GPP TS 38.331 [13].

**Multi-Radio Dual Connectivity:** Dual Connectivity between E-UTRA and NR nodes, or between two NR nodes, as defined in 3GPP TS 37.340 [34].

**ng-eNB:** As defined in 3GPP TS 38.300 [35].

**NE-DC:** NR-E-UTRA Dual Connectivity as defined in clause 4.1.3.2 of 3GPP TS 37.340 [34].

**NGEN-DC:** NG-RAN E-UTRA-NR Dual Connectivity as defined in clause 4.1.3.1 of 3GPP TS 37.340 [34].

**NR-DC:** NR-NR Dual Connectivity as defined in clause 4.1.3.3 of 3GPP TS 37.340 [34].

**Primary Cell:** As defined in 3GPP TS 38.331 [13].

**Quasi Co-Location:** As defined in 3GPP TS 38.214 [9].

**RedCap UE:** A UE with reduced capabilities as defined in clause 4.2 of TS 38.306 [11].

**RLM-RS resource:** A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List as defined in 3GPP TS 38.213 [8].

**SA operation mode:** Operation mode when the UE is configured with at least PCell and not any MR-DC.

**Secondary Cell:** As defined in 3GPP TS 38.331 [13].

**Secondary Cell Group:** As defined in 3GPP TS 38.331 [13].

**Serving Cell:** As defined in 3GPP TS 38.331 [13].

**SMTC:** An SSB-based measurement timing configuration configured by *SSB-MeasurementTimingConfiguration* as specified in 3GPP TS 38.331 [13].

**Special Cell:** As defined in 3GPP TS 38.331 [13].

**SSB:** SS/PBCH block as defined in clause 7.8.3 of 3GPP TS 38.211 [7].

**Timing Advance Group:** As defined in 3GPP TS 38.331 [13].

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

| | |
|---|---|
| […] | Values included in square bracket shall be considered for further studies, because it means that a decision about that value was not taken. |
| $BW_{Channel}$ | Channel bandwidth, defined in TS 38.101-1 [2], 38.101-2 [3] and clause 3.2 of 38.101-3 [4] |
| Ês | Received energy per RE (power normalized to the subcarrier spacing) during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector or at the gNB reference point as defined in clause 5.2 of TS 38.215 [10], for the respective measurement type |
| Io | The total received power density, including signal and interference, as measured at the UE antenna connector. |
| Ioc | The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector. |
| Iot | The received power spectral density of the total noise and interference for a certain RE (power integrated over the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector or at the gNB reference point as defined in clause 5.2 of TS 38.215 [10], for the respective measurement type |
| $N_{oc}$ | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector |
| S | Cell Selection Criterion defined in clause 5.2.3.2 of TS 38.304 [30], for NR |
| SSB_RP | Received (linear) average power of the resource elements that carry NR synchronisation burst, measured at the UE antenna connector |
| Srxlev | Cell selection RX level, defined in clause 5.2.3.2 of TS 38.304 [30] |
| Squal | Cell selection quality, defined in clause 5.2.3.2 of TS 38.304 [30] |
| Sintrasearch | Defined in clause 5.2.4.7 of TS 38.304 [30], for E-UTRAN and clause 5.2.4.7 of TS 38.304 [30] for NR |
| Snonintrasearch | Defined in clause 5.2.4.7 of TS 38.304 [30] |
| $Thresh_{x, high}$ | Defined in clause 5.2.4.7 of TS 38.304 [30] |
| $Thresh_{x, low}$ | Defined in clause 5.2.4.7 of TS 38.304 [30] |
| $Thresh_{serving, low}$ | Defined in clause 5.2.4.7 of TS 38.304 [30] |
| $T_{RE-ESTABLISH-REQ}$ | The RRC Re-establishment delay requirement, the time between the moment when erroneous CRCs are applied, to when the UE starts to send preambles on the PRACH. |
| $T_c$ | Basic time unit, defined in clause 4.1 of 3GPP TS 38.211 [7]. |
| $T_s$ | Reference time unit, defined in clause 4.1 of 3GPP TS 38.211 [7]. |
| $T_{UE_re-establish_delay}$ | Time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [13] is detected by the UE and when the UE sends PRACH to the target PCell. |

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

| | |
|---|---|
| AoA | Angle of Arrival |
| AoD | Angle of Departure |
| BFD | Beam Failure Detection |
| BFD-RS | BFD Reference Signal |
| BS | Base Station |
| BWP | Bandwidth Part |
| CBD | Candidate Beam Detection |
| CDF | Cumulative Distribution Function |
| CC | Component Carrier |
| CCA | Clear Channel Assessment |
| CLI | Cross Link Interference |
| CMR | Channel Measurement Resource |
| CORESET | Control Resource Set |
| CP | Cyclic Prefix |
| CPA | Conditional PSCell Addition |

| | |
|---|---|
| CPAC | Conditional PSCell Addition or Change |
| CPC | Conditional PSCell Change |
| CSI | Channel-State Information |
| CSI-RS | CSI Reference Signal |
| CSI-RSRP | CSI Reference Signal based Reference Signal Received Power |
| CSI-RSRQ | CSI Reference Signal based Reference Signal Received Quality |
| CSI-SINR | CSI Reference Signal based Signal to Noise and Interference Ratio |
| DBT | Discovery Burst Transmission |
| DC | Dual Connectivity |
| DCI | Downlink Control Information |
| DL | Downlink |
| DMRS | Demodulation Reference Signal |
| DRX | Discontinuous Reception |
| E-CID | Enhanced Cell ID |
| E-UTRA | Evolved UTRA |
| E-UTRA/5GC | E-UTRA connected to 5GC |
| E-UTRAN | Evolved UTRAN |
| EN-DC | E-UTRA – NR Dual Connectivity |
| FR | Frequency Range |
| FR1 | Frequency Range 1 |
| FR2 | Frequency Range 2 |
| GEO | Geostationary Earth Orbit |
| HARQ | Hybrid Automatic Repeat Request |
| HO | Handover |
| IMR | Interference Measurement Resource |
| L1-RSRP | Layer 1 RSRP |
| LEO | Low Earth Orbit |
| LMF | Location Management Function |
| LPP | LTE Positioning Protocol |
| LTM | L1/L2 Triggered Mobility |
| MAC | Medium Access Control |
| MCG | Master Cell Group |
| MG | Measurement Gap |
| MGL | Measurement Gap Length |
| MGRP | Measurement Gap Repetition Period |
| MIB | Master Information Block |
| MN | Master Node |
| MR-DC | Multi-Radio Dual Connectivity |
| NCSG | Network Controlled Small Gap |
| NE-DC | NR-E-UTRA Dual Connectivity |
| NGEN-DC | NG-RAN E-UTRA-NR Dual Connectivity |
| NR | New Radio |
| NR/5GC | NR Connected to 5GC |
| NR-DC | NR-NR Dual Connectivity |
| NTN | Non-Terrestrial Network |
| NSA | Non-Standalone |
| OCNG | OFDMA Channel Noise Generator |
| OFDM | Orthogonal Frequency Division Multiplexing |
| OFDMA | Orthogonal Frequency Division Multiple Access |
| PCC | Primary Component Carrier |
| PCell | Primary Cell |
| PDCCH | Physical Downlink Control Channel |
| PDSCH | Physical Downlink Shared Channel |
| PLMN | Public Land Mobile Network |
| PRACH | Physical RACH |
| PRS | Positioning Reference Signal |
| PSCell | Primary Secondary Cell |
| PSS | Primary Synchronization Signal |
| pTAG | Primary Timing Advance Group |
| PUCCH | Physical Uplink Control Channel |
| PUSCH | Physical Uplink Shared Channel |
| QCL | Quasi Co-Location |

| | |
|---|---|
| RACH | Random Access Channel |
| RAT | Radio Access Technology |
| RedCap | Reduced Capabilities |
| RLM | Radio Link Monitoring |
| RLM-RS | Reference Signal for RLM |
| RMC | Reference Measurement Channel |
| RMSI | Remaining Minimum System Information |
| RMTC | RSSI Measurement Timing Configuration |
| RRC | Radio Resource Control |
| RRM | Radio Resource Management |
| RSRP | Reference Signal Received Power |
| RSRQ | Reference Signal Received Quality |
| RSSI | Received Signal Strength Indicator |
| RSTD | Reference Signal Time Difference |
| RTD | Receive Timing Difference |
| RTT | Round Trip Time |
| SA | Standalone |
| SAB | Satellite Access Band |
| SAN | Satellite Access Node |
| SCC | Secondary Component Carrier |
| SCell | Secondary Cell |
| SCG | Secondary Cell Group |
| SCPAC | Subsequent Conditional PSCell Addition or Change |
| SCS | Subcarrier Spacing |
| $SCS_{SSB}$ | SSB Subcarrier Spacing |
| SDL | Supplementary Downlink |
| SFN | System Frame Number |
| SFTD | SFN and Frame Timing Difference |
| SI | System Information |
| SIB | System Information Block |
| SMTC | SSB-based Measurement Timing configuration |
| SpCell | Special Cell |
| SRS | Sounding Reference Signal |
| SRS-RSRP | Sounding Reference Signal based Reference Signal Received Power |
| SS | System Simulator |
| SS-RSRP | Synchronization Signal based Reference Signal Received Power |
| SS-RSRQ | Synchronization Signal based Reference Signal Received Quality |
| SS-SINR | Synchronization Signal based Signal to Noise and Interference Ratio |
| SSB | Synchronization Signal Block |
| SSB_RP | Received (linear) Average Power of the Resource Elements that Carry NR SSB Signals and Channels, Measured at the UE Antenna Connector. |
| SSS | Secondary Synchronization Signal |
| sTAG | Secondary Timing Advance Group |
| SUL | Supplementary Uplink |
| TA | Timing Advance |
| TAG | Timing Advance Group |
| TCI | Transmission Configuration Indicator |
| TN | Terrestrial Network |
| TTI | Transmission Time Interval |
| UL | Uplink |
| VIL | Visible Interruption Length |
| VIRP | Visible Interruption Repetition Period |

# 3A Requirements for the support of RRM

## 3A.1 General

### 3A.1.0 Overview of RRM requirements

Radio Resource Management (RRM) ensures the efficient use of the available radio resources and provides mechanisms that enable NR to meet radio resource related requirements. The requirements are divided in four main clauses according to the network deployment and the frequency range:

- Clause 4 for EN-DC test cases where all NR cells are in FR1.
- Clause 5 for EN-DC test cases where at least one NR cell is in FR2.
- Clause 6 for NR/5GC test cases where all NR cells are in FR1.
- Clause 7 for NR/5GC test cases where at least one NR cell is in FR2.

The requirements that are tested include:

- Idle mode, the cell re-selection algorithms that are controlled by the setting of parameters (thresholds and hysteresis values) that define the best cell and/or determine when the UE should select a new cell.
- Inactive mode, the cell re-selection algorithms that are controlled by the setting of parameters (thresholds and hysteresis values) that define the best cell and/or determine when the UE should select a new cell.
- The configuration of the UE measurement and reporting procedures that are transmitted via the dedicated signalling in connected mode and the reporting accuracy of the required measurements.
- Connected mode, the mobility of radio connections that has to be supported.
- Handover decisions that may be based on UE or gNB measurements.
- Inter-RAT RRM, the management of radio resources in connection with inter-RAT mobility, e.g. Inter-RAT handover.

Inter-frequency and inter-RAT test cases are performed without frequency overlapping between cells required in the test:

- For bands with bandwidth not accommodating all the NR cells required in the test without frequency overlapping, inter band testing shall be done according to clause 3A.5. If the UE does not support the combination given in clause 3A.5, the relevant tests are applicable only to the bands with the necessary bandwidth.
- In case when frequency overlapping occurs due to the frequency channel selection defined for the test (i.e. Cell number as per Annex D), other frequency channels which avoid the frequency overlapping shall be selected. If no suitable selection is found the test is not applicable for the affected band.

### 3A.1.1 Test coverage across 5G NR connectivity options

The test cases in this specification cover both NR/5GC (including FR1+ FR2 CA or FR1+FR2 NR-DC) as well as EN-DC and NGEN-DC testing. Below shall be the understanding with respect to coverage across 5G NR connectivity options:

1. Unless otherwise stated within the test case, it shall be understood that test requirements are agnostic of the EN-DC and NGEN-DC connectivity option configured within the test. The test coverage across the EN-DC and NGEN-DC connectivity options shall be considered fulfilled by executing the test case in one of these connectivity options.
2. EN-DC is the default connectivity option used for EN-DC and NGEN-DC test cases.

3. If a UE does not support EN-DC, NGEN-DC can be configured to execute the test. The leverage rule detailed in (1) would apply.

**Table 3A.1.1-1: Void**

**Table 3A.1.1-2: Void**

# 3A.2 Requirements classification for statistical testing

The test requirements are expressed as absolute requirements with a single value stating the requirement or expressed as a success rate. The statistical nature depends on the type of test requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a Device Under Test (DUT) passing the test actually meets the test requirement and determines how many times a test have to be repeated and what the pass and fail criteria is. The statistical significance shall be set according to Annex G.

# 3A.3 Antenna configuration

Unless otherwise specified, NR FDD or NR TDD cells in all RRM test cases in AWGN propagation condition are configured with antenna configuration 1x2.

# 3A.4 NR band groups

## 3A.4.0 General

The intention of the band grouping defined in this clause is to increase the readability of the test specification.

The frequency bands grouping is derived based on UE REFSENS requirements specified in 3GPP TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4] and assuming 0.5 dB step between the neighbour groups. The groups are defined in the order of increasing REFSENS, i.e., the group A has the smallest REFSENS among the groups. For the same SCS and a given bandwidth, the bands within the same group have the same Io conditions in a corresponding requirement in this specification, provided the bands support this SCS. For different SCSs supported by a frequency band and the same bandwidth, different Io conditions may apply for the frequency band in the requirements, while the band group is the same, based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported SCSs for this bandwidth. For the same SCS but different supported bandwidths, the group for a band is determined based on the lowest REFSENS requirement normalized by the number of subcarriers among its supported bandwidths.

## 3A.4.1 NR operating bands in FR1

NR frequency bands grouping for FR1 is specified in Table 3A.4.1-1.

**Table 3A.4.1-1: NR frequency band groups for FR1**

| Group | NR FDD | | NR TDD | | NR SDL | | NR CCA[10] | |
|---|---|---|---|---|---|---|---|---|
| | Band group notation | Operating bands | Band group notation | Operating bands | Band group notation | Operating bands | Band group notation | Operating bands |
| A | NR_FDD_FR1_A | n1, n18, n24, n70, n74[4], n91, n92, n93, n94, n100, n109 | NR_TDD_FR1_A | n34, n38[9], n39, n40, n50, n51, n53, n54, n101 | NR_SDL_FR1_A | n67, n75, n76 | NR_CCA_FR1_A | - |
| B | NR_FDD_FR1_B | n65, n66, n74[3] | NR_TDD_FR1_B | n38[7] | NR_SDL_FR1_B | - | NR_CCA_FR1_B | - |
| C | NR_FDD_FR1_C | n30 | NR_TDD_FR1_C | n48, n77[1], | NR_SDL_FR1_C | - | NR_CCA_FR1_C | - |

| | | | | n78, n79 | | | | |
|---|---|---|---|---|---|---|---|---|
| D | NR_FDD_FR1_D | n28 | NR_TDD_FR1_D | n77[2] | NR_SDL_FR1_D | - | NR_CCA_FR1_D | - |
| E | NR_FDD_FR1_E | n2, n5, n7 | NR_TDD_FR1_E | n41, n90 | NR_SDL_FR1_E | - | NR_CCA_FR1_E | - |
| F | NR_FDD_FR1_F | n26[6] | NR_TDD_FR1_F | - | NR_SDL_FR1_F | - | NR_CCA_FR1_F | - |
| G | NR_FDD_FR1_G | n3, n8, n12, n13, n14, n20, n71, n85, n105[11], n106 | NR_TDD_FR1_G | n104 | NR_SDL_FR1_G | n29 | NR_CCA_FR1_G | - |
| H | NR_FDD_FR1_H | n25 | NR_TDD_FR1_H | - | NR_SDL_FR1_H | - | NR_CCA_FR1_H | - |
| I | NR_FDD_FR1_I | - | NR_TDD_FR1_I | | NR_SDL_FR1_I | - | NR_CCA_FR1_I | n46 |
| J | NR_FDD_FR1_J | - | NR_TDD_FR1_J | n47[8] | NR_SDL_FR1_J | - | NR_CCA_FR1_J | n96, n102 |
| K | NR_FDD_FR1_K | - | NR_TDD_FR1_K | - | NR_SDL_FR1_K | - | NR_CCA_FR1_K | - |
| L | NR_FDD_FR1_L | - | NR_TDD_FR1_L | - | NR_SDL_FR1_L | - | NR_CCA_FR1_L | - |
| M | NR_FDD_FR1_M | - | NR_TDD_FR1_M | - | NR_SDL_FR1_M | - | NR_CCA_FR1_M | - |
| N | NR_FDD_FR1_N | n31, n72 | NR_TDD_FR1_N | - | NR_SDL_FR1_N | - | NR_CCA_FR1_N | - |

NOTE 1: Except 3.8 GHz to 4.2 GHz.
NOTE 2: Only 3.8 GHz to 4.2 GHz.
NOTE 3: Except 1475.9 MHz to 1510.9 MHz.
NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.
NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in TS 38.101-1 [2] and TS 38.101-3 [4].
NOTE 6: The minimum Io condition is reduced by 0.5 dB when the carrier frequency of the assigned NR channel bandwidth is within 865-894 MHz.
NOTE 7: When this band is only used for V2X SL service, the band is exclusively used for NR V2X in particular regions.
NOTE 8: This band is unlicensed band used for V2X service. There is no expected network deployment in this band.
NOTE 9: When this band is only used for WAN service.
NOTE 10: Operating bands where operation on carrier frequencies with CCA is supported.
NOTE 11: The minimum Io condition is reduced by 0.5 dB when the downlink channel overlap the 612-617 MHz frequency range and the channel bandwidth is 5 MHz.

**Table 3A.4.1-2: Power offsets for the test configuration between NR frequency band groups for FR1 with respect to NR_FDD_FR1_A**

| Group | NR FDD | | NR TDD | | NR SDL | |
|---|---|---|---|---|---|---|
| | Band group notation | Power Offset [dB], $\Delta_{BG_offset}$ | Band group notation | Power Offset [dB], $\Delta_{BG_offset}$ | Band group notation | Power Offset [dB], $\Delta_{BG_offset}$ |
| A | NR_FDD_FR1_A | - | NR_TDD_FR1_A | 0.0 | NR_SDL_FR1_A | 0.0 |
| B | NR_FDD_FR1_B | 0.5 | NR_TDD_FR1_B | 0.5 | NR_SDL_FR1_B | - |
| C | NR_FDD_FR1_C | 1.0 | NR_TDD_FR1_C | 1.0 | NR_SDL_FR1_C | - |
| D | NR_FDD_FR1_D | 1.5 | NR_TDD_FR1_D | 1.5 | NR_SDL_FR1_D | - |
| E | NR_FDD_FR1_E | 2.0 | NR_TDD_FR1_E | 2.0 | NR_SDL_FR1_E | - |
| F | NR_FDD_FR1_F | 2.5 | NR_TDD_FR1_F | 2.5 | NR_SDL_FR1_F | - |
| G | NR_FDD_FR1_G | 3.0 | NR_TDD_FR1_G | 3.0 | NR_SDL_FR1_G | - |
| H | NR_FDD_FR1_H | 3.5 | NR_TDD_FR1_H | 3.5 | NR_SDL_FR1_H | - |
| J | NR_FDD_FR1_J | 4.5 | NR_TDD_FR1_J | 4.5 | NR_SDL_FR1_J | - |
| K to M | Reserved | | | | | |
| N | NR_FDD_FR1_N | 6.5 | NR_TDD_FR1_N | 6.5 | NR_SDL_FR1_N | - |

NOTE: In the test parameters table, only the power configuration for NR_FDD_FR1_A or NR_TDD_FR1_A will be given.

**Table 3A.4.1-2A: Power offsets for the test configuration between NR frequency band groups for FR1 shared spectrum channel access with respect to NR_TDD_FR1_A**

| Group | NR-U | |
|---|---|---|
| | Band group notation | Power Offset [dB], $\Delta_{BG_offset}$ |
| I | NR_CCA_FR1_I | 4.0 |
| J | NR_CCA_FR1_J | 4.5 |

NOTE: In the test parameters table, the power configuration for NR_CCA_FR1_I and/or NR_TDD_FR1_J will be given.

## 3A.4.1A NR operating bands for satellite access in FR1

NR frequency bands grouping for satellite access in FR1 is specified in Table 3A.4.1A-1.

**Table 3A.4.1A-1: NR frequency band groups for satellite access in FR1**

| Group | NR FDD | |
|---|---|---|
| | Band group notation | Operating bands |
| A | NR_FDD_SAB_FR1_A | n254, n255, n256 |
| B | NR_FDD_SAB_FR1_B | FFS |
| C | NR_FDD_SAB_FR1_C | FFS |
| D | NR_FDD_SAB_FR1_D | FFS |
| E | NR_FDD_SAB_FR1_E | FFS |
| F | NR_FDD_SAB_FR1_F | FFS |
| G | NR_FDD_SAB_FR1_G | FFS |
| H | NR_FDD_SAB_FR1_H | FFS |
| I | NR_FDD_SAB_FR1_I | FFS |
| J | NR_FDD_SAB_FR1_J | FFS |

**Table 3A.4.1A-2: Power offsets for the test configuration between NR frequency band groups for FR1 satellite access with respect to NR_FDD_SAB_FR1_A**

| Group | NR-U | |
|---|---|---|
| | Band group notation | Power Offset [dB], $\Delta_{BG_offset}$ |
| B | NR_FDD_SAB_FR1_B | FFS |
| C | NR_FDD_SAB_FR1_C | FFS |
| D | NR_FDD_SAB_FR1_D | FFS |
| E | NR_FDD_SAB_FR1_E | FFS |
| F | NR_FDD_SAB_FR1_F | FFS |
| G | NR_FDD_SAB_FR1_G | FFS |
| H | NR_FDD_SAB_FR1_H | FFS |
| I | NR_FDD_SAB_FR1_I | FFS |
| J | NR_FDD_SAB_FR1_J | FFS |
| NOTE: In the test parameters table, the power configuration for NR_FDD_SAB_FR1_A will be given. | | |

## 3A.4.2 NR operating bands in FR2

NR frequency bands grouping for FR2 is specified in Table 3A.4.2-1.

**Table 3A.4.2-1: NR frequency band groups for FR2**

| Group | Band group notation | Operating bands |
|---|---|---|
| A | NR_TDD_FR2_A | n257[1], n258[1], n261[1] |
| B | NR_TDD_FR2_B | n257[4], n258[4], n261[4] |
| C | NR_TDD_FR2_C | |
| D | NR_TDD_FR2_D | |
| E | NR_TDD_FR2_E | |
| F | NR_TDD_FR2_F | n260[4] |
| G | NR_TDD_FR2_G | n260[1] |
| H | NR_TDD_FR2_H | |
| I | NR_TDD_FR2_I | |
| J | NR_TDD_FR2_J | |

| | | |
|---|---|---|
| K | NR_TDD_FR2_K | |
| L | NR_TDD_FR2_L | n257[2], n258[2], n261[2] |
| M | NR_TDD_FR2_M | |
| N | NR_TDD_FR2_N | |
| O | NR_TDD_FR2_O | |
| P | NR_TDD_FR2_P | |
| Q | NR_TDD_FR2_Q | |
| R | NR_TDD_FR2_R | |
| S | NR_TDD_FR2_S | |
| T | NR_TDD_FR2_T | n257[3], n258[3], n261[3] |
| U | NR_TDD_FR2_U | |
| V | NR_TDD_FR2_V | |
| W | NR_TDD_FR2_W | |
| X | NR_TDD_FR2_X | |
| Y | NR_TDD_FR2_Y | n260[3] |
| Z | NR_TDD_FR2_Y | |
| AA | NR_TDD_FR2_AA | n259[3] |
| NOTE 1: UE power class 1.<br>NOTE 2: UE power class 2.<br>NOTE 3: UE power class 3.<br>NOTE 4: UE power class 4. | | |

**Table 3A.4.2-2: Void**

# 3A.5 NR operating band configuration

The additional band defined in Table 3A.5-1 shall be used for RRM inter-frequency tests where the band under test cannot accommodate two (or more) non-overlapping inter-frequency cells. The usage of the additional band is conditioned to the UE supporting this band, the corresponding channel bandwidth and other band-dependent parameters. If the UE does not support the additional band or associated parameters, the inter-frequency test shall be considered Not Applicable for the band under test.

Inter-band configuration is not affecting the Test purpose since the minimum requirements are valid regardless of band. Band combinations defined in Table 3A.5-1 shall be used for testing.

**Table 3A.5-1: Inter-band configuration**

| Band under test | Additional band (s) |
|---|---|
| n12 | n66 |
| n13 | n66 |
| n14 | n66 |
| n18 | n1 |
| n30 | n66 |
| n34 | n41 |
| n38 | n41 |
| n39 | n41 |
| n53 | n41 |
| n70 | n66 |

NOTE 1: The band under test should contain the inter-frequency (neighbour) cell.
NOTE 2: The additional band should contain the serving cell of the test. If more than one inter-frequency cell is needed, that cell should be on the additional band.
NOTE 3: The bands and cells referred in this table are NR bands and cells only. For instructions on how to configure the E-UTRA operating band please refer to 3GPP TS 36.521-3 [26].
NOTE 4: The additional bands in this table are to be used in NR SA test cases only. EN-DC test cases cannot make use of additional bands.

## 3A.6 UE with multiband capability

The Radio Resource Management performance of a UE in all clauses except 4.7, 5.7, 6.7, 7.7 and 8.5.2 is independent from all bands. Therefore, the required performance in the respective test cases can be verified in one of the bands supported by the UE, except for inter-band testing requirements in clause 3A.1.

The NR standalone test cases in clauses 6.7 and 7.7 are dependent on the NR band of the target cell, and is required to be verified in all UE supported NR bands.

The EN-DC test cases in clauses 4.7, 5.7 and inter-RAT test cases in clause 8.5.2 are dependent on the NR band of the target cell, and is required to be verified in all UE supported NR bands. It is not necessary to repeat the tests for different LTE bands. For EN-DC configurations with the same NR band, it is sufficient to configure any one of them to execute the tests.

# 4 EN-DC with all NR cells in FR1

## 4.0 General

This clause contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR and PSCell. All NR cells are in Frequency Range 1.

## 4.1 Void

## 4.2 Void

## 4.3 RRC_CONNECTED state mobility

### 4.3.1 Void

### 4.3.2 RRC connection mobility control

#### 4.3.2.1 Void

#### 4.3.2.2 Random access

##### 4.3.2.2.1 EN-DC FR1 contention based random access

###### 4.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 4.3.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 4.3.2.2.1.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2 and A.4.3.2.2.1.

#### 4.3.2.2.1.4 Test description

##### 4.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.1.4.1-1.

**Table 4.3.2.2.1.4.1-1: Contention based random access test in FR1 for PSCell in EN-DC supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 4.3.2.2.1-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.1-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.1-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |

| | | |
|---|---|---|
| 4.3.2.2.1-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.1.4.1-2.

**Table 4.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.3.2.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.1.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.

#### 4.3.2.2.1.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via the dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.3.2.2.1.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.
4. Test 1: Correct behaviour when transmitting Random Access Preamble:
   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.
5. Test 2: Correct behaviour when receiving Random Access Response:
   5.1. Repeat steps 1-3.
   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.
   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.
   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3 including C-RNTI MAC control element.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

8.4. The System Simulator shall send a PDCCH addressed to the C-RNTI.

8.5. The UE shall send PUSCH according to the received PDCCH addressed to the C-RNTI.

9. Test 7: Correct behaviour when contention Resolution timer expires:

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

9.4. The System Simulator shall not send a PDCCH addressing the C-RNTI.

9.5. As there was no PDCCH addressing the C-RNTI, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

9.6. Measure the power and timing of the first preamble after the Contention Resolution Timer and backoff timer expire and it shall not exceed the values specified in clause 4.3.2.2.1.5.

#### 4.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.3.2.2.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 4.3.2.2.1.4.3-1: RACH-ConfigCommon for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon ::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | FR1 |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | 15 kHz |
| | kHz 30 | | 30 kHz |
| } | | | |

**Table 4.3.2.2.1.4.3-2: RACH-ConfigGeneric for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | FR1 |
| msg1-FDM | one | | FR1 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |

| | | | |
|---|---|---|---|
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 4.3.2.2.1.4.3-3: *ServingCellConfigCommon* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 4.3.2.2.1.5 Test requirement

Table 4.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for PSCell in EN-DC. Table 4.3.2.2.1.5-2, Table 4.3.2.2.1.5-3 and Table 4.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 4.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for PSCell in EN-DC**

| Parameter | | | Unit | Test 1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1,2 | | SSB.3 FR1 | As defined in clause A.3.1 |
| | | Config 3,4 | | SSB.4 FR1 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | FDD | |
| | | Config 3,4 | | TDD | |
| TDD Configuration | | Config 3,4 | | TDDConf.2.1 | |
| OCNG Pattern Note 1 | | | | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 | | SR1.1 FDD | As defined in clause A.1.1. |
| | | Config 3,4 | | SR.2.1 TDD | |
| RMSI CORESET reference channel | | Config 1,2 | | CR.1.1 FDD | |
| | | Config 3,4 | | CR.2.1 TDD | |
| Dedicated CORESET reference channel | | Config 1,2 | | CCR.1.1 FDD | |
| | | Config 3,4 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -95 | |
| | | Config 3,4 | | -98 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -115 | |
| | | Config 3,4 | | -118 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 3,4 | | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |

| | | | |
|---|---|---|---|
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | PRACH.1 FR1 | As defined in clause A.7.1. |
| Propagation Condition | - | AWGN | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.<br>NOTE 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.<br>NOTE 3: Void.<br>NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | |

Test 1: Correct behaviour when transmitting Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

- The UE shall send PUSCH according to the PDCCH addressed to the C-RNTI.

Test 7: Correct behaviour when contention resolution timer expires:

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 4.3.2.2.1.5-4.

**Table 4.3.2.2.1.5-2: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.1.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ±3.2 |

**Table 4.3.2.2.1.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 880*$T_c$ |
| | 30 | 30 | 624*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 4.3.2.2.2 EN-DC FR1 non-contention based random access

#### 4.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 4.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RS-CFRA-ForHO.

#### 4.3.2.2.2.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and clause A.4.3.2.2.2. Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

#### 4.3.2.2.2.4 Test description

##### 4.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.2.4.1-1.

**Table 4.3.2.2.2.4.1-1: Non-contention based random access test in FR1 for PSCell in EN-DC supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 4.3.2.2.2-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.2-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.2-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.2-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.2.4.1-2.

**Table 4.3.2.2.2.4.1-2: Initial conditions for Non-contention based random access test in FR1 for EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.3.2.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.2.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.

#### 4.3.2.2.2.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall explicitly assign a random access preamble via the dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC , DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Ensure the UE will choose SSB with index 0 to complete this procedure.

2. Set the parameters according to Table 4.3.2.2.2.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to the tables for Non-contention Random Access in clause 4.3.2.2.2.4.3.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

   5.1. Set the parameters according to Table 4.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3.

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response:

   7.1. Repeat steps 1-3.

   7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.2.5.

#### 4.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 with the following exceptions.

**Table 4.3.2.2.2.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 4.3.2.2.2.4.3-1: RACH-ConfigCommon for Non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | 15kHz |
| | kHz 30 | | 30kHz |
| } | | | |

**Table 4.3.2.2.2.4.3-2: RACH-ConfigDedicated for Non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 40 | | Subtest 2 |

| | | | |
|---|---|---|---|
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_51 | | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.3.2.2.2.4.3-3: RACH-ConfigGeneric for Non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 4.3.2.2.2.4.3-4: *ServingCellConfigCommon* for Non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

**Table 4.3.2.2.2.4.3-5: CellGroupConfig for Non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with Condition CFRA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicated | RACH-ConfigDedicated for Non-contention Based Random Access | Table 4.3.2.2.2.4.3-2 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4.3.2.2.2.5 Test requirement

Table 4.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for PSCell in EN-DC. Table 4.3.2.2.2.5-2, Table 4.3.2.2.2.5-3 and Table 4.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 4.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for PSCell in EN-DC**

| Parameter | | | Unit | Test 1 | Test 2 | Comments |
|---|---|---|---|---|---|---|
| SSB Configuration | | Config 1,2 | | SSB.3 FR1 | SSB.3 FR1 | As defined in clause A.3.1 |
| | | Config 3,4 | | SSB.4 FR1 | SSB.4 FR1 | |
| CSI-RS Configuration | | Config 1,2 | | N/A | CSI-RS.1.1 FDD | As defined in clause A.1.4 |
| | | Config 3,4 | | | CSI-RS.2.1 TDD | |
| Duplex Mode for Cell 2 | | Config 1,2 | | FDD | FDD | |
| | | Config 3,4 | | TDD | TDD | |
| TDD Configuration | | Config 3,4 | | TDDConf.2.1 | TDDConf.2.1 | |
| OCNG Pattern Note 1 | | | | OCNG pattern 1 | OCNG pattern 1 | As defined in clause A.2.1 |
| PDSCH parameters Note 4 | | Config 1,2 | | SR1.1 FDD | SR1.1 FDD | As defined in clause A.1.1 |
| | | Config 3,4 | | SR2.1 TDD | SR2.1 TDD | |
| RMSI CORESET reference channel | | Config 1,2 | | CR.1.1 FDD | CR.1.1 FDD | |
| | | Config 3,4 | | CR.2.1 TDD | CR.2.1 TDD | |
| Dedicated CORESET reference channel | | Config 1,2 | | CCR.1.1 FDD | CCR.1.1 FDD | |
| | | Config 3,4 | | CCR.2.1 TDD | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | -98 | |
| | | Config 3,4 | | -101 | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | 3 | |
| | SS-RSRP Note 3 | Config 1,2 | dBm/15kHz | -95 | -95 | |
| | | Config 3,4 | | -98 | -98 | |
| | SS-RSRP Note 3 | | dBm/SCS | -95 | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | -98 | |
| | | Config 3,4 | | -101 | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | -17 | |
| | SS-RSRP Note 3 | Config 1,2 | dBm/15kHz | -115 | -115 | |
| | | Config 3,4 | | -118 | -118 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 3,4 | | -62.2/38.16MHz | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13] |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2] |
| PRACH Configuration | | | | PRACH.2 FR1 | PRACH.3 FR1 | As defined in clause A.7.1 |
| Propagation Condition | | | - | AWGN | AWGN | |

NOTE 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: Es/Iot, SS-RSRP and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
NOTE 3: Void.
NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex.*

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList.*

Test 3: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.2.5-4.

**Table 4.3.2.2.2.5-2: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.2.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 4.3.2.2.2.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 880*$T_c$ |
| | 30 | 30 | 624*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

### 4.3.2.2.3 EN-DC FR1 2-step contention based random access

#### 4.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 4.3.2.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and twoStepRACH-r16.

#### 4.3.2.2.3.3 Minimum conformance requirement

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS 38.101-2 [3] for frequency range 2.

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE in SA operation mode or any MR-DC operation mode.

##### 4.3.2.2.3.3.1 Correct behaviour when transmitting MsgA

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, UE shall have the capability to transmit MsgA PRACH on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured.

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

##### 4.3.2.2.3.3.2 Correct behaviour when receiving MsgB

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

The UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH and monitor contention resolution as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

#### 4.3.2.2.3.3.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.3 and A.4.3.2.2.3.

### 4.3.2.2.3.4 Test description

#### 4.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.3.4.1-1.

**Table 4.3.2.2.3.4.1-1: Contention based random access test in FR1 for PSCell in EN-DC supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 4.3.2.2.3-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.3-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.3-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.3-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.3.4.1-2.

**Table 4.3.2.2.3.4.1-2: Initial conditions for Contention based random access test in FR1 for EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.3.2.2.3.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.3.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.

#### 4.3.2.2.3.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via the dedicated signalling in the downlink:

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.3.2.2.3.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB_RP above the configured rsrp-ThresholdSSB.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.3.5.

#### 4.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.3.2.2.3.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 4.3.2.2.3.4.3-1: *BWP-UplinkCommon***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkCommon ::= SEQUENCE { | | | |
| rach-ConfigCommon CHOICE { | | | |
| Setup | RACH-ConfigCommon | Table 4.3.2.2.3.4.3-2 | |
| } | | | |
| rach-ConfigCommonIAB-r16 | Not present | | |
| useInterlacePUCCH-PUSCH-r16 | Not present | | |
| msgA-ConfigCommon-r16 CHOICE { | | | |
| setup SEQUENCE { | | | |
| rach-ConfigCommonTwoStepRA-r16 | RACH-ConfigCommonTwoStepRA specified in TS 38.508-1 [14] Table 7.3.1-13A | | |
| msgA-PUSCH-Config-r16 | MsgA-PUSCH-Config-r16 specified in TS 38.508-1 [14] Table 7.3.1-14A | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.3.2.2.3.4.3-2: *RACH-ConfigCommon* (Table 4.3.2.2.3.4.3-1)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| totalNumberOfRA-Preambles | Not present | | |
| } | | | |

4.3.2.2.3.5 Test requirement

Table 4.3.2.2.3.5-1 defines the primary level settings for contention based random access test in FR1 for PSCell in EN-DC.

**Table 4.3.2.2.3.5-1: General test parameters**

| **Parameter** | | **Unit** | **Test 1** | **Comments** |
|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.3 FR1 | As defined in clause A.3.1 |
| | Config 3,4 | | SSB.4 FR1 | |
| Duplex Mode for Cell 2 | Config 1,2 | | FDD | |
| | Config 3,4 | | TDD | |
| TDD Configuration | Config 3,4 | | TDDConf.2.1 | |
| OCNG Pattern Note 1 | | | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | Config 1,2 | | SR1.1 FDD | As defined in clause A.1.1. |
| | Config 3,4 | | SR.2.1 TDD | |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -95 | |
| | | Config 3,4 | | -98 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -115 | |
| | | Config 3,4 | | -118 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3,4 | | -62.2/38.16 MHz | |
| ss-PBCH-BlockPower | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 1 | |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.<br>NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.<br>NOTE 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

**Table 4.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.3.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 dB |

**Table 4.3.2.2.3.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 880*$T_c$ |
| | 30 | 30 | 624*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 4.3.2.2.4 EN-DC FR1 2-step non-contention based random access

#### 4.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step non-contention based random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 4.3.2.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and twoStepRACH-r16.

#### 4.3.2.2.4.3 Minimum conformance requirement

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS 38.101-2 [3] for frequency range 2.

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE in SA operation mode or any MR-DC operation mode.

#### 4.3.2.2.4.3.1 Correct behaviour when transmitting MsgA

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, the UE should have the capability to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

#### 4.3.2.2.4.3.2 Correct behaviour when receiving MsgB

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated MsgA PRACH and MsgA PUSCH transmission power if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 4.3.2.2.4.3.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.3 and A.4.3.2.2.4.

### 4.3.2.2.4.4 Test description

#### 4.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 4.3.2.2.4.4.1-1.

**Table 4.3.2.2.4.4.1-1: Non-contention based random access test in FR1 for PSCell in EN-DC supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 4.3.2.2.4-1 | 1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.4-2 | 2 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.3.2.2.4-3 | 3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.3.2.2.4-4 | 4 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.3.2.2.4.4.1-2.

**Table 4.3.2.2.4.4.1-2: Initial conditions for non-contention based random access test in FR1 for EN-DC**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.3.2.2.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 4.3.2.2.4.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

#### 4.3.2.2.4.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR1 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via the dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.3.2.2.4.5-1.

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 4.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 4.3.2.2.4.5.

#### 4.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.3.2.2.4.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 4.3.2.2.4.4.3-1: *Same as Table 4.3.2.2.3.4.3-1***

**Table 4.3.2.2.4.4.3-2: *Same as Table 4.3.2.2.3.4.3-2***

**Table 4.3.2.2.4.4.3-3: *RACH-ConfigDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 with condition 2-step RA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated ::= SEQUENCE { | | | |
| cfra | Not present | | |
| cfra-TwoStep-r16 SEQUENCE { | | | |
| occasionsTwoStepRA-r16 SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | Not present | Same value in RACH-ConfigGeneric will be used | |
| msgA-RO-FDM-r16 | Not present | | |
| msgA-RO-FrequencyStart-r16 | Not present | | |
| msgA-ZeroCorrelationZoneConfig-r16 | Not present | | |
| msgA-PreamblePowerRampingStep-r16 | Not present | | |
| msgA-PreambleReceivedTargetPower-r16 | Not present | | |
| msgB-ResponseWindow-r16 | sl10 | | |
| preambleTransMax-r16 | Not present | | |

| | | | |
|---|---|---|---|
| } | | | |
| ssb-PerRACH-OccasionTwoStepRA-r16 | oneFourth | | |
| } | | | |
| msgA-CFRA-PUSCH-r16 SEQUENCE { | | | |
| msgA-MCS-r16 | 1 | | |
| nrofSlotsMsgA-PUSCH-r16 | 1 | | |
| nrofMsgA-PO-PerSlot-r16 | one | | |
| msgA-PUSCH-TimeDomainOffset-r16 | 1 | | |
| startSymbolAndLengthMsgA-PO-r16 | 27 | S = 0, L = 14 | |
| mappingTypeMsgA-PUSCH-r16 | typeA | | |
| nrofPRBs-PerMsgA-PO-r16 | 2 | | |
| msgA-DMRS-Config-r16 SEQUENCE { | | | |
| msgA-DMRS-AdditionalPosition-r16 | pos1 | | |
| msgA-PUSCH-NrofPorts-r16 | 1 | | |
| } | | | |
| msgA-Alpha-r16 | alpha1 | | |
| } | | | |
| resourcesTwoStep-r16 SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF CFRA-SSB-Resource { | 1 entry | | |
| CFRA-SSB-Resource SEQUENCE { | | entry 1 | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 50 | | |
| } | | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |

4.3.2.2.4.5 Test requirement

Table 4.3.2.2.4.5-1 defines the primary level settings for non-contention based random access test in FR1 for PSCell in EN-DC.

**Table 4.3.2.2.4.5-1: General test parameters**

| Parameter | | | Unit | Test 1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1,2 | | SSB.3 FR1 | As defined in clause A.3.1 |
| | | Config 3,4 | | SSB.4 FR1 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | FDD | |
| | | Config 3,4 | | TDD | |
| TDD Configuration | | Config 3,4 | | TDDConf.2.1 | |
| OCNG Pattern Note 1 | | | | OCNG pattern 1 | As defined in clause A.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 | | SR1.1 FDD | As defined in clause A.1.1. |
| | | Config 3,4 | | SR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -95 | |
| | | Config 3,4 | | -98 | |
| | SS-RSRP | | dBm/SCS | -95 | |

| Parameter | | | Unit | Test 1 | Comments |
|---|---|---|---|---|---|
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | Config 1,2 | dBm/15kHz | -115 | |
| | | Config 3,4 | | -118 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 3,4 | | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 2 | |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN | |

NOTE 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
NOTE 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

**Table 4.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 4.3.2.2.4.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 dB |

**Table 4.3.2.2.4.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 880*$T_c$ |
| | 30 | 30 | 624*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 4.3.2.3 Void

# 4.4 Timing

## 4.4.1 UE transmit timing

### 4.4.1.0 Minimum conformance requirements

#### 4.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 4.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}})\times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}})\times T_{\mathrm{c}}$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table 4.4.1.0.1-2.

**Table 4.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (Hz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 12*64*$T_c$ |
| | | 30 | 10*64*$T_c$ |

| | | | |
|---|---|---|---|
| | | 60 | 10*64*$T_c$ |
| | 30 | 15 | 8*64*$T_c$ |
| | | 30 | 8*64*$T_c$ |
| | | 60 | 7*64*$T_c$ |
| 2 | 120 | 60 | 3.5*64*$T_c$ |
| | | 120 | 3.5*64*$T_c$ |
| | 240 | 60 | 3*64*$T_c$ |
| | | 120 | 3*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 4.4.1.0.1-2: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset according to TS 38.101-1 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.101-2 [3] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.<br>NOTE 2: Void | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.

2) The minimum aggregate adjustment rate shall be $T_p$ per second.

3) The maximum aggregate adjustment rate shall be $T_q$ per 200ms.

where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 4.4.1.0.1-3.

**Table 4.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (KHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 1 | 15 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 30 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 60 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| 2 | 60 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| | 120 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

## 4.4.1.1 EN-DC FR1 UE transmit timing accuracy

### 4.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits.

### 4.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

### 4.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.1.1.

### 4.4.1.1.4 Test description

#### 4.4.1.1.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 4.4.1.1.4.1-1.

**Table 4.4.1.1.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.4.1.1-1 | LTE FDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-2 | LTE FDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-3 | LTE FDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz |
| 4.4.1.1-4 | LTE TDD, NR FDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-5 | LTE TDD, NR TDD, SSB SCS 15 KHz, data SCS 15 KHz, BW 10 MHz |
| 4.4.1.1-6 | LTE TDD, NR TDD, SSB SCS 30 KHz, data SCS 30 KHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 4.4.1.1.4.1-2

**Table 4.4.1.1.4.1-2: Initial conditions for EN-DC FR1 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6 4.4.1.1.4.3.

2. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The power levels and settings for Cell 1 are set according to clause A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. Downlink signals for NR cell are initially set up according to clause C.1.

#### 4.4.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up E-UTRA PCell according to parameters given in Table A.6.1.1-1 and setup NR PSCell according to parameters given in Table 4.4.1.1.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 4.4.1.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB:

   a. The $N_{TA}$ offset value (in $T_c$ units) is 25600 for FR1.

   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 4.4.1.1.5-4.

6. The test system shall adjust the timing of the DL path by values given in Table 4.4.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

**Table 4.4.1.1.4.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (KHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 15 | +64*64Tc | +32*64Tc |
| 30 | +32*64Tc | +16*64Tc |

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 4.4.1.1.5-5. This will only be done for Test1. The test system samples the UE transmit timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 4.4.1.0.1 and Table 4.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 4.4.1.0.1 and Table 4.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 4.4.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

#### 4.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.4.1.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 4.4.1.1.4.3-1: *SRS-Config* : Additional test requirement for UE transmit timing accuracy for EN-DC FR1 UE**

| Derivation Path: TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | SCS15 |
| | 25 | | SCS30 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl320 | 3 | | Test 2 and SCS15 |
| sl640 | 5 | | Test 2 and SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.4.1.1.4.3-2: *DRX-Config* : Additional test requirement for UE transmit timing accuracy Test 2 for EN-DC FR1**

| Derivation Path: TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |

| | | | |
|---|---|---|---|
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | NOT PRESENT | |
| } | | | |

4.4.1.1.5 Test requirements

**Table 4.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | Test2 | Band Group |
|---|---|---|---|---|---|
| SSB ARFCN | | 1,2,3,4,5,6 | Freq1 | Freq1 | |
| Duplex Mode | | 1,4 | FDD | | |
| | | 2,3,5,6 | TDD | | |
| TDD configuration | | 1,4 | Not Applicable | | |
| | | 2,5 | TDDConf.1.1 | | |
| | | 3,6 | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | | |
| Initial BWP Configuration | | 1,2,3,4,5,6 | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | 1,2,3,4,5,6 | DLBWP.1.1<br>ULBWP.1.1 | | |
| DRx Cycle | ms | 1,2,3,4,5,6 | N/A | DRX.8 Note5 | |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD | | |
| | | 2,5 | SR.1.1 TDD | | |
| | | 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | | |
| | | 2,5 | CR.1.1 TDD | | |
| | | 3,6 | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | | |
| | | 2,5 | CCR.1.1 TDD | | |
| | | 3,6 | CCR.2.1 TDD | | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | | |
| SSB configuration | | 1,4 | SSB.1 FR1 | | |
| | | 2,5 | SSB.1 FR1 | | |
| | | 3,6 | SSB.2 FR1 | | |
| SMTC configuration | | 1,2,3,4,5,6 | SMTC.2 | | |
| TRS configuration | | 1,4 | TRS.1.1 FDD | | |
| | | 2,5 | TRS.1.1 TDD | | |
| | | 3,6 | TRS.1.2 TDD | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2,4,5 | 15 | | |
| | | 3,6 | 30 | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 | -98 | |

| Parameter | Unit | Config | Test1 | Test2 | Band Group |
|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -98 | -98 | |
| | | 3,6 | -95 | -95 | |
| $\hat{E}_s / I_{ot}$ | | 1,2,3,4,5,6 | 3.3 | 3.3 | |
| $\hat{E}_s / N_{oc}$ | | 1,2,3,4,5,6 | 3.3 | 3.3 | |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -95 | -95 | |
| | | 3,6 | -92 | -92 | |
| Io Note3 | dBm/9.36MHz | 1,2,4,5 | -65.08 | -65.08 | |
| | dBm/38.1MHz | 3,6 | -61.99 | -61.99 | |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | | |
| SRS Config | | 1,2,4,5 | SRSConf.1 Note6 | SRSConf.3 Note6 | |
| | | 3, 6 | SRSConf.1 Note6 | SRSConf.2 Note6 | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: DRx related parameters are given in Table 4.4.1.1.5-3.
NOTE 6: SRS configs are given in Table 4.4.1.1.5-2.

**Table 4.4.1.1.5-2: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
|---|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | 0 | |
| | resourceType | Periodic | Periodic | Periodic | |
| | Usage | Codebook | Codebook | Codebook | |
| | SRS-ResourceSetId | 0 | 0 | 0 | |
| SRS-Resource | nrofSRS-Ports | Port1 | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | 0 | |
| | freqDomainShift | 0 | 0 | 0 | |
| | freqHopping c-SRS | 14 for test configuration 1,2,4,5 25 for test configuration 3,6 | 25 | 14 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | Neither | |
| | resourceType | Periodic | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1 | sl640,5 | sl320, 3 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | 0 | Any 10 bit number |

**Table 4.4.1.1.5-3: DRX-Configuration for UL Timing Tests**

| Field | Test 2 |
|---|---|

| | Value |
|---|---|
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| longDRX-CycleStartOffset | 320 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| NOTE: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | |

**Table 4.4.1.1.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (KHz) | SCS of uplink signals (KHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $13.75*64*T_c$ |
| | | 30 | $11.75*64*T_c$ |
| | | 60 | $11.75*64*T_c$ |
| | 30 | 15 | $9.75*64*T_c$ |
| | | 30 | $9.75*64*T_c$ |
| | | 60 | $8.75*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 4.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (KHz) | $T_q$ | $T_p$ | Maximum Adjustment Rate |
|---|---|---|---|---|
| 1 | 15 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 30 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 60 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | | |

## 4.4.2 UE timer accuracy

## 4.4.3 Timing advance

### 4.4.3.0 Minimum conformance requirements

The timing advance is initiated from PSCell in EN-DC operation mode with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

#### 4.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 4.4.3.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 4.4.3.0.1-1: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 | 120 |
|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ |

#### 4.4.3.0.2 Minimum conformance requirements for timing advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot *n*+ *k* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.3.1.

### 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

#### 4.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

#### 4.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 4.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 4.4.3.0.1 and clause 4.4.3.0.2.

The normative reference for this requirement is TS.38.133 [6] clause A.4.4.3.1.

#### 4.4.3.1.4 Test description

##### 4.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.4.3.1.4.1-1.

**Table 4.4.3.1.4.1-1: EN-DC FR1 timing advance adjustment accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.4.3.1.4.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.4.3.1.4.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.4.3.1.4.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.4.3.1.4.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.4.3.1.4.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.4.3.1.4.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.4.3.1.4.1-2

**Table 4.4.3.1.4.1-2: Initial conditions for EN-DC FR1 timing advance adjustment accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, E.1.2, and Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.4.3.1.4.1-3: General test parameters for timing advance**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| RF channel number | | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell |
| DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For SCS = 15kHz, $N_{TA_new} = N_{TA_old} + 8192*T_c$ (based on equation in TS 38.213 [8] clause 4.2)<br>For SCS = 30kHz, $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | S | 5 | |
| T2 | S | 5 | |

1. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.1.

2. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

#### 4.4.3.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 4.4.3.1.4.1-3 and Table 4.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message content are defined in clause 4.4.3.1.4.3.

2. Set the parameters according to values in Table 4.4.3.1.4.1-3 and Table 4.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value of 39 as specified in Table 4.4.3.1.4.1-3.

7. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay should be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 4.4.3.0.1-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 4.4.3.0.1-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

13. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

14. If any of the above Reconfiguration in Step 12 or 13 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 3-14 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.4.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 4.4.3.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 4.4.3.1.4.3-1: srs-Config setup**

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | Config 1,2,4,5 |
| | 24 | | Config 3,6 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 2 | Once every 5 | SCS15 |

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | Slots | |
| sl5 | 4 | Once every 5 Slots | SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4.4.3.1.5 Test requirement

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where:

$k$ = 5 for Config 1, 2, 3, 4, 5, 6

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in Table 4.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

Table 4.4.3.1.5-1 and Table 4.4.3.1.5-2 define the primary level settings.

**Table 4.4.3.1.5-1: Cell specific test parameters for timing advance**

| **Parameter** | | **Unit** | **Test1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| TDD configuration | Config 1,4 | | Not Applicable | |
| | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | |
| | Config 2,5 | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | |
| | Config 2,5 | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR2.1 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | |
| | Config 2,5 | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | |
| SMTC configuration | Config 1,2,4,5 | | SMTC.1 FR1 | |
| | Config 3,6 | | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |

| Parameter | | Unit | Test1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | 3 | |
| $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -67.57 | |
| | Config 3,6 | dBm/ 38.16MHz | -62.58 | |
| Propagation condition | | - | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 4.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance**

| Field | | Value | Comment |
|---|---|---|---|
| c-SRS | Config 1,2,4,5 | 12 | Frequency hopping is disabled |
| | Config 3,6 | 24 | |
| b-SRS | | 0 | |
| b-hop | | 0 | |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 | |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5@2 for SCS 15kHz sl5@4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| Usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 | |
| repetitionFactor | | n1 | |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 | |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |

NOTE: For further information see clause 6.3.2 in TS 38.331.

**Table 4.4.3.1.5-3: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 |
|---|---|---|---|
| **UE Timing Advance adjustment accuracy** | ±344 $T_c$ | ±344 $T_c$ | ±216 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 4.5 Signalling characteristics

## 4.5.1 Radio link monitoring

### 4.5.1.00 General

The requirements in this clause apply for radio link monitoring on PSCell in EN-DC operation mode.

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

### 4.5.1.0 Minimum conformance requirements

#### 4.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ [ms] evaluation period. The requirements in this clause apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 4.5.1.0.1-1.

$T_{Evaluate_out_SSB}$ is defined in Table 4.5.1.0.1-1 for FR1.

**Table 4.5.1.0.1-1: Evaluation period $T_{Evaluate_out}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) |
|---|---|
| no DRX | max(200,ceil(10*P)*$T_{SSB}$) |
| DRX cycle≤320 | max(200,ceil(15*P)*max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 | ceil(10*P)*$T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB configured for RLM. $T_{DRX}$ is the DRX cycle length | |

For FR1,

- P=1/(1 - $T_{SSB}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

The normative reference for this requirement is TS 38.133 [6] clause 8.1.2.

#### 4.5.1.0.2 Void

#### 4.5.1.0.3 Minimum conformance requirements for out-of-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133, clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out_CSI-RS}$ within $T_{Evaluate_out_CSI-RS}$ [ms] evaluation period.

- $T_{Evaluate_out_CSI-RS}$ is defined in Table 4.5.1.0.3-1 for FR1.

For FR1,

- $P=1/(1 - T_{CSI-RS}/MGRP)$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

The value of $M_{out}$ used in Table 4.5.1.0.3-1 is defined as:

- $M_{out}$ = 20 if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 4.5.1.0.3-1: Evaluation period $T_{Evaluate_out_CSI-RS}$ for FR1**

| Configuration | $T_{Evaluate_out_CSI-RS}$ (ms) |
|---|---|
| no DRX | $\max(200, \text{ceil}(M_{out}\times P)\times T_{CSI-RS})$ |
| DRX ≤ 320ms | $\max(200, \text{ceil}(1.5\times M_{out}\times P)\times \max(T_{DRX}, T_{CSI-RS}))$ |
| DRX > 320ms | $\text{ceil}(M_{out}\times P) \times T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clauses 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331.

The out-of-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in clause 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM\text{-}RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

#### 4.5.1.0.4 Minimum conformance requirements for in-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_CSI\text{-}RS}$ within $T_{Evaluate_in_CSI\text{-}RS}$ [ms] evaluation period.

- $T_{Evaluate_in_CSI\text{-}RS}$ is defined in Table 8.1.3.2-1 for FR1.

For FR1,

- P=1/(1 - $T_{CSI\text{-}RS}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

The value of $M_{in}$ used in Table 8.1.3.2-1 is defined as:

- $M_{in}$ = 10, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth ≥ 24 PRBs.

**Table 8.1.3.2-1: Evaluation period $T_{Evaluate_in_CSI\text{-}RS}$ for FR1**

| Configuration | $T_{Evaluate_in_CSI\text{-}RS}$ (ms) |
|---|---|
| no DRX | max(100, ceil($M_{in}$×P) × $T_{CSI\text{-}RS}$) |
| DRX ≤ 320ms | max(100, ceil(1.5×$M_{in}$×P)× max($T_{DRX}$, $T_{CSI\text{-}RS}$)) |
| DRX > 320ms | ceil($M_{in}$×P) × $T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI\text{-}RS}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clauses 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period

corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in}$, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in clause 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI-RS}$ specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

#### 4.5.1.0.5 Requirements for UE configured with relaxed measurement criteria

[TS 38.133, clause 8.1.1.1]

For the UE supporting rlm-Relaxation-r17 and configured with explicit signalling goodServingCellEvaluationRLM, which is always configured to the UE when the network enables RLM relaxation for the UE as specified in TS 38.331 [13], the relaxed requirements defined in clause 4.5.1.0.5.1 for SSB based radio link monitoring and the relaxed requirements defined in clause 4.5.1.0.5.2 for CSI-RS based radio link monitoring are allowed to apply to the relaxed RLM measurements on SpCell after fulfilling the following conditions:

- for the serving cells in intra-band carrier aggregation configured with SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on SCell, when
- the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on SCell in the intra-band carrier aggregation if the lowMobilityEvaluationConnected is not configured, or
- the UE is also configured with lowMobilityEvaluationConnected and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of TSearchDeltaP-Connected and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on SCell in the intra-band carrier aggregation.
- for other serving cells, when
- the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell if the lowMobilityEvaluationConnected is not configured, or
- the UE is also configured with lowMobilityEvaluationConnected and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of TSearchDeltaP-Connected and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell.

otherwise, UE shall apply the requirements defined in clause 4.5.1.0.1 for SSB based radio link monitoring and the requirements defined in clause 4.5.1.0.3 and 4.5.1.0.4 for CSI-RS based radio link monitoring. Note that when multiple resources are configured on a serving cell for RLM or BFD evaluation, the good serving cell quality criterion is considered as fulfilled for the serving cell when any resource configured for the cell fulfils the good serving defined in clause 5.7.13.2 of TS 38.331 [13].

The UE is no longer allowed to relax RLM measurements and apply the relaxed radio link monitoring provided that at least one of the following conditions is met:

- The UE sends out-of-sync indications to the higher layers.
- The timer T310 is running.
- No DRX is used or DRX cycle is longer than 80 ms.

#### 4.5.1.0.5.1 Minimum requirement of SSB based radio link monitoring for UE fulfilling relaxed measurement criteria

[TS 38.133, clause 8.1.2.4]

This clause contains minimum requirements for relaxed radio link monitoring based on SSB.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB_Relax}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB_Relax}$ [ms] evaluation period.

$T_{Evaluate_out_SSB_Relax}$ is defined in Table 4.5.1.0.5.1-1 for FR1.

The value of P is defined in clause 4.5.1.0.1.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 4.5.1.0.5.1-1: Evaluation period $T_{Evaluate_out_SSB_Relax}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX},T_{SSB}) \leq 80ms$ | $Max(200\times K3^{NOTE3}, Ceil(15 \times K1^{NOTE2} \times P) \times Max(T_{DRX},T_{SSB}))$ |
| $80ms < Max(T_{DRX},T_{SSB}) \leq 160ms$ | $Ceil(15 \times P) \times Max(T_{DRX},T_{SSB})$ |
| NOTE 1: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length and no longer than 80ms. | |
| NOTE 2: K1 = 4 for $Max(T_{DRX},T_{SSB}) \leq 40ms$ and K1 = 2 for $40ms<Max(T_{DRX},T_{SSB}) \leq 80ms$. | |
| NOTE 3: K3 = K1, if K1 ≤ 2; otherwise K3 = 1. | |

### 4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

#### 4.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the FR1 PSCell radio link monitoring requirements in TS 38.133 [6], clause 8.1.2.

#### 4.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 4.5.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 4.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.1.

#### 4.5.1.1.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.1.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

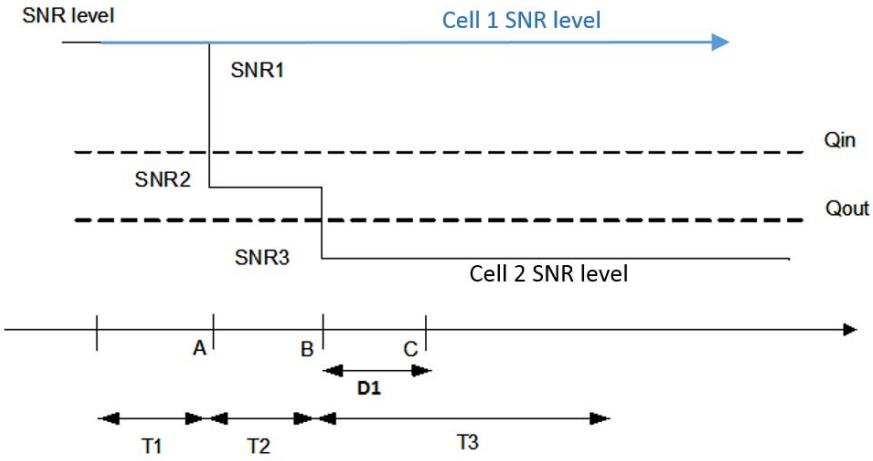


**Figure 4.5.1.1.4-1: SNR variation for out-of-sync testing**

#### 4.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.1.4.1-1.

**Table 4.5.1.1.4.1-1: EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.5.1.1-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.1-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.1-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.1-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.1-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.1-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.1.4.1-2.

**Table 4.5.1.1.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 4.5.1.1.4.1-3: Void**

1. Message contents are defined in clause 4.5.1.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. The test parameters are given in Table 4.5.1.1.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

**Table 4.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2, 5 | | CCR.1.3 TDD |
| | Config 3, 6 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz |
| | Config 3, 6 | | 30 KHz |
| PRACH Configuration | Config 1, 2, 4, 5 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3, 6 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *gp0* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration | | Config 1, 4 | | CSI-RS.1.1 FDD |
| | | Config 2, 5 | | CSI-RS.1.1 TDD |
| | | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2, 5 | | TRS.1.1 TDD |
| | | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 4.5.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 4.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 4.5.1.1.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.1.5-1 for subtests 1 and 2. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.1.5-1 for subtests 1 and 2. T3 starts.

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

8. Otherwise the number of failed tests is increased by one and proceed to Step 12.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.1.5-1.

10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

11. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

12. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat steps 4-12 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and clause 7.3.1 with condition "Short_DCI" and with the following exceptions.

**Table 4.5.1.1.4.3-1: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-4 with condition gapUE<br>Table H.3.4-5 with condition BFD<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM |

**Table 4.5.1.1.4.3-2: Void**

**Table 4.5.1.1.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

#### 4.5.1.1.5 Test requirement

Table 4.5.1.1.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows.

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 4.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 KHz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>NOTE 4: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.9dB (including test tolerances) | | | | | |

**Table 4.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap). | |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

### 4.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync, for the purpose of monitoring downlink radio link quality of the PSCell, when DRX is not used. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.2.

### 4.5.1.2.2 Test applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC.

#### 4.5.1.2.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.2.

#### 4.5.1.2.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.2.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

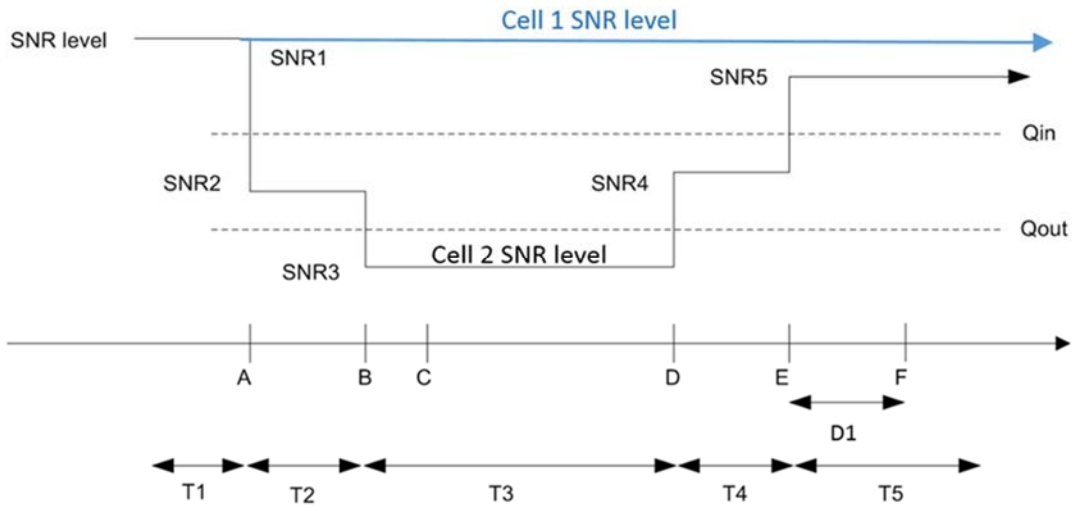


**Figure 4.5.1.2.4-1: SNR variation for in-sync testing**

#### 4.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.2.4.1-1.

**Table 4.5.1.2.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.2-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.2-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.2-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.2-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.2-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.2-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.2.4.1-2.

**Table 4.5.1.2.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.2.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 4.5.1.2.4.1-3: Void**

1. Message contents are defined in clause 4.5.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The general test parameters are given in Table 4.5.1.2.4.1-4.
4. Downlink signals for NR cell are initially set up according to clause C.1.

**Table 4.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz |
| | Config 3, 6 | | 30 KHz |
| PRACH Configuration | Config 1, 2, 4, 5 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3, 6 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |

NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.
NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.
NOTE 3: E-UTRAN is in non-DRX mode under test.

4.5.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 4.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.2.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 4.5.1.2.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 4.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 4.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 4.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CSI reporting during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-7 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and clause 7.3.1 with condition "Short_DCI" with the following exceptions.

**Table 4.5.1.2.4.3-1: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM |

**Table 4.5.1.2.4.3-2: Void**

**Table 4.5.1.2.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

#### 4.5.1.2.5 Test requirement

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 4.5.1.2.3.

Table 4.5.1.2.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows.

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

**Table 4.5.1.2.5-1: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 4.5.1.2.4-1.
NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8 dB and -8.8 dB(including test tolerances).

### 4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode

#### 4.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 4.5.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

#### 4.5.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 4.5.1.0.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.3.

#### 4.5.1.3.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.3.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

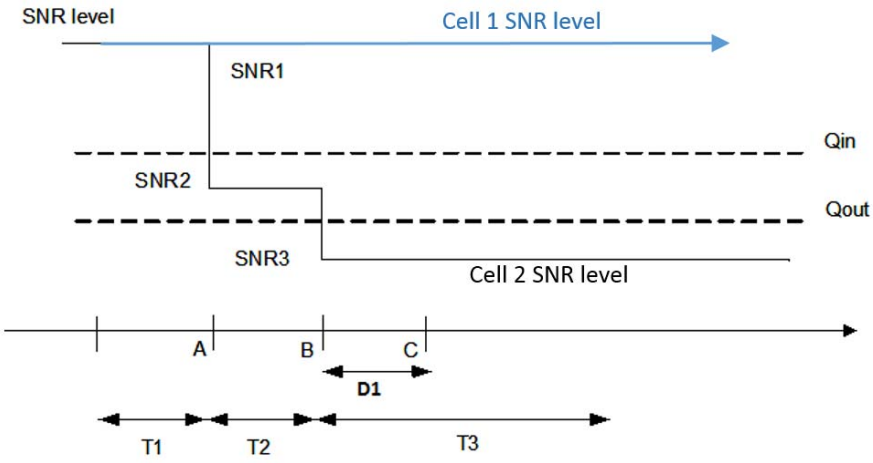


**Figure 4.5.1.3.4-1: SNR variation for out-of-sync testing**

#### 4.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.3.4.1-1.

**Table 4.5.1.3.4.1-1: EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.5.1.3-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.3-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.3-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.3-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.3-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.3-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.3.4.1-2.

**Table 4.5.1.3.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 4.5.1.3.4.1-3: Void**

1. Message contents are defined in clause 4.5.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. The test parameters are given in Table 4.5.1.3.4.1-4.
4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

**Table 4.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2, 5 | | CCR.1.3 TDD |
| | Config 3, 6 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz |
| | Config 3, 6 | | 30 KHz |
| PRACH Configuration | Config 1, 2, 4, 5 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3, 6 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.68 |
| T3 | | s | 0.68 |
| D1 | | s | 0.64 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | |

#### 4.5.1.3.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 4.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.3.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.3.5-1 for subtests 1 and 2. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.3.5-1 for subtests 1 and 2. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one, and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure that PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and clause 7.3.1 with condition "Short_DCI" and with the following exceptions:

**Table 4.5.1.3.4.3-0: Common Exception messages for EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3 |

**Table 4.5.1.3.4.3-1: Void**

**Table 4.5.1.3.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

#### 4.5.1.3.5 Test requirement

Table 4.5.1.3.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 4.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 KHz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | |
| NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | |
| NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.3.4-1. | | | | | |
| NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances). | | | | | |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode

### 4.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 4.5.1.4.2 Test applicability

This test applies to all types of E-UTRA UE Release 15 and forward supporting EN-DC FR1 and long DRX cycle.

### 4.5.1.4.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.2. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.4.

### 4.5.1.4.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.4.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is

enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

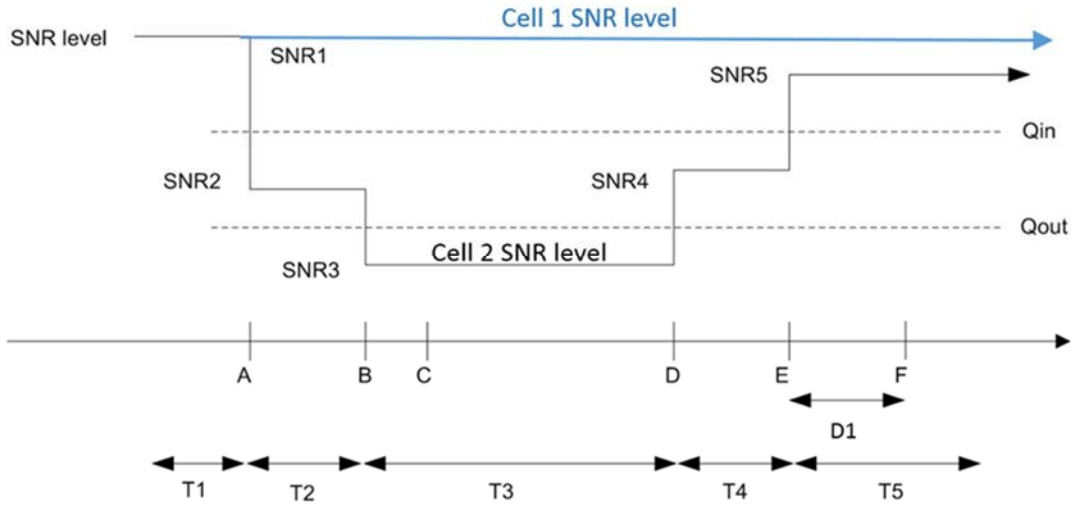


**Figure 4.5.1.4.4-1 - SNR variation for in-sync testing**

### 4.5.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.4.4.1-1.

**Table 4.5.1.4.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.4-1 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.4-2 | LTE FDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.4-3 | LTE FDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.4-4 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.4-5 | LTE TDD, NR 15 KHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.4-6 | LTE TDD, NR 30 KHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.4.4.1-2.

**Table 4.5.1.4.4.1-2: Initial conditions for EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 4.5.1.4.4.1-3: Void**

1. Message contents are defined in clause 4.5.1.4.4.3.
2. The power levels and settings for Cell 1 are set according to clause A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. The general test parameters are given in Table 4.5.1.4.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to clause C.1.

**Table 4.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active E-UTRA PCell | | | | Cell 1 |
| E-UTRA RF Channel Number | | | | 1 |
| Active PSCell | | | | Cell 2 |
| RF Channel Number | | | | 2 |
| Duplex mode | | Config 1, 4 | | FDD |
| | | Config 2, 3, 5, 6 | | TDD |
| $BW_{channel}$ | | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | | Config 3, 6 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2, 5 | | TDDConf.1.1 |
| | | Config 3, 6 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2, 5 | | CR.1.1 TDD |
| | | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD |
| | | Config 2, 5 | | CCR.1.1 TDD |
| | | Config 3, 6 | | CCR.2.1 TDD |
| SSB Configuration | | Config 1, 4 | | SSB.1 FR1 |
| | | Config 2, 5 | | SSB.1 FR1 |
| | | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 | | SMTC.1 |
| | | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 | | 15 KHz |
| | | Config 3, 6 | | 30 KHz |
| PRACH Configuration | | Config 1, 2, 4, 5 | | Table A.7.1-1, PRACH.1 FR1 |
| | | Config 3, 6 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM | | | 2 |

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| | | symbols | | |
| | | Aggregation level | CCE | 8 |
| | | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | | DMRS precoder granularity | | REG bundle size |
| | | REG bundle size | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 4 | | CSI-RS.1.1 FDD |
| | | Config 2, 5 | | CSI-RS.1.1 TDD |
| | | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS tracking | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2, 5 | | TRS.1.1 TDD |
| | | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.64 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| D1 | | | s | 0.84 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 4.5.1.4.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 4.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.1.4.5-1 for subtest 1 and 2. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the subframe according the configured CSI reporting mode (PUCCH 1-0) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG,

Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-7 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short_DCI" and with the following exceptions.

**Table 4.5.1.4.4.3-0: Common Exception messages for EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3 |

**Table 4.5.1.4.4.3-1: Void**

**Table 4.5.1.4.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

#### 4.5.1.4.5 Test requirement

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 4.5.1.4.3.

Table 4.5.1.4.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

**Table 4.5.1.4.5-1: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 4.5.1.4.4-1.
NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB (including test tolerances).

## 4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

### 4.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 4.5.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

### 4.5.1.5.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.5.

### 4.5.1.5.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

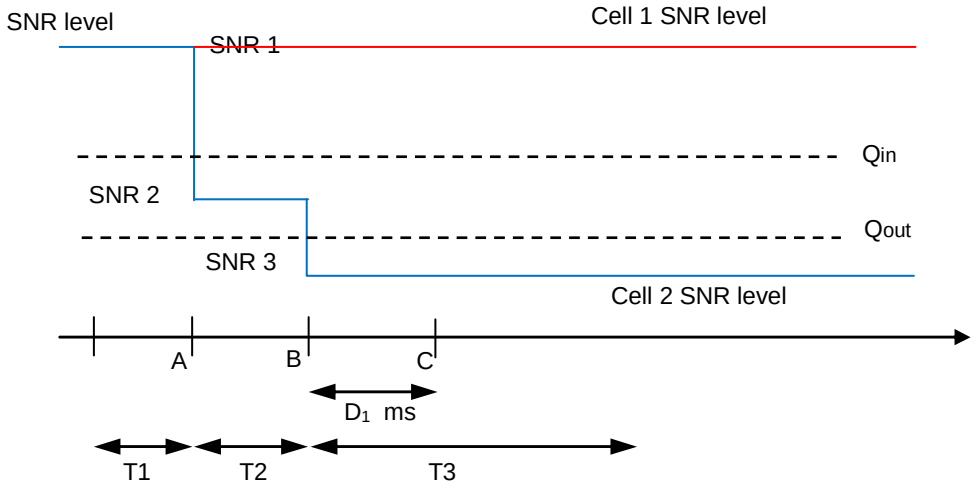


**Figure 4.5.1.5.4-1: SNR variation for out-of-sync testing**

#### 4.5.1.5.4.1 Initial conditions

Test 4.5.1.5 can be run in one of the configurations defined in Table 4.5.1.5.4.1-1.

**Table 4.5.1.5.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.5.4.1-2.

**Table 4.5.1.5.4.1-2: Initial conditions for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The test parameters are given in Table 4.5.1.5.4.1-3 below.
2. Message contents are defined in clause 4.5.1.5.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

**Table 4.5.1.5.4.1-3: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| DedicatedCORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2, 5 | | CCR.1.3 TDD |
| | Config 3, 6 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz |
| | Config 3, 6 | | 30 KHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2, 5 | | Resource #4 in TRS.1.1 TDD |
| | Config 3, 6 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS 1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

**Table 4.5.1.5.4.1-4: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

### 4.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters of Cell 2 according to T1 in Table 4.5.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.5.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.5.5-1. T3 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.5.5-1.

9. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 4-11 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

**Table 4.5.1.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-9<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-4 with condition gapUE<br>Table H.3.4-5 with condition BFD<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM |

**Table 4.5.1.5.4.3-2: Void**

#### 4.5.1.5.5 Test requirement

Tables 4.5.1.5.4.1-2 and 4.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 4.5.1.5.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15K Hz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | |
| NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. | | | | |
| NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. | | | | |
| NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | |
| NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | |
| NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | |
| NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.5.4-1. | | | | |
| NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances). | | | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all slots configured for CSI transmission according the configured CSI reporting mode on PUCCH.

The UE shall stop transmitting uplink signal no later than time point C (D1 after the start of time duration T3).

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal
- UE output power equal to or less than transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

### 4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

#### 4.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

#### 4.5.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

#### 4.5.1.6.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.6.

#### 4.5.1.6.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

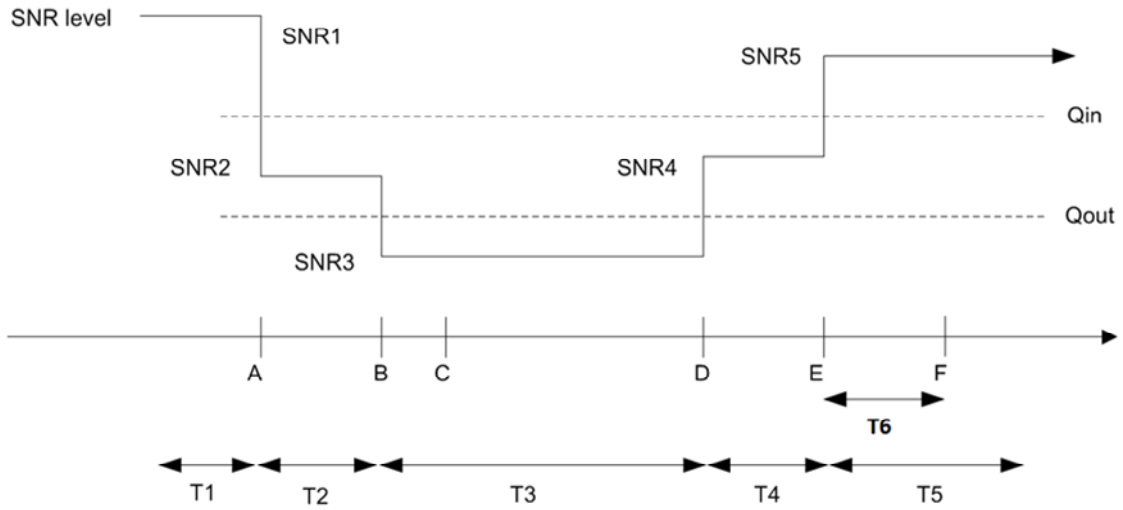


**Figure 4.5.1.6.4-1: SNR variation for in-sync testing**

#### 4.5.1.6.4.1 Initial conditions

Test 4.5.1.6 can be run in one of the configurations defined in Table 4.5.1.6.4.1-1.

**Table 4.5.1.6.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.6.4.1-2.

**Table 4.5.1.6.4.1-2: Initial conditions for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The test parameters are given in Table 4.5.1.6.4.1-3 below.
2. Message contents are defined in clause 4.5.1.6.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.2 and C.1.3.

**Table 4.5.1.6.4.1-3: General test parameters for FR1 PSCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active E-UTRA PCell | | | | Cell 1 |
| E-UTRA RF Channel Number | | | | 1 |
| Active PSCell | | | | Cell 2 |
| RF Channel Number | | | | 2 |
| Duplex mode | | Config 1, 4 | | FDD |
| | | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2, 5 | | TDDConf.1.1 |
| | | Config 3, 6 | | TDDConf. 2.1 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2, 5 | | CR.1.1 TDD |
| | | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD |
| | | Config 2, 5 | | CCR.1.1 TDD |
| | | Config 3, 6 | | CCR.2.1 TDD |
| SSB Configuration | | Config 1, 4 | | SSB.1 FR1 |
| | | Config 2, 5 | | SSB.1 FR1 |
| | | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 | | SMTC.1 |
| | | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 | | 15 KHz |
| | | Config 3, 6 | | 30 KHz |
| TRS configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2, 5 | | TRS.1.1 TDD |
| | | Config 3, 6 | | TRS.1.2 TDD |
| CSI-RS for RLM | | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | | Config 2, 5 | | Resource #4 in TRS.1.1 TDD |
| | | Config 3, 6 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | | TCI.State.2 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical | | dB | 0 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | PDCCH RE energy to average CSI-RS RE energy | | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| T6 | | s | 0.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

#### 4.5.1.6.4.2 Test procedure and test mode *On*

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-10 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 4.5.1.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM |

#### 4.5.1.6.5 Test requirement

Tables 4.5.1.6.4.1-2 and 4.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring in-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 4.5.1.6.5-1: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15KHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.6.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least in all slots configured for CSI transmission according to the configured CSI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

### 4.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 PSCell CSI-RS out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

### 4.5.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM and long DRX cycle.

### 4.5.1.7.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.7.

### 4.5.1.7.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

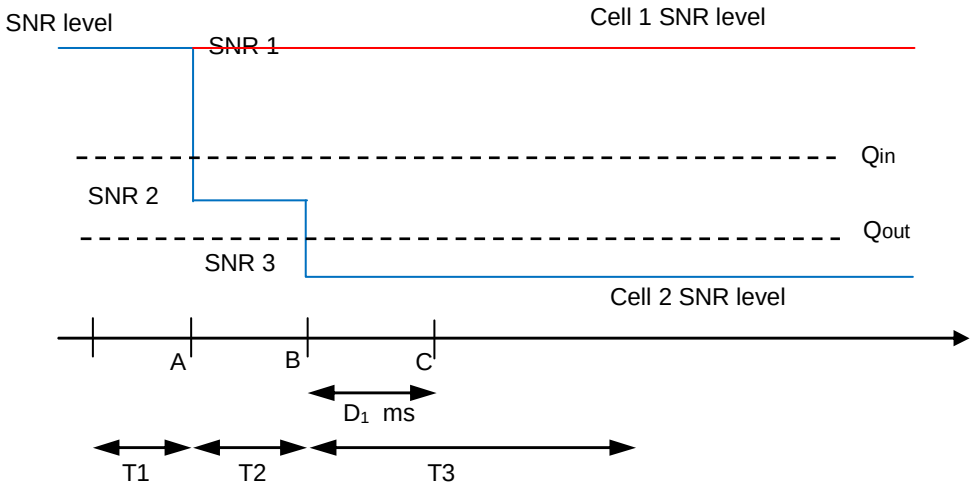


**Figure 4.5.1.7.4-1: SNR variation for out-of-sync testing**

#### 4.5.1.7.4.1 Initial conditions

Test 4.5.1.7 can be run in one of the configurations defined in Table 4.5.1.7.4.1-1.

**Table 4.5.1.7.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.7-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.7-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.7-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.7-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.7-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.7-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.7.4.1-2.

**Table 4.5.1.7.4.1-2: Initial conditions for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The test parameters are given in Table 4.5.1.7.4.1-3 below.
2. Message contents are defined in clause 4.5.1.7.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

**Table 4.5.1.7.4.1-3: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2, 5 | | CCR.1.3 TDD |
| | Config 3, 6 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz |
| | Config 3, 6 | | 30 KHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2, 5 | | Resource #4 in TRS.1.1 TDD |
| | Config 3, 6 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

#### 4.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 2 according to T1 in Table 4.5.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect any uplink power on NR carrier higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

**Table 4.5.1.7.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3 |

**Table 4.5.1.7.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| } | | | |

### 4.5.1.7.5 Test requirement

Tables 4.5.1.7.4.1-2 and 4.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

**Table 4.5.1.7.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | |

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15KHz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.1.7.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least once every DRX cycle, in the On-duration part of the cycle in the slots configured for CSI transmission according the configured CSI reporting mode on PUCCH.

The UE shall stop transmitting uplink signal no later than time point C (D1 after the start of time duration T3).

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

- UE output power equal to or less than transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

### 4.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

### 4.5.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM and long DRX cycle.

### 4.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.8.

### 4.5.1.8.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

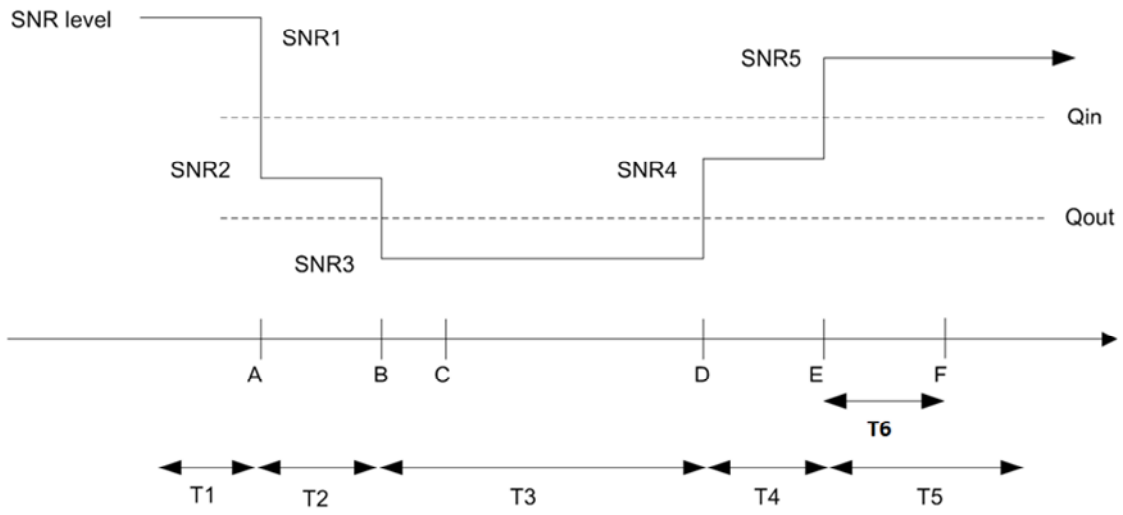


**Figure 4.5.1.8.4-1: SNR variation for in-sync testing**

#### 4.5.1.8.4.1 Initial conditions

Test 4.5.1.8 can be run in one of the configurations defined in Table 4.5.1.8.4.1-1.

**Table 4.5.1.8.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.1.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.1.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.1.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.1.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 4.5.1.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.8.4.1-2.

**Table 4.5.1.8.4.1-2: Initial conditions for CSI-RS in-sync radio link monitoring in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The test parameters are given in Table 4.5.1.8.4.1-3 below.
2. Message contents are defined in clause 4.5.1.8.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

**Table 4.5.1.8.4.1-3: General test parameters for FR1 PSCell for CSI-RS in-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH | Config 1, 2, 4, 5 | | 15 KHz |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| subcarrier spacing | Config 3, 6 | | 30 KHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2, 5 | | Resource #4 in TRS.1.1 TDD |
| | Config 3, 6 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI for reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| T6 | | s | 1.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

**Table 4.5.1.8.4.1-4: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

### 4.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.
3. The UE shall transmit *RRCReconfigurationComplete* message.
4. Set the parameters of Cell 2 according to T1 in Table 4.5.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.8.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.8.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.1.8.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.1.8.5-1. T5 starts.
9. If the SS detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
10. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.
11. Repeat steps 4-10 for both subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 4.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 4.5.1.8.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-4 with condition gapUE<br>Table H.3.4-5 with condition BFD<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3 and Gap |

**Table 4.5.1.8.4.3-2: Void**

**Table 4.5.1.8.4.3-3: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| } | | | |

4.5.1.8.5 Test requirement

Tables 4.5.1.8.4.1-2 and 4.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring in-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode.

**Table 4.5.1.8.5-1: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2, 5 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3, 6 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15KHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | |
| NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. | | | | | | |
| NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. | | | | | | |
| NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | | |
| NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | |
| NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | | |
| NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.8.4-1. | | | | | | |
| NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances). | | | | | | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least once every DRX cycle, in the ON-duration part of the cycle in the slots configured for CSI transmission according to the configured CSI reporting mode on PUCCH.

The uplink signal is verified on the basis of the UE output power:

- UE output power equal to or higher than transmit minimum power (as defined in TS 38.521-1 [17] clause 6.3.1.5) means uplink signal

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 4.5.1.9 EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion

### 4.5.1.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements specified in clause 4.5.1.0.5.1 for UE fulfilling good serving cell quality criterion and low mobility criterion, if configured.

### 4.5.1.9.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC and RLM relaxation criteria *rlm-Relaxation-r17*.

### 4.5.1.9.3 Minimum conformance requirement

The requirements for UE supporting relaxed measurement criterion are specified in clause 4.5.1.0.5. The minimum requirements for SSB-based RLM with this criterion are specified in clause 4.5.1.0.5.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.1.9.

### 4.5.1.9.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 4.5.1.9.4.1-1. The test parameters are given in Tables 4.5.1.9.4.1-3 and 4.5.1.9.5-1.

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.9.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states.

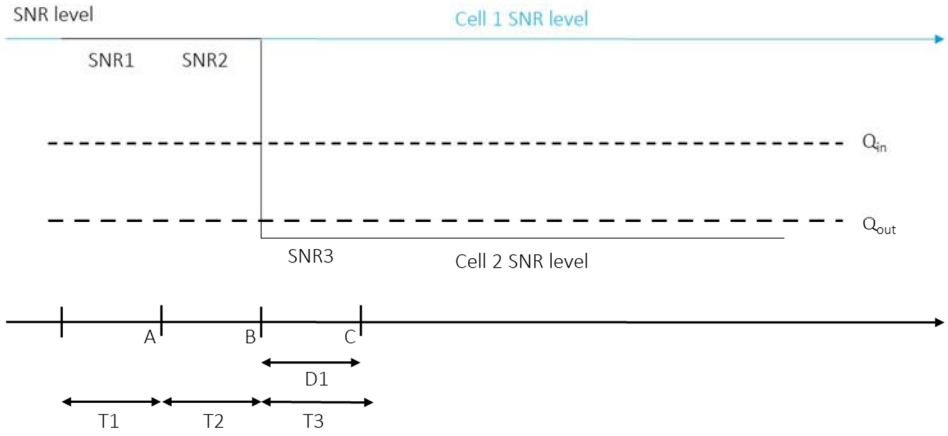


**Figure 4.5.1.9.4-1: SNR variation for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

### 4.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.1.9.4.1-1.

**Table 4.5.1.9.4.1-1: Supported test configurations for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Test Case ID | Description |
|---|---|
| 4.5.1.9-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.1.9-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.1.9-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.1.9-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.1.9.4.1-2.

**Table 4.5.1.9.4.1-2: Initial conditions for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use TS 38.508-1 [14] A.3.2.5.2 for DUT part and TS 38.508-1 [14] A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 4.5.1.9.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The test parameters are given in Table 4.5.1.9.4.1-3 below.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

**Table 4.5.1.9.4.1-3: General test parameters for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 |
| | Config 2, 5 | | 10: NRB,c = 52 |
| | Config 3, 6 | | 40: NRB,c = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 |
| | Config 3, 6 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 kHz |
| | Config 3, 6 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 4, 5 | | Table A.7.1-1 |
| | Config 3, 6 | | Table A.7.1-1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |

| | | | |
|---|---|---|---|
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 5.2 |
| T2 | | s | 0.68 |
| T3 | | s | 2.48 |
| D1 | | s | 2.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. | | | |

#### 4.5.1.9.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) configuring the UE with *goodServingCellEvaluationRLM* and measurements as specified in clause 4.5.1.9.4.3.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfiguration* message).

4. Set the parameters according to T1 in Table 4.5.1.9.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.9.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.9.5-1. T3 starts.

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the on-duration part of every DRX cycle in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 in any of such CSI transmission occasions, from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one. Otherwise, the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.9.5-1.

9. If the UE has not re-established the connection in at least 1s, go to step 10. Otherwise go to step 11.

10. The SS shall ensure the PSCell is released. Then it shall transmit an *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If the reconfiguration fails go to step 11, otherwise go to step 12.

11. Switch off and on the UE and go to step 12.

12. Repeat steps 1-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with the following exceptions.

**Table 4.5.1.9.4.3-1: Common Exception messages for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-3<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with Condition DRX.3 |

**Table 4.5.1.9.4.3-2: *RLF-TimersAndConstant* for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 4.5.1.9.4.3-3: *CellGroupConfig* for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| goodServingCellEvaluationRLM-r17 SEQUENCE { | | | |
| offset-r17 | Not present | If this field is absent, the UE applies the (default) value of 0 dB | |
| } | | | |
| } | | | |
| } | | | |

#### 4.5.1.9.5 Test requirement

Table 4.5.1.9.5-1 defines the cell specific primary level settings including test tolerances for EN-DC FR1 Radio Link Monitoring out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion.

**Table 4.5.1.9.5-1: Cell specific test parameters for EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM RS for UE fulfilling relaxed measurement criterion**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | 1.8 | -15.8 |
| | Config 2, 5 | | 1.8 | 1.8 | -15.8 |
| | Config 3, 6 | | 1.8 | 1.8 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15k Hz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| $N_{oc}$ | Config 1, 4 | dBm/SCS | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -95 | | |
| goodServingCellEvaluationRLM | | | configured | | |
| offset in goodServingCellEvaluationRLM | | dB | Not configured | | |
| goodServingCellEvaluationRLM | | dB | 0 | | |
| s-SearchDeltaP-Connected | | dB | 3 | | |
| t-SearchDeltaP-Connected | | s | 5 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.9.4-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.5.2 Interruption

### 4.5.2.0 Minimum conformance requirements

#### 4.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX.

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active during DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in Tablein Table 4.5.2.0.1-1.

Each interruption shall not exceed X slot as defined in Tablein Table 4.5.2.0.1-1.

**Table 4.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) | |
|---|---|---|---|
| | | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 1 | 2 |
| 2 | 0.25 | 3 | |
| 3 | 0.125 | 5 | |

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

#### 4.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS 38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

**Table 4.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 2 |
| 3 | 0.125 | 4 |

**Table 4.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ |
| 1 | 0.5 | 1 + $T_{SMTC_duration}$ |
| 2 | 0.25 | 2 + $T_{SMTC_duration}$ |
| 3 | 0.125 | 4 + $T_{SMTC_duration}$ |
| NOTE: $T_{SMTC_duration}$ is<br>- the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated;<br>- the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

### 4.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS 38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells is 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed:

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

**Table 4.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) | Interruption length Y3 (slots) |
|---|---|---|---|
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |
| 2 | 0.25 | 2 | 2 |
| 3 | 0.125 | 4 | 4 |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

### 4.5.2.0.4 Minimum conformance requirements for interruptions at NR SRS carrier based switching

[TS 38.133 clause 8.2.1.2.12]

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS 38.331 [13];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [9];
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG;
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [13], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5] [xxx: need further check], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

**Table 4.5.2.0.4-1: Interruption length X1 (slots)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
| | | 300, 500 | 5 | 4 |
| | | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
| | | 300, 500 | 9 | 7 |
| | | 900 | 12 | 10 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

**Table 4.5.2.0.4-2: Interruption length X2 (slots)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) Note1 | Interruption length X2 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 60 | 120 |
| 0 | 1 | $\leq 200$ | 2 | 2 |
| 1 | 0.5 | $\leq 200$ | 2 | 2 |
| 2 | 0.25 | $\leq 200$ | 3 | 3 |
| 3 | 0.125 | $\leq 200$ | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 based on SRS carrier switching time $\leq$ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.12.

### 4.5.2.0.5 Minimum conformance requirements for interruptions at E-UTRA SRS carrier based switching

[TS 38.133 clause 8.2.1.2.13]

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] [xxx: need further check] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] [xxx: need further check] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex [15] [xxx: need further check];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 36.213 [33];
- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS 36.213 [33];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [29], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [27], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1

**Table 4.5.2.0.5-1: Interruption length X3 (slots)**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.13.

#### 4.5.2.0.6 Minimum conformance requirements for interruptions due to RRM and RLM/BFD measurements on deactivated NR SCG

[TS 36.133, clause 7.32.2.20]

If the UE is not configured with RLM or BFD on the deactivated NR PSCell, interruptions on E-UTRA PCell or activated E-UTRA SCell(s) due to measurements on the deactivated NR PSCell are allowed with up to 0.5% probability of missed ACK/NACK feedback when the configured *measCyclePSCell* is 640ms or longer.

- For inter-band EN-DC, the UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed 1 subframe for synchronous inter-band EN-DC or 2 subframes for asynchronous inter-band EN-DC.
- For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption shall not exceed the duration of the SMTC of the deactivated NR PSCell + 2 subframes. The interruption is based on assumption that the cell specific reference signals from both cells are available in the same slot.

If the UE is configured with RLM or BFD on the deactivated NR PSCell, interruptions on E-UTRA PCell or activated E-UTRA SCell(s) due to measurements on the deactivated NR PSCell are allowed with up to 1.0% probability of missed ACK/NACK feedback.

The normative reference for this requirement is TS 36.133 [23] clause 7.32.2.20.

### 4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

#### 4.5.2.1.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

#### 4.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1 and long DRX cycle.

#### 4.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.1.

#### 4.5.2.1.4 Test description

##### 4.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.1.4.1-1.

**Table 4.5.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 4.5.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.1.4.1-2.

**Table 4.5.2.1.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.1.4.1-3.
2. Message contents are defined in clause 4.5.2.1.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.1.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to Cell1 and Cell 2 |
| DRX | | DRX.4 | DRX related parameters are defined in TS 38.133 Table A.3.3.4-1 |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 10 | |

### 4.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On according* to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [25] clause 4.6 with the message content exceptions defined in clause 4.5.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

6. Set the parameters according to T1 in Table 4.5.2.1.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

8. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

9. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

12. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 3-10 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 4.5.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

### 4.5.2.1.5 Test requirement

Table 4.5.2.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

**Table 4.5.2.1.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Unit | Cell 2 |
|---|---|---|

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| | | | |
| | | | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| Time offset to cell1 Note 4 | | µs | 3 for intra-band EN-DC, 33 for inter-band EN-DC |
| Propagation Condition | | | AWGN |

| Parameter | Unit | Cell 2 |
|---|---|---|
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | |

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.1.5-2.

**Table 4.5.2.1.5-2: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X (slot) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

### 4.5.2.2.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 4.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1 and long DRX cycle.

### 4.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.2.

### 4.5.2.2.4 Test description

#### 4.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.2.4.1-1.

**Table 4.5.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 4.5.2.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.2.4.1-2.

**Table 4.5.2.2.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.2.4.1-3.
2. Message contents are defined in clause 4.5.2.2.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.2.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to Cell1 and Cell 2 |
| DRX | | DRX.4 | DRX related parameters are defined in TS 38.133 Table A.3.3.4-1 |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 10 | |

### 4.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [25] clause 4.6 with the message content exceptions defined in clause 4.5.2.2.4.3.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

6. Set the parameters according to T1 in Table 4.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitorACK/NACK/DTX on PSCell.

8. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

9. If no longer than X consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX". Where

   - For test configuration 4.5.2.2-1 and 4.5.2.2-4:

     - X = interruption length+k1 if k1 $\leq$ interruption length, otherwise X = interruption length.

   - For test configuration other than 4.5.2.2-1 and 4.5.2.2-4:

     - X = interruption length.

   - Interruption length is given in Table 4.5.2.2.5-2.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

12. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

13. Repeat step 3-10 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 4.5.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

### 4.5.2.2.5 Test requirement

Table 4.5.2.2.5-1 define the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

**Table 4.5.2.2.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $N_{oc}$ Note 2 | Config 1,2,4,5 | -104 | -104 |
| | Config 3,6 | | -101 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | µs | 500 |
| | Config 3,6 | | 250 |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.2.5-2.

**Table 4.5.2.2.5-2: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

### 4.5.2.3.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

### 4.5.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

### 4.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.3.

### 4.5.2.3.4 Test description

#### 4.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.3.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.3.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.2.3.4.1-1: Supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 4.5.2.3-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.3-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.3-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.2.3-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.3-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.3-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.2.3.4.1-1A: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 4.5.2.3-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.2.3-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.2.3-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.3.4.1-2.

**Table 4.5.2.3.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.3.4.1-3.
2. Message contents are defined in clause 4.5.2.3.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.3.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 4.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.3.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- X = 1 for inter-band EN-DC, and X = 3 for intra-band EN-DC.

6b. If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.3-1 and 4.5.2.3-4,

  - X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length.

Note: UE expects that the SS will not use k1 = 3 for test configuration 4.5.2.3-1 and 4.5.2.3-4.

- For test configuration other than 4.5.2.3-1 and 4.5.2.3-4,

  - X = interruption length.

- interruption length is given in Table 4.5.2.3.5-2 for inter-band case and in Table 4.5.2.3.5-3 for intra-band case.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK", "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.2.3.4.3-1: Common Exception messages**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition Deactivated SCell;<br>Table H.3.1-4 with A3-offset = 15 |
| Specific message contents exceptions for Test Configuration 4.5.2.3-1, 4.5.2.3-2, 4.5.2.3-4 and 4.5.2.3-5 | Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.5.2.3-3 and 4.5.2.3-6 | Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.2.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.2.3.4.3-3: ServingCellConfig (Cell 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 | |
| } | | | |

### 4.5.2.3.5 Test requirement

Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations for NR PSCell and SCell.

**Table 4.5.2.3.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 8 |
| $BW_{occupied}$ | Config 1,2,4,5 | RB | 52 Note 6 |
| | Config 3,6 | | 106 Note 7 |
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR 2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR 2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 6 |
| | Config 3,6 | | OP.1 Note 7 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | µs | 3 for intra-band EN-DC, 33 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | µs | - |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

**Table 4.5.2.3.5-1A: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 8 |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 6 |

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| | $Config_{SCell}$ 3 | | 106 Note 7 |
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | N/A |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR 2.1 TDD |
| PDCCH CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| TRS configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 6 |
| | $Config_{SCell}$ 3 | | OP.1 Note 7 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | µs | 3 + Time offset to Cell2 for intra-band EN-DC, 33 + Time offset to Cell2 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | µs | 3 |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-3.

**Table 4.5.2.3.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

**Table 4.5.2.3.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 2+SMTC duration |
| 1 | 0.5 | 2+SMTC duration |

For synchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 1 subframe.

For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption on E-UTRA PCell no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption on E-UTRA PCell shall not exceed SMTC duration + 2 subframes.

The rate of correct events observed during repeated tests shall be at least 90%.

### 4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

#### 4.5.2.4.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC

#### 4.5.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

#### 4.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.4.

#### 4.5.2.4.4 Test description

##### 4.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.4.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.4.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.2.4.4.1-1: Supported test configurations for LTE PCell and NR PSCell**

| Configuration | Description |
|---|---|
| 4.5.2.4-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.4-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.4-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.2.4-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.2.4-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.2.4-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration | |

**Table 4.5.2.4.4.1-1A: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.4.4.1-2.

**Table 4.5.2.4.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.4.4.1-3.
2. Message contents are defined in clause 4.5.2.4.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.4.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channel |

| | | | |
|---|---|---|---|
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

#### 4.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.4.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.4-1, 4.5.2.4-2 and 4.5.2.4-3, X = 3;

- For test configuration 4.5.2.4-4, 4.5.2.4-5 and 4.5.2.4-6, X = 2;

7. If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.4-1 and 4.5.2.4-4,

  - X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length

Note: UE expects that the SS will not use k1 = 3 for test configuration 4.5.2.4-1 and 4.5.2.4-4.

- For test configuration other than 4.5.2.4-1 and 4.5.2.4-4,

  - X = interruption length.

- Interruption length is given in Table 4.5.2.4.5-2 for inter-band case and in Table 4.5.2.4.5-3 for intra-band case.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.5.2.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition Deactivated SCell;<br>Table H.3.1-4 with A3-offset = 15 |
| Specific message contents exceptions for Test Configuration 4.5.2.4-1, 4.5.2.4-2, 4.5.2.4 -4 and 4.5.2.4-5 | Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.5.2.4-3 and 4.5.2.4-6 | Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.2.4.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.2.4.4.3-3: ServingCellConfig (Cell 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 | |
| } | | | |

### 4.5.2.4.5 Test requirement

Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations for NR PSCell and NR SCell.

**Table 4.5.2.4.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 8 |
| $BW_{occupied}$ | Config 1,2,4,5 | RB | 52 Note 6 |
| | Config 3,6 | | 106 Note 7 |
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR 2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR 2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 6 |
| | Config 3,6 | | OP.1 Note 7 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | µs | 500 |
| | Config 3,6 | | 250 |
| Time offset to Cell2 Note 5 | | µs | N/A |
| Propagation Condition | | | AWGN |

| Parameter | Unit | Cell 2 |
|---|---|---|
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | |
| NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | |
| Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | |
| Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | |
| Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. | | |

**Table 4.5.2.4.5-1: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 8 |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 6 |
| | $Config_{SCell}$ 3 | | 106 Note 7 |
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | N/A |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR 2.1 TDD |
| PDCCH CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| TRS configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 6 |
| | $Config_{SCell}$ 3 | | OP.1 Note 7 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | $Config_{SCell}$ 1,2 | dBm/9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | $Config_{SCell}$ 1,2 | µs | 500 + Time offset to Cell2 |
| | $Config_{SCell}$ 3 | | 250 + Time offset to Cell2 |
| Time offset to Cell2 Note 5 | | µs | 3 |
| Propagation Condition | | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. | | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells. | | | |
| NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | |
| Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | | |
| Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | | |
| Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-3.

**Table 4.5.2.4.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

**Table 4.5.2.4.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 2+SMTC duration |
| 1 | 0.5 | 2+SMTC duration |

For asynchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 2 subframe.

The rate of correct events observed during repeated tests shall be at least 90%.

### 4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

#### 4.5.2.5.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

#### 4.5.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

#### 4.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.5.

#### 4.5.2.5.4 Test description

##### 4.5.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.5.4.1-1.

**Table 4.5.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| | **LTE PCell + NR PSCell** Note 2 |
| 4.5.2.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.5.4.1-2 and Table 4.5.2.5.4.1-3.

**Table 4.5.2.5.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.5.4.1-3.
2. Message contents are defined in clause 4.5.2.5.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clause C.1.1 and C.1.2.

**Table 4.5.2.5.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2. 3 | Two E-UTRAN RF channels and one NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 4.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Table 4.5.2.5.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.5-1, 4.5.2.5-2 and 4.5.2.5-3,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.
- For test configuration 4.5.2.5-4, 4.5.2.5-5 and 4.5.2.5-6,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Z consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX".

- For test configuration 4.5.2.5-1 and 4.5.2.1-4,
  - Z = interruption length+k1 if k1 ≤ interruption length, otherwise Z = interruption length
- For test configuration other than 4.5.2.5-1 and 4.5.2.5-4,
  - Z = interruption length.

- Interruption length is given by "Interruption length X" column in Table 4.5.2.5.5-2 for inter-band case and by "Interruption length Y" column in Table 4.5.2.5.5-2 for intra-band case.

7a. The SS shall transmit *RRCConnectionReconfiguration* according to Table 4.5.2.5.4.3-4 to release the E-UTRAN SCell. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.2.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-10 with A3-offset = 15 |

**Table 4.5.2.5.4.3-2: Void**

**Table 4.5.2.5.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition**

| Derivation Path: 36.508 Table 4.6.1-8, condition SCell_AddMod | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Table H.3.4-4 | E-UTRA_Deactivated_SCell AND GAPLESS |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.2.5.4.3-4: *RRCConnectionReconfiguration***

| Derivation Path: 36.508 Table 4.6.1-8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---|---|---|
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v890-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v920-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1020-IEs | |
| sCellToReleaseList-r10 SEQUENCE (SIZE (1)) OF SCellToReleaseMod-r10 { | | | |
| SCellToReleaseMod-r10[1] | PhysCellId of Cell 3 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4.5.2.5.5 Test requirement

Table 4.5.2.5.5-1 defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

**Table 4.5.2.5.5-1: NR cell specific test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| | | | |
| | | | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | µs | 3 for intra-band EN-DC, 33 for inter-band EN-DC |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [8] clause 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed X defined in Table 4.5.2.5.5-2 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table Table 4.5.2.5.5-2 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

**Table 4.5.2.5.5-2: Interruption length X and Y at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X (slot) | Interruption length Y (slot) |
|---|---|---|---|
| 0 | 1 | 1 | 1+SMTC duration |
| 1 | 0.5 | 1 | 1+SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90 %.

## 4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

### 4.5.2.6.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

### 4.5.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

### 4.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.6.

### 4.5.2.6.4 Test description

#### 4.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.6.4.1-1.

**Table 4.5.2.6.4.1-1: Supported test configurations for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Configuration | Description |
|---|---|
| | LTE PCell + NR PSCell Note 2 |
| 4.5.2.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.6.4.1-2.

**Table 4.5.2.6.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.6.4.1-3.
2. Message contents are defined in clause 4.5.2.6.4.3.

3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.6.4.1-3: General test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | Two E-UTRAN RF channels and one NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell 2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 4.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Table 4.5.2.6.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.6-1, 4.5.2.6-2 and 4.5.2.6-3,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.
- For test configuration 4.5.2.6-4, 4.5.2.6-5 and 4.5.2.6-6,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Xconsecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.6-1 and 4.5.2.6-4,
  - Z = interruption length+k1 if k1 ≤ interruption length, otherwise Z = interruption length

- For test configuration other than 4.5.2.6-1 and 4.5.2.6-4,
  - Z = interruption length.
- Interruption length is given by Table 4.5.2.6.5-2 for inter-band case and Table 4.5.2.6.5-3 for intra-band case.

7a. The SS shall transmit *RRCConnectionReconfiguration* message with condition SCell_Rel according to 4.5.2.6.4.3-4 to release E-UTRA SCell. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.5.2.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-10 with A3-offset = 15 |

**Table 4.5.2.6.4.3-2: Void**

**Table 4.5.2.6.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition**

| Derivation Path: 36.508 Table 4.6.1-8, condition SCell_AddMod | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Table H.3.4-4 | E-UTRA_Deactivated_SCell AND GAPLESS |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.2.6.4.3-4: *RRCConnectionReconfiguration* in step 7a: SCell release**

| Derivation Path: 36.508 Table 4.6.1-8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE { | 1 entry | | |
| sCellIndex-r10[1] | Cell Index of Cell 3 | | |
| } | | | |

4.5.2.6.5 Test requirement

Table 4.5.2.6.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

**Table 4.5.2.6.5-1: NR cell specific test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | µs | 500 |
| | Config 3,6 | | 250 |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on E-UTRAN PCell and NR PSCell shall not exceed the value defined in Table 4.5.2.6.5-2 and Table 4.5.2.6.5-3.

**Table 4.5.2.6.5-2: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

**Table 4.5.2.6.5-3: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.2.7

## 4.5.2.8 E-UTRAN - NR FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

#### 4.5.2.8.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

#### 4.5.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in NR.

#### 4.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.8.

#### 4.5.2.8.4 Test description

##### 4.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.8.4.1-1.

**Table 4.5.2.8.4.1-1: Supported test configurations for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Configuration | Description |
|---|---|
| | **LTE PCell + NR PSCell** Note 2 |
| 4.5.2.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.8.4.1-2.

**Table 4.5.2.8.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.8.4.1-3.
2. Message contents are defined in clause 4.5.2.8.4.3.
3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E-UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.8.4.1-3: General test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | Configured PSCell on NR RF channel number 2. |
| Configured SCell | | Cell3 | Configured activated secondary cell on NR RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3. |
| DRX | | OFF | Continuous monitoring of primary cell |
| Filter coefficient | | 0 | L3 filtering is not used |
| T1 | s | 5 | |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

### 4.5.2.8.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN Pcell, Cell2 is NR FR1 PSCell with PUCCH/PUSCH transmission, Cell3 is activated SCell which operates in downlink without PUCCH/PUSCH. The test consists of two time periods, with duration of T1 and T2. Prior to the start of the test, the UE is configured with the SRS carrier based switching between PSCell and SCell. UE shall also indicate SRS-SwitchingTimeNR in the capabilities.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.7.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2 with the message exceptions as in 4.5.2.8.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.8.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. The SS activates Scell (Cell3) and starts to schedule DL transmission continuously on PCell and PSCell and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK on PSCell.

6. Set the parameters according to T2 in Tables 4.5.2.8.5-1. T2 starts.

7. Immediately at the beginning of T2, SRS is requested via DCI format 2_3 and the UE shall initiate NR SRS switching.

8. If the interruption in the received ACK/NACK on NR PSCell during the switching from NR PSCell to NR SCell exceeds the value as defined in Table 4.5.2.8.5-2 or the interruption in the received ACK/NACK on E-UTRAN PCell during the switching from NR PSCell to NR SCell exceeds the value as defined in Table 4.5.2.9.5-3, increase the number of failed iterations by one and move to step 12, otherwise increase the number of passed iterations by one and continue with step 9.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 2-11 until a test verdict has been achieved.

#### 4.5.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.5.2.8.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| carrierSwitching | *SRS-CarrierSwitching* | | |
| } | | | |
| } | | | |

**Table 4.5.2.8.4.3-2: *SRS-CarrierSwitching***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-181 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-CarrierSwitching ::= SEQUENCE { | | | |
| srs-SwitchFromServCellIndex | 1 | | |
| srs-SwitchFromCarrier | nUL | | |
| } | | | |

**Table 4.5.2.8.4.3-3: SRS-Config**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| srs-ResourceSetId | 0 | | |
| srs-ResourceIdList SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-ResourceId { | 1 entry | | |
| SRS-ResourceId[1] | 0 | entry 1 | |
| } | | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| usage | antennaSwitching | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-Resource { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| resourceMapping SEQUENCE { | | | |
| startPosition | 1 | | |
| nrofSymbols | n1 | | |
| repetitionFactor | n1 | | |
| } | | | |
| freqDomainPosition | 0 | | |
| freqDomainShift | 0 | | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | |
| } | | | |

| | | | |
|---|---|---|---|
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4.5.2.8.5 Test requirement

Table 4.5.2.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

**Table 4.5.2.8.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | | Unit | Cell2 | Cell3 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1,4 | | FDD | TDD |
| | Config 2,3,5,6 | | TDD | TDD |
| TDD configuration | Config 1,4 | | Not Applicable | TDDConfig.1.2 |
| | Config 2,5 | | TDDConf.1.2 | TDDConfig.1.2 |
| | Config 3,6 | | TDDConf.2.3 | TDDConfig.2.3 |
| $BW_{channel}$ | Config 1,2,4,5 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| DL Initial BWP configuration | Config 1-6 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1-6 | | DLBWP.1.1 | DLBWP.1.1 |
| UL Initial BWP configuration | Config 1-6 | | ULBWP.0.1 | - |
| UL dedicated BWP configuration | Config 1-6 | | ULBWP.1.1 | - |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | SR.1.1 TDD |
| | Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 TDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 TDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 TDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | 15 kHz |
| | Config 3,6 | | 30 kHz | 30 kHz |
| SRS Configuration | Config 1,2,4,5 | kHz | - | SRS.4 TDD |
| | Config 3,6 | | - | SRS.5 TDD |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | - |
| | Config 3,6 | | 30 kHz | - |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | -104 |
| | Config 3,6 | | -101 | -101 |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | -87 |
| | Config 3,6 | | -84 | -84 |
| $\hat{E}_s / I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s / N_{oc}$ | | dB | 17 | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 Note 4 | | µs | - | 3 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

During the time duration T2, the interruption on NR PSCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-2 dependent on the applied SRS carrier switching time.

**Table 4.5.2.8.5-2: Interruption length on NR active serving cells at NR SRS carrier switching (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)Note 1 | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |

Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.

During the time duration T2, the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-3 dependent on the applied SRS carrier switching time.

**Table 4.5.2.8.5-3: Interruption length on E-UTRAN active serving cells at NR SRS carrier switching**

| NR SRS carrier switching time (us)[note1] | Interruption length X1 (subframes) |
|---|---|
| ≤500 | 2 |
| 900 | 3 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 4.5.2.9 E-UTRAN - NR FR1 interruptions at E-UTRA SRS carrier based switching

### 4.5.2.9.1 Test purpose

The purpose of this test is to verify the active serving cell in SCG interruptions during carrier-based switching to one PUSCH-less SCCs from a CC with PUSCH, when a UE needs to transmit aperiodic SRS.

### 4.5.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2DL CA in E-UTRA.

### 4.5.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.9.

### 4.5.2.9.4 Test description

#### 4.5.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.9.4.1-1.

**Table 4.5.2.9.4.1-1: Supported test configurations for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Configuration | Description |
|---|---|
| | LTE PCell + NR PSCell [Note 2] |
| 4.5.2.9-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.9-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.9-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.2.9-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.2.9-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.2.9-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.9.4.1-2.

**Table 4.5.2.9.4.1-2: Initial conditions for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Diagram | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.9.4.1-3 and SRS parameters are given in Table 4.5.2.9.4.1-4.

2. Message contents are defined in clause 4.5.2.9.4.3.

3. There are two E-UTRA carriers and one NR carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 is E-UTRA PCell, Cell2 is NR FR1 PSCell and Cell 3 is E-UTRA activated SCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.9.4.1-3: General test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell | | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

**Table 4.5.2.9.4.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| Field | Value | Comment |
|---|---|---|
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | Sc8 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | N/A | Not applicable |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigIndexAp | 17 | SRS periodicity of 10ms. See Table 8.2-5 in TS 36.213 for aperiodic SRS transmission. |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. | | |

### 4.5.2.9.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN Pcell, Cell2 is NR FR1 PSCell with PUCCH/PUSCH transmission, Cell3 is E-UTRAN activated SCell which operates in downlink without PUCCH/PUSCH. The test consists of two time periods, with duration of T1 and T2. Prior to the start of the test, the UE is configured with the SRS carrier based switching between PCell and SCell. UE shall also indicate SRS-SwitchingTimeNR in the capabilities.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.7.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A, with the message content exceptions defined in clause 4.5.2.9.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.9.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. The SS activates Scell (Cell3) and starts to schedule DL transmission continuously on PCell and PSCell and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK on PSCell.

6. Set the parameters according to T2 in Tables 4.5.2.9.5-1. T2 starts.

7. Immediately at the beginning of T2, SRS is requested via DCI format 2_3 and the UE shall initiate NR SRS switching.

8. If the interruption in the received ACK/NACK on NR PSCell during the switching from NR PSCell to E-UTRA SCell exceeds the value as defined in Table 4.5.2.9.5-2, increase the number of failed iterations by one and move to step 12, otherwise increase the number of passed iterations by one and continue with step 9.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 2-11 until a test verdict has been achieved.

#### 4.5.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.5.2.9.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| carrierSwitching | *SRS-CarrierSwitching* | | |
| } | | | |
| } | | | |

**Table 4.5.2.9.4.3-2: *SRS-CarrierSwitching***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-181 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-CarrierSwitching ::= SEQUENCE { | | | |
| srs-SwitchFromServCellIndex | 0 | | |
| srs-SwitchFromCarrier | nUL | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 4.5.2.9.4.3-3: SoundingRS-UL-Config**

| Derivation Path: 36.508 Table 4.6.3-22 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw5 | | |
| srsSubframeConfig | Sc8 | | |
| ackNackSrsSimultaneousTransmission | FALSE | | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | | |
| srs-ConfigIndex | 17 | See Table 8.2-5 in TS 36.213 | FDD |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | | |
| SRS-AntennaPort | an1 | | |
| } | | | |
| } | | | |

4.5.2.9.5 Test requirement

Table 4.5.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching.

**Table 4.5.2.9.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching**

| **Parameter** | | **Unit** | **Cell2** |
|---|---|---|---|
| **Frequency Range** | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.2 |
| | Config 3,6 | | TDDConf.2.3 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |

| | | | |
|---|---|---|---|
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | µs | 33 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

The UE shall be continuously scheduled in NR PSCell throughout the test and during the time duration T2. Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.9.2-1.

**Table 4.5.2.9.5-2: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 4.5.2.10 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell

### 4.5.2.10.1 Test purpose

The purpose of this test is to verify the E-UTRAN PCell interruptions during the measurement on the deactivated NR PSCell, the UE missed ACK/NACK does not exceed the limits.

To verify the missed ACK/NACK rate for E-UTRAN PCell in EN-DC

### 4.5.2.10.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting RRM and RLM/BFD measurements on deactivated NR PSCell.

#### 4.5.2.10.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.10.

#### 4.5.2.10.4 Test description

##### 4.5.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.10.4.1-1.

**Table 4.5.2.10.4.1-1: Supported test configurations for EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.10.4.1-2.

**Table 4.5.2.10.4.1-2: Initial conditions for EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.2.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.2.10.4.1-3 and SRS parameters are given in Table 4.5.2.10.4.1-4.

2. Message contents are defined in clause 4.5.2.10.4.3.

3. There are two cells (one E-UTRA carrier and one NR carrier) specified in the test. Cell1 is E-UTRAN PCell, and Cell2 is deactivated NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

**Table 4.5.2.10.4.1-3: General test parameters for E-UTRAN – NR interruptions due to measurements on deactivated PSCell in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is NR RF channel and the other is E-UTRAN RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured deactivated PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to Cell1, Cell2 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |

| | | | |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

#### 4.5.2.10.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is E-UTRAN PCell, and Cell2 is deactivated NR FR1 PSCell. The test consists of one single period, T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. At the start of T1, the RRC message including *measCycleSCell* or *allowInterruptions* is received at the UE antenna connector and Cell2 is deactivated. During T1. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured with RRM and RLM/BFD measurement on NR deactivated NR PSCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On according* to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure PSCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.10.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.10.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX and ACK/NACK/DTX on PCell.

6. If more than 98.5% of uplink transmissions on PCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add and deactivate NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK", "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.2.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.2.10.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-8 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 4.6.3-19 in TS 38.508-1 [14] with condition RLM_BFD_PSCell |

### 4.5.2.10.5 Test requirement

Table 4.5.2.10.5-1 defines the primary level settings for FR1 interruptions during measurements on deactivated PSCell in synchronous EN-DC test configurations.

**Table 4.5.2.10.5-1: NR cell specific test parameters for E-UTRAN – NR interruptions due to measurements on deactivated PSCell in synchronous EN-DC**

| Parameter | | Unit | Cell2 |
|---|---|---|---|
| **Frequency Range** | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| TCI state | | | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | µs | 500 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

The UE shall be continuously scheduled in Cell1 during the entire length of T1 and the UE is configured with RRM and RLM/BFD measurements on the deactivated Cell2. During the time duration T1 the UE shall transmit at least 98.5% of ACK/NACK on E-UTRAN PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.3 SCell activation and deactivation delay

### 4.5.3.0 Minimum conformance requirements

#### 4.5.3.0.1 SCell activation and deactivation delay

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot n + $\frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where:

$T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8].

$T_{activation_time}$ is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, $T_{activation_time}$ is:

- $T_{FirstSSB}$ + 5ms, if the measurement period of the SCell being activated is equal to or smaller than 2400ms.
- $T_{FirstSSB_MAX}$ + $T_{rs}$ + 5ms, if the measurement period of the SCell being activated is larger than 2400ms.

If the SCell is unknown and belongs to FR1, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, $T_{activation_time}$ is:

- $T_{FirstSSB_MAX}$ + $T_{SMTC_MAX}$ + 2*$T_{rs}$ + 5ms.

If the SCell being activated belongs to FR2, and if there is at least one active serving cell on that FR2 band, then $T_{activation_time}$ is $T_{FirstSSB}$ + 5ms provided:

- The UE is provided with SMTC for the target SCell, and

- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3.

- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

- SSB is in the same half-frame on the SCell and the contiguous FR2 active serving cell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, $T_{activation_time}$ is 3ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- 3 ms + max($T_{uncertainty_MAC}$ +$T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0, if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- max($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC}$ + $T_{RRC_delay-THARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$)

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max (($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)).

Where,

$T_{SMTC_MAX}$:

- In FR1, in case of intra-band SCell activation, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated.

- In FR2, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- $T_{SMTC_MAX}$ is bounded to a minimum value of 10ms.

$T_{rs}$ is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves $T_{rs}$ is applied with $T_{rs}$ = 5ms assuming the SSB transmission periodicity is 5ms. There is no requirements if the SSB transmission periodicity is not 5ms.

$T_{FirstSSB}$: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

$T_{FirstSSB_MAX}$: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state

$T_{L1\text{-}RSRP,\ measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ ms or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

$T_{L1\text{-}RSRP,report}$ is delay of acquiring CSI reporting resources.

$T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_SP}$ is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5 measCycleSCell, 5 DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

- the SSB measured during the period equal to max(5 measCycleSCell, 5 DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

The requirements for FR1 unknown SCell activation specified in this clause apply when one of the following conditions is met

- ‘ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
- ‘ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and clause 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, $T_{SMTC_SCell}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. $T_{SMTC_MAX}$ follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133[6] clause 8.2, shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot slot $n+1+\frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being activated, and $T_X$ is:

- $T_{FirstSSB}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB}$;
- $T_{FirstSSB_MAX}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB_MAX}$;
- $T_{uncertainty_MAC} + T_{FineTiming}$, for any scenario where $T_{activation_time}$ includes $T_{FineTiming}$.

The length of the interruption window may be different for different victim cells, and depends on the applicable The requirements in this clause and requirements on interruption due to SCell activation in TS 38.133 [6] clause 8.2 apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the SCell.Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The starting point of an interruption on SpCell or any activated SCell in the same cell group as SCell being deactivated for NR standalone, EN-DC, NE-DC or NR-DC mode specified TS 38.133 [6] in clause 8.2 shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$. where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{3ms}{NR\ slot\ length}$. The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133 [6] clause 8.2, shall not occur before slot n+1 and not occur after slot $n+1+\frac{3ms}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.

For a UE supporting *scellWithoutSSB-InterBandCA-r18* if the SCell being activated belongs to FR1 and if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) in the target SCell (FrequencyInfoDL) nor SMTC configuration for the target SCell, and if there is one collocated active reference serving cell on different FR1 band, when the following conditions are fulfilled,

- The RTD between the target SCell and the collocated reference serving cell is within CP where CP is corresponding to the SCS of SSB-less SCell, and
- The EPRE difference at the UE is smaller than or equal to [30] dB, where EPRE difference is the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell normalized by SCSs of SSB of reference Cell and A-TRS/P-TRS of SSB-less Cell., and
- The RS(s) of the SSB-less SCell being activated is (are) QCL-TypeA with TRS(s) of the SSB-less SCell being activated, and the TRS(s) of the SSB-less SCell being activated is (are) further QCL-TypeC with SSB(s) of an inter-band active serving cell, and the inter-band active serving cell shall be same as the reference serving cell.

where the reference serving cell can be indicated by higherlayer parameter *referenceCell-r18*. If UE is not indicated with *referenceCell-r18*, the reference serving cell is assumed to be the QCL-typeC source cell if there is only one active QCL-typeC source cell configured.

$T_{activation_time}$ is

- $T_{first_TRS} + T_{TRS}$ +5 ms, if aperiodic CSI-RS resources are not configured for SCell activation or UE do not support *aperiodicCSI-RS-FastScellActivation-r17*, when the the EPRE difference is smaller than or equal to 12 dB
- $T_{first_ATRS} + T_{gap} + T_{ATRS}$ + 5 ms if aperiodic CSI-RS resources are configured for SCell activation for UE supporting *aperiodicCSI-RS-FastScellActivation-r17*, when the the EPRE difference is smaller than or equal to 12 dB
- $T_{first_TRS} + 2*T_{TRS}$ +5 ms, when the EPRE difference is larger than 12 dB but smaller than or equal to [30] dB

For a UE supporting *scellWithoutSSB-InterBandCA-r18*, when UE receive SCell activation command for more than one SSB-less SCell, the SCell activation delay for each of the to-be-activated SCell is the same as the single SCell activation delay, when

- SSB-less SCells being activated are on different bands, or
- all SCells being activated are SSB-less SCells, the SCells are contiguous on the same band, and all to-be-activated SCells have the same QCL-typeC QCL source cell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

#### 4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

#### 4.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

#### 4.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

#### 4.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.1.

#### 4.5.3.1.4 Test description

##### 4.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.3.1.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.3.1.4.1-1: supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 4.5.3.1-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.3.1-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.3.1-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4.5.3.1-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 4.5.3.1-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 4.5.3.1-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |
| Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.3.1.4.1-1A: supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |
| Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.1.4.1-2 and Table 4.5.3.1.4.1-3.

**Table 4.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.1.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

**Table 4.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.1 of TS38.133 [6] |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell3 timing offset to cell2 | µs | 0 | |
| Time alignment error between cell3 and cell2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell is configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| K | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

### 4.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers. E-UTRA has one cell and NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot n + $\frac{T_{\text{HARQ}}+3ms}{NR\ slot\ length}$. The starting point of any PSCell interruption due to the deactivation shall occur in the slot n + 1 + $\frac{T_{\text{HARQ}}}{NR\ slot\ length}$ to n + 1 + $\frac{T_{\text{HARQ}}+3\text{ms}}{NR\ slot\ length}$. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{\text{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{EUTRA\ subframe\ length}$, where $n_1$ and $n_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.1.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.* If the TE doesn't receive the *MeasurementReport* during T1, go to step 9.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{T_{\text{HARQ}}+3\text{ms}+T_{CSI_Reporting}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\text{THARQ}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\text{THARQ}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 4.5.3.1.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.1.4.3-5 | |
| measConfig | MeasConfig | Table 4.5.3.1.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.1.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 4.5.3.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 4.5.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.1.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 4.5.3.1.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r16 | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

**Table 4.5.3.1.4.3-5: CellGroupConfig-SCell (Table 4.5.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 4.5.3.1.4.3-7: ServingCellConfig-SCell (Table 4.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 4.5.3.1.5 Test requirement

Table 4.5.3.1.5-1 and Table 4.5.3.1.5-1A defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.1.5-1: Cell specific test parameters for NR PSCell known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| SSB ARFCN | | | freq1 | | |
| Duplex mode | Config 1,4 | | FDD | | |
| | Config 2,3,5,6 | | TDD | | |

| | | | |
|---|---|---|---|
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | MHz | Note 7 |
| $BW_{occupied}$ | Config 1,2,4,5 | RB | 52 Note 5 |
| | Config 3,6 | | 106 Note 6 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| DRX Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 |
| | Config 3,6 | | OP.1 Note 6 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD |
| | Config 2,5 | | CSI-RS.1.1 TDD |
| | Config 3,6 | | CSI-RS.2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 |
| | Config 3,6 | | 30 |
| reportConfigType | Config 1-6 | | periodic |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 |
| | Config 3,6 | | 10 |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 |
| | Config 3,6 | | 4 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 |
| | Config 3,6 | | -101 |
| $\hat{E}_s / I_{ot}$ | | dB | 17 |
| $\hat{E}_s / N_{oc}$ | | dB | 17 |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 |
| | Config 3,6 | | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |

| | | | |
|---|---|---|---|
| | Config 3,6 | dBm/38.16MHz | -52.87 |
| Propagation condition | | - | AWGN |
| Correlation Matrix and Antenna configuration | | | 2x2 Low |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The uplink resources for CSI reporting is assigned to the UE prior to the start of time period T2.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

**Table 4.5.3.1.5-1A: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 3 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| SSB ARFCN | | | freq2 | | |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | | |
| | $Config_{SCell}$ 2,3 | | TDD | | |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable | | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | Note 7 | | |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 5 | | |
| | $Config_{SCell}$ 3 | | 106 Note 6 | | |
| DL initial BWP configuration | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration | | | DLBWP.1.1 | | |
| UL initial BWP configuration | | | ULBWP.0.1 | | |
| UL dedicated BWP configuration | | | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | $Config_{SCell}$ 1 | | CR.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | $Config_{SCell}$ 1 | | CCR.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD | | |
| TRS configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD | | |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 | | |
| | $Config_{SCell}$ 3 | | OP.1 Note 6 | | |
| SMTC configuration | | | SMTC.1 | | |
| SSB configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 | | |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | $Config_{SCell}$ 1 | | CSI-RS.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | CSI-RS.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | $Config_{SCell}$ 1,2 | kHz | 15 | | |

| | | | |
|---|---|---|---|
| | Config$_{SCell}$ 3 | | 30 |
| reportConfigType | | | N/A |
| reportQuantity | | | N/A |
| CSI reporting periodicity | | slot | N/A |
| CSI reporting offset | | slot | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 |
| $N_{oc}$ Note2 | Config$_{SCell}$ 1,2 | dBm/SCS | -104 |
| | Config$_{SCell}$ 3 | | -101 |
| $\hat{E}_s / I_{ot}$ | | dB | 17 |
| $\hat{E}_s / N_{oc}$ | | dB | 17 |
| SS-RSRP Note3 | Config$_{SCell}$ 1,2 | dBm/SCS | -87 |
| | Config$_{SCell}$ 3 | | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 |
| Io Note3 | Config$_{SCell}$ 1,2 | dBm/9.36MHz | -58.96 |
| | Config$_{SCell}$ 3 | dBm/38.16MHz | -52.87 |
| Propagation condition | | - | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within BW$_{occupied}$.
NOTE 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
NOTE 5: All UL/DL transmission shall be confined within BW$_{occupied}$ (i.e. 10 MHz, 52 RBs) from F$_{C,low}$, and Io is independent of the BW$_{channel}$ configured.
NOTE 6: All UL/DL transmission shall be confined within BW$_{occupied}$ (i.e. 40 MHz, 106 RBs) from F$_{C,low}$, and Io is independent of the BW$_{channel}$ configured.
NOTE 7: N$_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured BW$_{channel}$.

During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot m + $\frac{T_{\text{HARQ}}+3ms}{\text{NR slot length}}$. UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in slot m + 1 + $\frac{T_{\text{HARQ}}+3ms+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$ was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot m + 1 + $\frac{T_{\text{HARQ}}+3ms+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{\text{HARQ}}+T_{\text{activtion_time}}+T_{\text{CSI_Reporting}}}{NR\ slot\ length}$, T$_{\text{activation_time}}$ = T$_{\text{FirstSSB}}$+ 5ms, as defined in TS 38.133 [6] clause 8.3.

Figures 4.5.3.1.5-1 shows the deriviation of the Test procedure requreiment for DTX during T2, based on the core requirements for interruption.

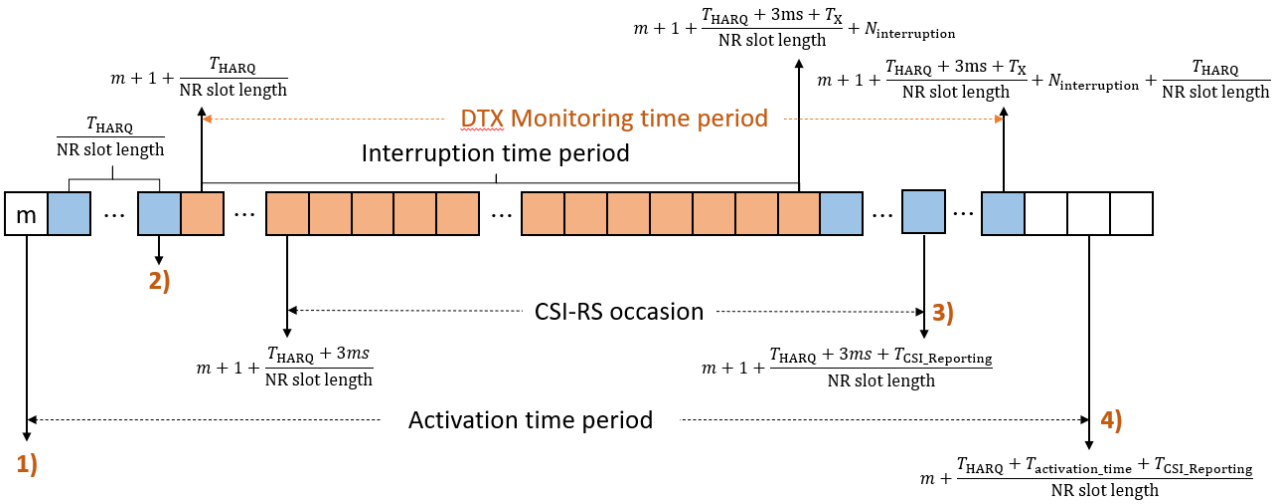


**Figure 4.5.3.1.5-1: Procedure derivation for Activation**

1) Activation command for SCell
2) ACK for MAC-CE for SCell1 activation
3) First CSI report timing (could be invalid CQI)
4) First non-zero CSI report transmission

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{EUTRA slot length}} + N_{interruption}$, as defined in TS 38.133 [6] clause 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot n + $1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to n + $1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3, and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{HARQ}+3ms}{EUTRA\ subframe\ length}$.

Figures 4.5.3.1.5-2 shows the deriviation of the Test procedure requreiment for NR PSCell DTX during T3, based on the core requirements for interruption.

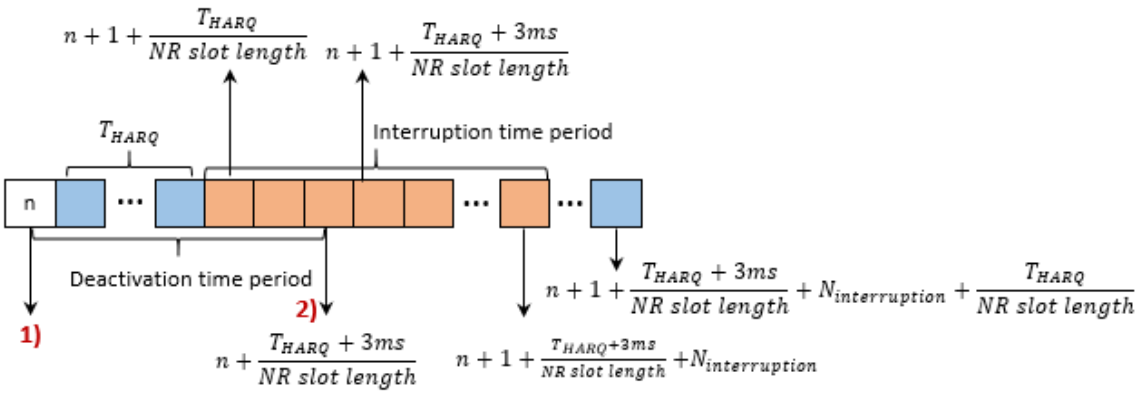


**Figure 4.5.3.1.5-2: Procedure derivation for Deactivation**

1) Deactivation command for SCell

2) Latest slot stop sending CSI reports for SCell

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

### 4.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

### 4.5.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

### 4.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.2.

### 4.5.3.2.4 Test description

#### 4.5.3.2.4.1 Initial conditions

Same initial conditions as described in clause 4.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 4.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

**Table 4.5.3.2.4.1-1: Void**

**Table 4.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |

#### 4.5.3.2.4.2 Test procedure

Same test procedure as described in clause 4.5.3.1.4.2:

#### 4.5.3.2.4.3 Message contents

Same message contents as described in clause 4.5.3.1.4.3 with following exception:

- Table 4.5.3.1.4.3-3 is replaced by Table 4.5.3.2.4.3-1.

**Table 4.5.3.2.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |

### 4.5.3.2.5 Test requirement

Same test requirement as described in clause 4.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX}$ + $T_{rs}$ + 5ms.

## 4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX

### 4.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is unknown by the UE at the time of activation.

### 4.5.3.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

### 4.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.3.

### 4.5.3.3.4 Test description

#### 4.5.3.3.4.1 Initial conditions

Same initial conditions as described in clause 4.5.3.1.4.1 with following exception:

- The listed parameter values in Table 4.5.3.3.4.1-2 will replace the values of corresponding parameters in Table 4.5.3.1.4.1-3.

**Table 4.5.3.3.4.1-1: Void**

**Table 4.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell is configured but not detected. |

### 4.5.3.3.4.2 Test procedure

Same test procedure as described in clause 4.5.3.1.4.2, except step 3and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete. The SCell (Cell 3) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell3), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

- Step 3a is removed.

### 4.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.3.4.3-1: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.3.3.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.3.4.3-2: CellGroupConfig (Table 4.5.3.3.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.3.4.3-3 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.3.4.3-4 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 4.5.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 4.5.3.3.4.3-4: ServingCellConfig-SCell (Table 4.5.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

#### 4.5.3.3.5 Test requirement

Same test requirement as described in clause 4.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX}$ + $T_{SMTC_MAX}$ + 2*$T_{rs}$ + 5ms

### 4.5.3.4 SCell activation and deactivation of multiple unknown SCells in FR1 with single activation/deactivation command

Editor's Note: This test case is incomplete in following aspects:

- Message contents need further work.

#### 4.5.3.4.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the two SCells in FR1 are unknown by the UE at the time of activation, with a single activation/deactivation command.

#### 4.5.3.4.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and supporting 3DL CA in NR.

#### 4.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.4.

#### 4.5.3.4.4 Test description

##### 4.5.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.4.4.1-1. Supported test configurations for NR SCells are shown in Table

4.5.3.4.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.3.4.4.1-1: supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.3.4.4.1-1A: supported test configurations for NR SCells**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.4.4.1-2 and Table 4.5.3.4.4.1-3.

**Table 4.5.3.4.4.1-2: Initial conditions for unknown FR1 SCells activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.1.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.3.4.4.1-3: General test parameters for unknown FR1 SCells activation case with 2 deactivated SCells, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3,4 | One E-UTRAN radio channel (1) and three NR radio channels (2,3,4) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.1 of TS38.133 [6] |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell 1 | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 which is an intra-band contiguous CC to PSCC of Cell 2; ssb-PositionInBurst of Cell 3 is same as the one for Cell 2 |

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Configured deactivated SCell 2 | | Cell 4 | Configured deactivated secondary cell on NR RF channel number 4 which is an inter-band CC to PSCC of Cell 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell 3 timing offset to Cell 2 | µs | 0 | |
| Cell 4 timing offset to Cell 2 | µs | 0 | |
| Time alignment error between Cell 3 and Cell 2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| Time alignment error between Cell 4 and Cell 2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 100 | During this time the PSCell shall be known and the SCell is configured but not detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| K | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.4.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2, Cell 3 and Cell 4 are NR FR1 cells. Cell 2 is the PSCell. Cell 3 and Cell 4 are the deactivated SCells.

#### 4.5.3.4.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers. E-UTRA has one cell and NR has three cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) and Cell 4 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCells (Cell 3 and Cell 4) become configured on NR. During T1 the SCells (Cell 3 and Cell 4) are powered off and UE is not aware of SCells.

A MAC message for activation of SCells (Cell 3 and Cell 4) is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCells is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of Cell 3 and Cell 4 are increased to the same level as for cell 2. The UE shall be able to report valid CSI for the activated SCells (Cell 3 and Cell 4) at latest in slot m + $\frac{T_{HARQ}+T_{activation_time_multiple_scells}+T_{CSI_Reporting}}{NR\ slot\ length}$ respectively as defined clause 8.3.7 in TS 38.133 [6] provided the SCells can be successfully detected on the first attempt. The UE shall start

reporting CSI for cell 3 and cell 4 after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation for cell 3 and cell 4 has been completed, respectively. Any PSCell interruption due to activation of SCells shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in clause 8.3 in TS 38.133 [6], where $N_{\text{interruption}}$ is the interruption length given in clause 8.2 in TS 38.133 [6]. Any E-UTRA PCell interruption due to activation of SCells shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

Time period T3 starts when a MAC message for deactivation of the SCells (Cell 3 and Cell 4), sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCells at latest in slot $n + \frac{T_{\text{HARQ}}+3ms}{NR\ slot\ length}$ as defined in clause 8.3 in TS 38.133 [6]. The starting point of any PSCell interruption due to the deactivation shall occur in the slot $n + 1 + \frac{T_{\text{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{NR\ slot\ length}$, as defined in clause 8.3 in TS 38.133 [6]. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{\text{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{EUTRA\ subframe\ length}$, where $n_1$ and $n_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.4.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCells (Cell 3 and Cell 4) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.4.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete. The SCells (Cell 3 and Cell 4) shall be powered OFF till T2 starts.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCells (Cell 3 and Cell 4), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCells and the SS shall monitor CSI reports for SCells sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCells is received by the SS no later than slot $s_{first_CSI} = \text{m} + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{CSI_Reporting}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI} = \text{m} + \frac{T_{\text{HARQ}}+T_{\text{activation_time_multiple_scells}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCells and the SS shall monitor CSI reports for SCells sent from the UE and ACK/NACK sent in PSCell during SCells deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\text{THARQ}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\text{THARQ}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. Set Cell 4 physical cell identity = ((current Cell 4 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.4.4.3-1: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.3.4.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.4.4.3-2: CellGroupConfig (Table 4.5.3.4.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.4.4.3-3 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.4.4.3-4 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.4.4.3-3: ServingCellConfig-SpCell (Table 4.5.3.4.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 4.5.3.4.4.3-4: ServingCellConfig-SCell (Table 4.5.3.4.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

### 4.5.3.4.5 Test requirement

Table 4.5.3.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.4.5-1: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 3 | | Cell 4 | |
|---|---|---|---|---|---|---|
| | | | T2 | T3 | T2 | T3 |
| SSB ARFCN | | | Freq2 | | Freq3 | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |
| | Config 3,6 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | | | SMTC.1 | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | |
| | Config 3,6 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | |
| | Config 3,6 | | 30kHz | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | |
| | Config 3,6 | | -101 | |
| $\hat{E}_s / I_{ot}$ | | dB | 17 | |
| $\hat{E}_s / N_{oc}$ | | dB | 17 | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | |
| | Config 3,6 | | -84 | |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | |
| Propagation condition | | - | AWGN | |

The test requirements defined in clause 4.5.3.1.5 shall apply to this test case for both Cell 3 and Cell 4, except the followings:

- For Cell 3 activation delay, $T_{activation_time}$ will be replaced with the value $T_{activation_time_multiple_scells} = T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs} + 5ms$.
- For Cell 4 activation delay, $T_{activation_time}$ will be replaced with the value $T_{activation_time_multiple_scells} = T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + 2*T_{rs} + 5ms$.

## 4.5.3.5 EN-DC FR1 direct SCell activation at SCell addition of known SCell

### 4.5.3.5.1 Test purpose

The purpose of this test is to verify that the direct SCell activation time is within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

### 4.5.3.5.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and supporting 2DL CA in NR and direct SCell activation.

### 4.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.5.

### 4.5.3.5.4 Test description

#### 4.5.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.3.5.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.3.5.4.1-1: known FR1 direct SCell activation supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 4.5.3.5-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.3.5-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.3.5-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.3.5-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.3.5.4.1-1A: supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.5.4.1-2 and Table 4.5.3.5.4.1-3.

**Table 4.5.3.5.4.1-2: Initial conditions for known FR1 SCell activation case**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.5.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.3.5.4.1-3: General test parameters for known FR1 direct SCell activation**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in TS 38.133 [6] clause A.3.7.2.1 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| SCell | | Cell 3 | Secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every four slots. |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell3 timing offset to cell2 | µs | 0 | |
| Time alignment error between cell3 and cell2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the Cell 3 shall be known. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 | |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | ms | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\,\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1.Message contents are defined in clause 4.5.3.5.4.3.

2.Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the known activated SCell.

#### 4.5.3.5.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers E-UTRA has one cell and NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the RRC message for direct SCell activation is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The test equipment sends the RRCConnectionReconfiguration message for the activation of the SCell within time period specified in TS 38.133 [6] clause 8.3.2 for known cell definition to ensure the configured SCell is known. The NR shall be using an *RRCConnectionReconfiguration* message with parameter *sCellState* set to *activated* for the SCell (Cell 3), which causes the SCell to become configured and activated on radio channel 3 (SCC). The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$, where $N_{direct}$ is the time taken for direct SCell activation as defined in TS 38.133 [6] clause 8.3.4. The UE shall start reporting CSI in PSCell in slot (m+k+$T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay as specified in clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 of TS 38.331 [13]. It shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1$ to slot $m + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.4, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1$ to subframe $m_2 + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, Tx is the time to the end of the first complete the SSB burst as specified in TS 36.133 [23] clause 8.3.4, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.5.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.5.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

    a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The UE shall start reporting CSI in PSCell in slot (m+k+$T_{RRC_process}$) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

    - If the first CSI report for SCell is received by the SS no later than slot m + 1 + $\frac{T_{HARQ}+T_1+\text{TRRC_process}+T_(CSI_Reporting)}{NR\ slot\ length}$,

    - or slot $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_(CSI_Reporting)+T_1+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{T_{HARQ}+T_1+\text{TRRC_process}+T_(CSI_Reporting)}{NR\ slot\ length}$ was subject to interruption,

    - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$,

- or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$

- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_1+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 6.

6. When T2 expires or a fail was counted for the event "Activation" in step 5, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

7. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

9. Repeat steps 2-8 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 4.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 4.5.3.5.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.5.4.3-5 | |
| measConfig | MeasConfig | Table 4.5.3.5.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.5.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 4.5.3.5.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 4.5.3.5.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.5.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 4.5.3.5.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.5.4.3-5: CellGroupConfig-SCell (Table 4.5.3.5.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |

| | | | |
|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.5.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.5.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| sCellState-r16 | activated | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.5.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

**Table 4.5.3.5.4.3-7: ServingCellConfig-SCell (Table 4.5.3.5.4.3-5)**

### 4.5.3.5.5 Test requirement

Table 4.5.3.5.5-1 and Table 4.5.3.5.5-1A defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.5.5-1: Cell specific test parameters for NR PSCell for known FR1 direct SCell activation**

| **Parameter** | | **Unit** | **Cell 2** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| **SSB ARFCN** | | | **freq1** | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| TDD configuration | Config 1,4 | | Not Applicable | |
| | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | |

| | | | |
|---|---|---|---|
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1,2,3,4,5,6 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1,2,3,4,5,6 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1,2,3,4,5,6 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1,2,3,4,5,6 | | ULBWP.1.1 |
| DRx Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz |
| | Config 3,6 | | 30kHz |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD |
| | Config 2,5 | | CSI-RS.1.1 TDD |
| | Config 3,6 | | CSI-RS.2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 |
| | Config 3,6 | | 30 |
| reportConfigType | Config 1-6 | | periodic |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 |
| | Config 3,6 | | 10 |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 |
| | Config 3,6 | | 4 |
| EPRE ratio of PSS to SSS | | | |
| EPRE ratio of PBCH DMRS to SSS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | dB | 0 |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104~~+TT~~ |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104~~+TT~~ |
| | Config 3,6 | | -101~~+TT~~ |
| $\hat{E}_s / I_{ot}$ | | dB | 17~~+TT~~ |
| $\hat{E}_s / N_{oc}$ | | dB | 17~~+TT~~ |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87~~+TT~~ |
| | Config 3,6 | | -84~~+TT~~ |
| SCH_RP Note 3 | | dBm/15 kHz | -87~~+TT~~ |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

**Table 4.5.3.5.5-1A: Cell specific test parameters for NR SCell for known FR1 direct SCell activation**

| Parameter | | Unit | Cell 3 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| SSB ARFCN | | | freq2 | |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | |
| | $Config_{SCell}$ 2,3 | | TDD | |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | $Config_{SCell}$ 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | $Config_{SCell}$ 2 | | 10: $N_{RB,c}$ = 52 | |
| | $Config_{SCell}$ 3 | | 40: $N_{RB,c}$ = 106 | |
| DL initial BWP configuration | $Config_{SCell}$ 1,2,3 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | $Config_{SCell}$ 1,2,3 | | DLBWP.1.1 | |
| UL initial BWP configuration | $Config_{SCell}$ 1,2,3 | | ULBWP.0.1 | |

| | | | |
|---|---|---|---|
| UL dedicated BWP configuration | $Config_{SCell}$ 1,2,3 | | ULBWP.1.1 |
| DRX Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| TRS configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | $Config_{SCell}$ 1,2 | kHz | 15 |
| | $Config_{SCell}$ 3 | | 30 |
| CSI-RS configuration for CSI reporting | $Config_{SCell}$ 1 | | CSI-RS.1.1 FDD |
| | $Config_{SCell}$ 2 | | CSI-RS.1.1 TDD |
| | $Config_{SCell}$ 3 | | CSI-RS.2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | $Config_{SCell}$ 1,2 | kHz | 15 |
| | $Config_{SCell}$ 3 | | 30 |
| reportConfigType | $Config_{SCell}$ 1-3 | | periodic |
| reportQuantity | $Config_{SCell}$ 1-3 | | cri-RI-PMI-CQI |
| CSI reporting periodicity | $Config_{SCell}$ 1,2 | slot | 5 |
| | $Config_{SCell}$ 3 | | 10 |
| CSI reporting offset | $Config_{SCell}$ 1,2 | slot | 2 |
| | $Config_{SCell}$ 3 | | 4 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104~~+TT~~ |
| $N_{oc}$ Note2 | $Config_{SCell}$ 1,2 | dBm/SCS | -104~~+TT~~ |
| | $Config_{SCell}$ 3 | | -101~~+TT~~ |
| $\hat{E}_s / I_{ot}$ | | dB | 17~~+TT~~ |

| | | | |
|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | | dB | 17~~+TT~~ |
| SS-RSRP Note3 | Config$_{SCell}$ 1,2 | dBm/SCS | -87~~+TT~~ |
| | Config$_{SCell}$ 3 | | -84~~+TT~~ |
| SCH_RP Note 3 | | dBm/15 kHz | -87~~+TT~~ |
| Propagation condition | | - | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot ($m+k+T_{RRC_process}$). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot ($m+k+T_{RRC_process}$) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot ($m+k+T_{RRC_process}$).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $m + \frac{N_{direct}}{NR\ slot\ length}$. $N_{direct} = T_{RRC_Process} + T_1 + T_{activation_time} + T_{CSI_Reporting}$ - 3ms, where $T_{RRC_Process}$ = 20 ms and other components are defined in TS 38.133 [6] clause 8.3.4.

During T2 interruption of PSCell during direct SCell activation shall not happen outside the slot $m + 1$ to $m + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1$ to subframe $m_2 + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.4.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.8.

All the above test requirements shall be fulfilled for the observed direct SCell activation delay to be counted as correct. The rate of correct observed direct SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $m + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 4.5.3.6 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle

### 4.5.3.6.1 Test purpose

The purpose of this test is to verify that the fast SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the SCell in FR1 is known by the UE at the time of activation.

### 4.5.3.6.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting 2DL CA in NR and fast SCell activation.

### 4.5.3.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

#### 4.5.3.6.4 Test description

##### 4.5.3.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell, NR PSCell and NR SCell are shown in Table 4.5.3.6.4.1-1.

**Table 4.5.3.6.4.1-1: fast known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.6.4.1-2 and Table 4.5.3.6.4.1-3.

**Table 4.5.3.6.4.1-2: Initial conditions for fast known FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.5.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.3.6.4.1-3: General test parameters for fast known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in TS 38.133 [6] clause A.3.7.2.1 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |

| | | | |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell3 timing offset to cell2 | µs | 0 | |
| Time alignment error between cell3 and cell2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell is configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 | |
| $T_{HARQ}$ | ms | $k_1$NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.6.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the known activated SCell.

#### 4.5.3.6.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers. E-UTRA has one cell and NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.6.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{\mathrm{T_{HARQ}+3ms}+T_{CSI_Reporting}}{NR\,slot\,length}$,

   - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\,slot\,length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

   - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, where $T_{activation_time} = T_{FirstATRS}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.16,

   - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

   - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+\mathrm{TRRC_process}+T_1+T_X}{NR\,slot\,length} + N_{interruption} + \frac{T_{HARQ}}{NR\,slot\,length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 4.5.3.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 4.5.3.6.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.6.4.3-5 | |
| measConfig | MeasConfig | Table 4.5.3.6.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.6.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 4.5.3.6.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 4.5.3.6.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.6.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 4.5.3.6.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.6.4.3-5: CellGroupConfig-SCell (Table 4.5.3.6.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.6.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.6.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.6.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.6.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |
| } | | | |

**Table 4.5.3.6.4.3-7: ServingCellConfig-SCell (Table 4.5.3.6.4.3-5)**

### 4.5.3.6.5 Test requirement

Table 4.5.3.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.6.5-1: Cell specific test parameters for fast known FR1 SCell activation case, 160ms SCell measurement cycle**

| **Parameter** | | **Unit** | **Cell 2** | | **Cell 3** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| **SSB ARFCN** | | | **freq1** | | **freq2** | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |
| | Config 3,6 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,4 | MHz | Note 7 | | | |
| | Config 2,5 | | Note 7 | | | |
| | Config 3,6 | | Note 7 | | | |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 5 | | | |
| | Config 2,5 | | 52 Note 5 | | | |
| | Config 3,6 | | 106 Note 6 | | | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | | | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | | | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | | | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | | | |
| Aperiodic CSI-RS for SCell activation | Config 1,4 | | N/A | | TRS.1.3 FDD | |
| | Config 2,5 | | N/A | | TRS.1.3 TDD | |
| | Config 3,6 | | N/A | | TRS.1.4 TDD | |
| gapBetweenBursts | | Slot | N/A | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | | SR.1.1 FDD | |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 | |
| | Config 3,6 | | OP.1 Note 6 | |
| SMTC configuration | | | SMTC.1 | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | |
| | Config 3,6 | | SSB.2 FR1 | |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD | |
| | Config 2,5 | | CSI-RS.1.1 TDD | |
| | Config 3,6 | | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| reportConfigType | Config 1-6 | | periodic | |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | N/A |
| CSI reporting offset | Config 3,6 | slot | 10 | N/A |
| | Config 1,2,4,5 | | 2 | N/A |
| | Config 3,6 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | |
| | Config 3,6 | | -101 | |
| $\hat{E}_s / I_{ot}$ | | dB | 17 | |
| $\hat{E}_s / N_{oc}$ | | dB | 17 | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | NA |
| | Config 3,6 | | -84 | NA |
| CSI-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | NA | -87 |
| | Config 3,6 | | NA | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | |
| Propagation condition | | - | AWGN | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 | |
| | Config 3,6 | dBm/ 38.16MHz | -52.87 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within

| | |
|---|---|
| | $BW_{occupied}$. |
| Note 3: | SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + 5ms$, as defined in TS 38.133 [6] clause 8.3. During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{NR slot length}} + N_{\text{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3. The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.19.

All the above test requirements shall be fulfilled for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 4.5.3.7 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 640ms SCell measurement cycle

### 4.5.3.7.1 Test purpose

The purpose of this test is to verify that the fast SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the SCell in FR1 is known by the UE at the time of activation.

### 4.5.3.7.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting 2DL CA in NR and fast SCell activation.

### 4.5.3.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

### 4.5.3.7.4 Test description

#### 4.5.3.7.4.1 Initial conditions

Same initial conditions as described in clause 4.5.3.6.4.1 with following exception:

The listed parameter values in Table 4.5.3.7.4.1-1 will replace the values of corresponding parameters in Table 4.5.3.6.4.1-3. The listed parameter values in Table 4.5.3.7.4.1-2 will replace the values of corresponding parameters in Table 4.5.3.6.5-1.

**Table 4.5.3.7.4.1-1: General test parameters for known FR1 SCell activation case, 640 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |

**Table 4.5.3.7.4.1-2: Cell specific test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| gapBetweenBursts | | Slot | 2 | | | |

### 4.5.3.7.4.2 Test procedure

Same test procedure as described in clause 4.5.3.6.4.2:

### 4.5.3.7.4.3 Message contents

Same message contents as described in clause 4.5.3.6.4.3 with following exception:

- Table 4.5.3.6.4.3-3 is replaced by Table 4.5.3.7.4.3-1.

**Table 4.5.3.7.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

**Table 4.5.3.7.4.3-2: SCellActivationRS-Config**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCellActivationRS-Config-r17 ::= SEQUENCE { | | | |
| gapBetweenBursts-r17 | 2 | | |
| } | | | |

### 4.5.3.7.5 Test requirement

Table 4.5.3.6.5-1 defines the primary level settings including test tolerances for all tests except the listed parameter values in Table 4.5.3.7.5-1 will replace the values of corresponding parameters in Table 4.5.3.6.5-1.

**Table 4.5.3.7.5-1: Cell specific test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| SSB ARFCN | | | freq1 | | freq2 | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4 | MHz | Note 7 | |
| | Config 2,5 | | Note 7 | |
| | Config 3,6 | | Note 7 | |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 5 | |
| | Config 2,5 | | 52 Note 5 | |
| | Config 3,6 | | 106 Note 6 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| Aperiodic CSI-RS for SCell activation | Config 1,4 | | N/A | TRS.1.3 FDD |
| | Config 2,5 | | N/A | TRS.1.3 TDD |
| | Config 3,6 | | N/A | TRS.1.4 TDD |
| gapBetweenBursts | | Slot | 2 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 | |
| | Config 3,6 | | OP.1 Note 6 | |
| SMTC configuration | | | SMTC.1 | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | |
| | Config 3,6 | | SSB.2 FR1 | |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD | |
| | Config 2,5 | | CSI-RS.1.1 TDD | |
| | Config 3,6 | | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| reportConfigType | Config 1-6 | | periodic | |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | N/A |
| CSI reporting offset | Config 3,6 | slot | 10 | N/A |
| | Config 1,2,4,5 | | 2 | N/A |
| | Config 3,6 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | |
| | Config 3,6 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | NA |
| | Config 3,6 | | -84 | NA |
| CSI-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | NA | -87 |
| | Config 3,6 | | NA | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | |
| Propagation condition | | - | AWGN | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 | |
| | Config 3,6 | dBm/ 38.16MHz | -52.87 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + T_{gap} + T_{ATRS}$+ 5ms, as defined in TS 38.133 [6] clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{EUTRA slot length}} + N_{interruption}$, as defined in TS 38.133 [6] clause 8.3. The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.19.

All the above test requirements shall be fulfilled for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 4.5.3.8 to 4.5.3.10

## 4.5.3.11 EN-DC FR1 TRS-based SCell Activation of SSB-less SCell in FR1 collocated inter-band in non-DRX

### 4.5.3.11.1 Test purpose

The purpose of this test is to verify that the TRS based SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.2, when the SCell is an SSB-less SCell on a FR1 band different from the reference cell (i.e., PSCell) and provided with periodic CSI-RS for tracking instead of SSB. The SCell and PSCell are collocated.

### 4.5.3.11.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 18 onwards and supporting 2DL CA in NR and inter-band SSB-less SCell operation.

### 4.5.3.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

### 4.5.3.11.4 Test description

#### 4.5.3.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell, NR PSCell and NR SCell are shown in Table 4.5.3.11.4.1-1.

**Table 4.5.3.11.4.1-1: TRS-based SCell activation of SSB-less SCell in FRI inter-band supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.11.4.1-2 and Table 4.5.3.11.4.1-3.

**Table 4.5.3.11.4.1-2: Initial conditions for TRS-based SCell activation of SSB-less SCell in FR1 inter-band**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.11.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.3.11.4.1-3: General test parameters for TRS-based SCell activation of SSB-less SCell in FR1 inter-band**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.1 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| Cell 3 timing offset to Cell 2 | μs | Length of CP of Cell 3 | |
| Time alignment error between Cell 3 and Cell 2 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell is configured but not detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.11.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the deactivated SCell. The NR band that indicates '*referenceBand*' in UE capability *supportOfSingleGroup* is configured as PSCell, and the NR band that indicates '*scellWithoutSSB*' in UE capability *supportOfSingleGroup* is configured as SCell. If both NR bands indicate '*both*' in UE capability *supportOfSingleGroup*, either of the two NR bands can be configured as a PSCell, and the other band is configured as an SCell.

#### 4.5.3.11.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers. E-UTRA has one cell. NR has two cells. Each NR cell has one carrier and these two carriers are collocated and on different FR1 bands. SSB is not transmitted on the SCell hence the UE is not provided with SSB configuration (*absoluteFrequencySSB*) in the SCell (FrequencyInfoDL) nor SMTC configuration. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The test equipment sends a MAC message for activation of the SCell and triggering the periodic CSI-RS for TRS-based SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where in the case of SSB-less SCell $T_{\text{activation_time}}$ is defined as $T_{\text{First_TRS}}$ + $T_{\text{TRS}}$ + 5 ms. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed.

Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, where $N_{\text{interruption}}$ is the interruption length given in clause 8.3 in TS 38.133 [6]. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.11.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.11.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE. The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m and T2 starts. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports in PSCell for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI} = \text{m} + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{CSI_Reporting}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

- or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s_{first_CSI}^{int}$,

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where $T_{\text{activation_time}} = T_{\text{First_TRS}} + T_{\text{TRS}} + 5$ ms, as defined in TS 38.133 [6] clause 8.3.2,

  - or slot $s_{nonzero_CQI}^{int} = max\left(s_{first_CSI}^{int}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

  - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s_{nonzero_CQI}^{int}$,

- and DTX is not observed in NR PSCell by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$ up to the end of T2, where $N_{\text{interruption}}$ is the interruption length given in clause 8.3 in TS 38.133 [6].

- and DTX is not observed in E-UTRA PCell by the SS outside the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$ up to the end of T2, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 4.5.3.11.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.11.4.3-1: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.11.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.11.4.3-2: CellGroupConfig-SCell (Table 4.5.3.11.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | Value 1 for EN-DC | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.11.4.3-3 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigCommon | ServingCellConfigCommon-SCell | Table 4.5.3.11.4.3-5 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.11.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.11.4.3-3: ServingCellConfig-SpCell (Table 4.5.3.11.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig-SCell | Table 4.5.3.11.4.3-8 | |
| } | | | |

**Table 4.5.3.11.4.3-4: ServingCellConfig-SCell (Table 4.5.3.11.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 with condition No_UL and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| downlinkConfigCommon | DownlinkConfigCommon-SCell | Table 4.5.3.11.4.3-6 | |
| } | | | |

**Table 4.5.3.11.4.3-5: ServingCellConfigCommon-SCell (Table 4.5.3.11.4.3-2)**

**Table 4.5.3.11.4.3-6: DownlinkConfigCommon-SCell (Table 4.5.3.11.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-52 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| frequencyInfoDL | FrequencyInfoDL | Table 4.5.3.11.4.3-7 | |
| } | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-59 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoDL::= SEQUENCE { | | | |
| absoluteFrequencySSB | Not present | | |
| referenceCell-r18 | ServCellIndex of NR SpCell | Value 1 for EN-DC | |
| } | | | |

**Table 4.5.3.11.4.3-7: *FrequencyInfoDL* (Table 4.5.3.11.4.3-6)**

**Table 4.5.3.11.4.3-8: *CSI-MeasConfig-SCell***

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-MeasConfig::= SEQUENCE { | | | |
| nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource { | n1+n2+n3 entries | n1=1<br><br>n2=0<br><br>n3=4 | |
| NZP-CSI-RS-Resource[k, k=1..n1] | NZP-CSI-RS-Resource for CSI | entry 1, Table 4.5.3.11.4.3-9 | n1>0 |
| NZP-CSI-RS-Resource[k, k=n1+1.. n1+n2] | NZP-CSI-RS-Resource for BM (k-n1-1) | entry ... | n2>0 |
| NZP-CSI-RS-Resource[k, k= n1+n2+1.. n1+n2+n3] | NZP-CSI-RS-Resource for TRS (k-n1-n2) | entry ..., Table 4.5.3.11.4.3-10 | n3>0 |
| } | | | |
| } | | | |

**Table 4.5.3.11.4.3-9: NZP-CSI-RS-Resource for CSI (Table 4.5.3.11.4.3-8)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-7A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| qcl-InfoPeriodicCSI-RS | TCI-StateId-RRM(2) | Table 4.5.3.11.4.3-11 | |
| } | | | |

**Table 4.5.3.11.4.3-10: NZP-CSI-RS-Resource for TRS(Id) (Table 4.5.3.11.4.3-8)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| qcl-InfoPeriodicCSI-RS | TCI-StateId-RRM(0) | Table 4.5.3.11.4.3-11 | |
| } | | | |

**Table 4.5.3.11.4.3-11: *TCI-State(Id)***

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-19 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | TCI-StateId-RRM(Id) | | |
| qcl-Type1 SEQUENCE { | | | |
| cell | ServCellIndex of NR SpCell | | |
| bwp-Id | BWP-Id of the active BWP | | Id = 2 |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | Id = 0 |
| csi-rs | NZP-CSI-RS-ResourceId for TRS (4) | | Id = 2 |
| } | | | |
| qcl-Type | typeC | | Id = 0 |
| | typeA | | Id = 2 |
| } | | | |
| } | | | |

4.5.3.11.5 Test requirement

Table 4.5.3.11.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.11.5-1: Cell specific test parameters for TRS-based SCell activation of SSB-less SCell in FR1 inter-band**

| Parameter | | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| SSB ARFCN | | | freq1 | | freq2 | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |
| | Config 3,6 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,4 | MHz | Note 7 | | | |
| | Config 2,5 | | Note 7 | | | |
| | Config 3,6 | | Note 7 | | | |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 5 | | | |
| | Config 2,5 | | 52 Note 5 | | | |
| | Config 3,6 | | 106 Note 6 | | | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | | | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | | | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | | | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | | | |
| gapBetweenBursts | | Slot | N/A | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | | SR.1.1 FDD | |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference | Config 1,4 | | CR.1.1 FDD | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | |

| | | | | |
|---|---|---|---|---|
| Channel | | | | |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 | |
| | Config 3,6 | | OP.1 Note 6 | |
| TCI state | Config 1, 2, 3, 4, 5, 6 | | TCI.State.0 | TCI.State.0 Note 8 |
| SMTC configuration | Config 1, 2, 3, 4, 5, 6 | | SMTC.1 | Not Applicable |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | Not Applicable |
| | Config 3,6 | | SSB.2 FR1 | Not Applicable |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD | |
| | Config 2,5 | | CSI-RS.1.1 TDD | |
| | Config 3,6 | | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| reportConfigType | Config 1-6 | | periodic | |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | N/A |
| | Config 3,6 | | 10 | N/A |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 | N/A |
| | Config 3,6 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | | 0 | N/A |
| EPRE ratio of PBCH DMRS to SSS | | | 0 | N/A |
| EPRE ratio of PBCH to PBCH DMRS | | | 0 | N/A |
| EPRE ratio of PDCCH DMRS to SSS | | | 0 | N/A |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | N/A |
| EPRE ratio of PDSCH DMRS to SSS | | | 0 | N/A |
| EPRE ratio of PDSCH to PDSCH | | | 0 | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | 0 | N/A |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | 0 | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | -120 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | -120 |
| | Config 3,6 | | -101 | -117 |
| $\hat{E}_s / I_{ot}$ | Config 1,2,4,5 | Config 1,2,4,5 | 17 | 36-$\Delta_{EPRE}$ |
| | Config 3,6 | Config 3,6 | 18 | 37-$\Delta_{EPRE}$ |
| $\hat{E}_s / N_{oc}$ | Config 1,2,4,5 | Config 1,2,4,5 | 17 | 36-$\Delta_{EPRE}$ |
| | Config 3,6 | Config 3,6 | 18 | 37-$\Delta_{EPRE}$ |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | NA |
| | Config 3,6 | | -83 | NA |
| SCH_RP Note 3 | Config 1,2,3, 4,5,6 | dBm/15 kHz | NA | NA |
| Propagation condition | | - | AWGN | |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | -68.03 ($\Delta_{EPRE}$ = |

| | | | | |
|---|---|---|---|---|
| | | | | 12dB)<br>-85.07 ($\Delta_{EPRE}$ = 30dB) |
| | Config 3,6 | dBm/38.16MHz | -51.88 | -60.93 (ΔEPRE = 12dB)<br>-78.15 (ΔEPRE = 30dB) |
| Note 1: | OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. | | | |
| Note 3: | SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | | |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | | |
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. | | | |
| Note 8: | The SSB in referenceSignal in the TCI state is configured as the SSB in Cell 2. | | | |
| Note 9: | $\Delta_{EPRE}$ is configured as different values to verify different requirements defined in 4.5.3.11.5. | | | |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PSCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where $T_{activation_time}$ =

- $T_{first_TRS}$ + $T_{TRS}$ + 5 ms, if aperiodic CSI-RS resources are not configured for SCell activation or UE do not support *aperiodicCSI-RS-FastScellActivation-r17*, when the EPRE difference($\Delta_{EPRE}$) is equal to 12 dB

- $T_{first_TRS}$ + 2*$T_{TRS}$ +5 ms, when the EPRE difference($\Delta_{EPRE}$) is equal to 30 dB

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{EUTRA slot length}} + N_{interruption}$.

The interruption of PSCell shall not be more than the values specified for EN-DC in clause 8.3.2 in TS 38.133 [6].

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 4.5.3.12 EN-DC FR1 Inter-band SSB-less SCell activation using A-TRS

### 4.5.3.12.1 Test purpose

The purpose of this test is to verify that User Equipment's (UE) support for SCell activation and measure the associated activation delay. The test will assess whether the activation times meet the specified requirements when a collocated active reference serving cell on a different FR1 band is present. This test will validate the requirements outlined in TS 38.133 [6] clause 8.3.2.

#### 4.5.3.12.2 Test applicability

This test applies to all types of NR UE releases 18 onwards that support scellWithoutSSB-InterBandCA-r18.

#### 4.5.3.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

#### 4.5.3.12.4 Test description

##### 4.5.3.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell, NR PSCell and NR SCell are shown in Table 4.5.3.12.4.1-1.

**Table 4.5.3.12.4.1-1: Inter-band SSB less SCell activation in FR1 supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.12.4.1-2 and Table 4.5.3.12.4.1-3.

**Table 4.5.3.12.4.1-2: Initial conditions for FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.3.5.5-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |

**Table 4.5.3.12.4.1-3: General test parameters for Inter-band SSB less SCell activation in FR1**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.1 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |

| | | | |
|---|---|---|---|
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| Cell 3 timing offset to Cell 2 | µs | Length of CP of Cell 3 | |
| Time alignment error between Cell 3 and Cell 2 | µs | ≤ 3 | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell is configured. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | $k_1$ NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in TS38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 4.5.3.12.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the unknown activated SCell.

### 4.5.3.12.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers. E-UTRA has one cell and NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes added. The configuration for the SCell (Cell 3) is not provided with SSB configuration (*absoluteFrequencySSB*) in the SCell *FrequencyInfoDL* nor SMTC configuration for the SCell and PSCell (Cell 2) is indicated as reference cell by higherlayer parameter *referenceCell-r18*. Cell 3 is configured with TRS as shown in Table 4.5.3.12.5-1. The RS(s) of the Cell 3 is QCL-TypeA with TRS(s) of the Cell 3, and the TRS(s) of the Cell 3 is QCL-TypeC with SSB(s) of Cell 2.

The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation. The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 +$

$1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] clause 7.32.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.3.12.5**-**1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.12.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI} = \text{m} + 1 + \frac{\text{T}_{\text{HARQ}}+3\text{ms}+T_{CSI_Reporting}}{NR\,slot\,length}$,

   - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\,slot\,length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

   - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI} = \text{m} + \frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where $\text{T}_{\text{activation_time}} = = \text{T}_{\text{first_ATRS}} + \text{T}_{\text{gap}} + \text{T}_{\text{ATRS}} + 5$ ms, as defined in TS 38.133 [6] clause8.3.2,

   - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

   - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_1+T_X}{NR\,slot\,length} + N_{interruption} + \frac{T_{HARQ}}{NR\,slot\,length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 4.5.3.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 4.5.3.12.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 4.5.3.12.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 4.5.3.12.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.12.4.3-5: CellGroupConfig-SCell (Table 4.5.3.12.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 4.5.3.12.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 4.5.3.12.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.3.12.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.12.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |

**Table 4.5.3.12.4.3-7: ServingCellConfig-SCell (Table 4.5.3.12.4.3-5)**

### 4.5.3.12.5 Test requirement

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time}$ = $T_{first_ATRS}$ + $T_{gap}$ + $T_{ATRS}$ + 5 ms, as defined in TS 38.133 [6] clause 8.3. During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{NR slot length}} + N_{\text{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3. The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.19.

All the above test requirements shall be fulfilled for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

Table 4.5.3.12.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.3.12.5-1: Cell specific test parameters for Inter-band SSB less SCell activation in FR1**

| **Parameter** | | **Unit** | **Cell 2** | | **Cell 3** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| **SSB ARFCN** | | | **freq1** | | **Not applicable** | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | | TDDConf.2.1 | |
| Reference Channel | | | N/A | Cell 2 |
| $BW_{channel}$ | Config 1,4 | MHz | Note 7 | |
| | Config 2,5 | | Note 7 | |
| | Config 3,6 | | Note 7 | |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 5 | |
| | Config 2,5 | | 52 Note 5 | |
| | Config 3,6 | | 106 Note 6 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TCI state | | | TCI.State.0 | TCI.State.0 Note 8 |
| Aperiodic CSI-RS for SCell activation | Config 1,4 | | N/A | TRS.1.3 FDD |
| | Config 2,5 | | N/A | TRS.1.3 TDD |
| | Config 3,6 | | N/A | TRS.1.4 TDD |
| gapBetweenBursts | | Slot | N/A | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 | |
| | Config 3,6 | | OP.1 Note 6 | |
| SMTC configuration | | | SMTC.1 | Not Applicable |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | Not Applicable |
| | Config 3,6 | | SSB.2 FR1 | Not Applicable |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.1.1 FDD | |
| | Config 2,5 | | CSI-RS.1.1 TDD | |
| | Config 3,6 | | CSI-RS.2.1 TDD | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| reportConfigType | Config 1-6 | | periodic | |
| reportQuantity | Config 1-6 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | N/A |
| CSI reporting offset | Config 3,6 | slot | 10 | N/A |
| | Config 1,2,4,5 | | 2 | N/A |
| | Config 3,6 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | |
| | Config 3,6 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 10 | 18 |
| $\hat{E}_s/N_{oc}$ | | dB | 10 | 18 |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | NA |
| | Config 3,6 | | -84 | NA |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | Note 3 |
| Propagation condition | | - | AWGN | |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 | Note 3 |
| | Config 3,6 | dBm/ 38.16MHz | -52.87 | Note 3 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.
Note 8: The SSB in referenceSignal in the TCI state is configured as the SSB in Cell 1.

## 4.5.4 UE UL carrier RRC reconfiguration delay

### 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay

#### 4.5.4.1.1 Test purpose

This test is to verify that when the UE receives an RRC message implying NR UL or Supplementary UL (SUL) carrier configuration, the UE is ready to start transmission on the newly configured carrier within the time limits specified for configuring and deconfiguring carrier. This test will verify the UE being configured or deconfigured with a SUL carrier or NR UL carrier RRC reconfiguration delay requirements in TS 38.133 clause 8.4.

#### 4.5.4.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. This test is applicable to UE that supports SUL.

#### 4.5.4.1.3 Minimum conformance requirements

When the UE receives an RRC message implying NR UL or supplementary UL (SUL) carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of the slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.

  $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

When the UE receives an RRC message implying NR UL or supplementary UL (SUL) carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_config}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.4.1.

#### 4.5.4.1.4 Test description

##### 4.5.4.1.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 4.5.4.1.4.1-1.

**Table 4.5.4.1.4.1-1: Supported test configurations for FR1 PSCell (Cell2) and SCell (Cell3)**

| Configuration | PSCell (Cell2) | SCell (Cell3) |
|---|---|---|
| 4.5.4.1-1 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-2 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-3 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-4 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-5 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-6 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-7 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-8 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 4.5.4.1-9 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.4.1.4.1-2.

**Table 4.5.4.1.4.1-2: Initial conditions for EN-DC FR1 UE UL carrier RRC reconfiguration delay**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.5.4.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. Cell 3 is NR FR1 SCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The test parameters are given in Table 4.5.4.1.4.1-3 below.
4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

**Table 4.5.4.1.4.1-3: General test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Config 1, 2, 3, 4, 5, 6, 7, 8, 9 | Cell 1: E-UTRAN PCell<br>Cell 2: FR1 PSCell<br>Cell 3: FR1 SCell | E-UTRAN PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length | | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | Normal | |
| DRX | | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | OFF | |
| Measurement gap pattern Id | | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | OFF | |
| Filter coefficient | | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 0 | L3 filtering is not used |
| T1 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 | |
| T2 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 | |
| T3 | s | Config 1,2, 3, 4, 5, 6, 7, 8, 9 | 5 | |

#### 4.5.4.1.4.2 Test procedure

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*.

The test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 2 is configured to UE. At the start of T2, a supplementary uplink cell (Cell 3) is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

At the start of the test the UE is in RRC_CONNECTED state with Cell 1 (NR uplink cell). The SS shall provide continuous UL grants to the UE, so it can transmit in the corresponding uplink carrier as soon as it is ready for transmission.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Setup E-UTRAN PCell (Cell 1) according to parameters given in Table A.6.1.1-1 and setup FR1 PSCell (Cell 2) according to parameters given in Table 4.5.4.1.5-1.

3. Both Cell 2 NR uplink and SUL Cell 3 supplementary uplink are broadcast by *ServingCellConfigCommonSIB* of Cell 2.

4. During time duration T1, NR uplink (Cell 2) is configured on the UE. Setup Cell 2 according to parameters given in Table 4.5.4.1.5-1.

5. At the start of T2, the supplementary uplink Cell (Cell 3) is configured to UE through *RRCConnectionReconfiguration*, then UE shall start transmission on the supplementary uplink Cell (Cell 3) within 20ms. If UE transmits data on the supplementary uplink Cell (Cell 3) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration" and proceed with step 7.

6. At the start of T3, the supplementary uplink is released through *RRCConnectionReconfiguration*, then UE shall transmit data only on the NR uplink carrier of SCell within 20ms. If UE stops transmitting data on supplementary uplink carrier on SCell (Cell 3) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

7. Repeat steps 1-6 until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 4.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 4.5.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.8-1<br>Table H.3.8-2<br>Table 4.6.3-128 in TS 38.508-1 [14] with condition SUL<br>Table 4.6.3-167 in TS 38.508-1 [14] with condition PUSCH_PUCCH_ON_SUL<br>Table 4.6.3-169 in TS 38.508-1 [14] with condition SUL<br>Table 4.6.3-202 in TS 38.508-1 [14] with condition SUL_SUL |

### 4.5.4.1.5 Test requirements

Table 4.5.4.1.5-1 and 4.5.4.1.5-2 defines the primary level settings including test tolerances for the EN-DC FR1 UE UL carrier RRC reconfiguration delay test with all NR cells in FR1.

**Table 4.5.4.1.5-1: NR Cell specific test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay on PSCell (Cell 2)**

| Parameter | Unit | Test Configuration | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Channel number | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2 | | |
| TDD configuration | | Conf 1, 2, 3 | N/A | | |
| | | Conf 4, 5, 6 | TDD Conf.1.1 | | |
| | | Conf 7, 8, 9 | TDD Conf.2.1 | | |
| $BW_{channel}$ | MHz | Conf 1, 2, 3 | Note 6 | | |
| | | Conf 4, 5, 6 | Note 6 | | |
| | | Conf 7, 8, 9 | Note 6 | | |
| $BW_{occupied}$ | RB | Conf 1, 2, 3 | 52 Note 4 | | |
| | | Conf 4, 5, 6 | 52 Note 4 | | |
| | | Conf 7, 8, 9 | 106 Note 5 | | |
| PDSCH reference measurement channel as defined in clause A.3.1.1 | | Conf 1, 2, 3 | SR.1.1 FDD | | |
| | | Conf 4, 5, 6 | SR.1.1 TDD | | |
| | | Conf 7, 8, 9 | SR 2.1 TDD | | |
| RMSI CORESET reference | | Conf 1, 2, 3 | CR.1.1 FDD | | |
| | | Conf 4, 5, 6 | CR.1.1 TDD | | |

| | | | | | |
|---|---|---|---|---|---|
| measurement channel as defined in clause A.3.1.2 | | Conf 7, 8, 9 | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in clause A.3.1.3 | | Conf 1, 2, 3 | CCR.1.1 FDD | | |
| | | Conf 4, 5, 6 | CCR.1.1 TDD | | |
| | | Conf 7, 8, 9 | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 | | Conf 1, 2, 3, 4, 5, 6 | OP.1 Note 4 | | |
| | | Config 7, 8, 9 | OP.1 Note 5 | | |
| SSB configuration | | Conf 1, 2, 3, 4, 5, 6 | SSB.1 FR1 | | |
| | | Conf 7, 8, 9 | SSB.2 FR1 | | |
| SMTC configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | |
| CSI-RS for tracking | | Conf 1 | TRS.1.1 FDD | | |
| | | Conf 2 | TRS.1.1 FDD | | |
| | | Conf 3 | TRS.1.1 FDD | | |
| | | Conf 4 | TRS.1.1 TDD | | |
| | | Conf 5 | TRS.1.1 TDD | | |
| | | Conf 6 | TRS.1.1 TDD | | |
| | | Conf 7 | TRS.1.2 TDD | | |
| | | Conf 8 | TRS.1.2 TDD | | |
| | | Conf 9 | TRS.1.2 TDD | | |
| DL initial BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | |
| DL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | |
| UL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note 2 | dBm/15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | |
| | dBm/SCS | Conf 1,2,3,4,5,6 | -102 | | |
| | | Conf 7,8,9 | -99 | | |
| $\hat{E}_s / N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| $\hat{E}_s / I_{ot}$ Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16+TT | 16 |
| SS-RSRP Note 3 | dBm/SCS | Conf 1,2,3,4,5,6 | -86 | -86+TT | -86 |

| | | | | | |
|---|---|---|---|---|---|
| | | Conf 7,8,9 | -83 | -83+TT | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1,2,3,4,5,6 | -57.9 | -57.9+TT | -57.9 |
| | dBm/ 38.16 MHz | Conf 7,8,9 | -51.8 | -51.8 | -51.8 |
| Propagation Condition | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | |
| Antenna configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: $\hat{E}_s/I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1[2] with configured $BW_{channel}$.

**Table 4.5.4.1.5-2: NR Cell specific test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay on SUL Cell (Cell 3)**

| Parameter | Unit | Test Configuration | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Channel number | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 3 | | |
| TDD configuration | | Conf 1, 4, 7 | N/A | | |
| | | Conf 2, 5, 8 | TDDConf.1.1 | | |
| | | Conf 3, 6, 9 | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | Conf 1, 4, 7 | Note 6 | | |
| | | Conf 2, 5, 8 | Note 6 | | |
| | | Conf 3, 6, 9 | Note 6 | | |
| $BW_{occupied}$ | RB | Conf 1, 4, 7 | 52 Note 4 | | |
| | | Conf 2, 5, 8 | 52 Note 4 | | |
| | | Conf 3, 6, 9 | 106 Note 5 | | |
| PUSCH parameters for NR UL carrier | | Conf 1, 4, 7 | G-FR1-A3-10 in TS 38.104 [28] | G-FR1-A3-10 in TS 38.104 [28] | G-FR1-A3-10 in TS 38.104 [28] |
| | | Conf 2, 5, 8 | G-FR1-A3-10 in TS 38.104 [28] | G-FR1-A3-10 in TS 38.104 [28] | G-FR1-A3-10 in TS 38.104 [28] |
| | | Conf 3, 6, 9 | G-FR1-A3-14 in TS 38.104 [28] | G-FR1-A3-14 in TS 38.104 [28] | G-FR1-A3-14 in TS 38.104 [28] |
| PUCCH parameters For NR UL carrier | | Conf 1, 4, 7 | Table 8.3.3.1.2-1 in TS 38.104 [28] | Table 8.3.3.1.2-1 in TS 38.104 [28] | Table 8.3.3.1.2-1 in TS 38.104 [28] |
| | | Conf 2, 5, 8 | Table 8.3.3.1.2-1 in TS 38.104 [28] | Table 8.3.3.1.2-1 in TS 38.104 [28] | Table 8.3.3.1.2-1 in TS 38.104 [28] |

| | | | | | |
|---|---|---|---|---|---|
| | | Conf 3, 6, 9 | Table 8.3.3.1.2-2 in TS 38.104 [28] | Table 8.3.3.1.2-2 in TS 38.104 [28] | Table 8.3.3.1.2-2 in TS 38.104 [28] |
| PUSCH parameters for supplementary UL | | Conf 1, 4, 7 | N/A | G-FR1-A3-10 in TS 38.104 [28] | N/A |
| | | Conf 2, 5, 8 | N/A | G-FR1-A3-10 in TS 38.104 [28] | N/A |
| | | Conf 3, 6, 9 | N/A | G-FR1-A3-14 in TS 38.104 [28] | N/A |
| PUCCH parameters for supplementary UL | | Conf 1, 4, 7 | N/A | N/A | N/A |
| | | Conf 2, 5, 8 | N/A | N/A | N/A |
| | | Conf 3, 6, 9 | N/A | N/A | N/A |
| PDSCH reference measurement channel as defined in clause A.1.1 | | Conf 1, 4, 7 | SR.1.1 FDD | | |
| | | Conf 2, 5, 8 | SR.1.1 TDD | | |
| | | Conf 3, 6, 9 | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in clause A.1.2 | | Conf 1, 4, 7 | CR.1.1 FDD | | |
| | | Conf 2, 5, 8 | CR.1.1 TDD | | |
| | | Conf 3, 6, 9 | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in clause A.1.3 | | Conf 1, 4, 7 | CCR.1.1 FDD | | |
| | | Conf 2, 5, 8 | CCR.1.1 TDD | | |
| | | Conf 3, 6, 9 | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 | | Conf 1, 2, 4, 5, 7, 8 | OP.1 Note 4 | | |
| | | Conf 3, 6, 9 | OP.1 Note 5 | | |
| SSB configuration | | Conf 1, 2, 4, 5, 7,8 | SSB.1 FR1 | | |
| | | Conf 3, 6, 9 | SSB.2 FR1 | | |
| SMTC configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | |
| CSI-RS for tracking | | Conf 1 | TRS.1.1 FDD | | |
| | | Conf 2 | TRS.1.1 TDD | | |
| | | Conf 3 | TRS.1.2 TDD | | |
| | | Conf 4 | TRS.1.1 FDD | | |
| | | Conf 5 | TRS.1.1 TDD | | |
| | | Conf 6 | TRS.1.2 TDD | | |
| | | Conf 7 | TRS.1.1 FDD | | |
| | | Conf 8 | TRS.1.1 TDD | | |
| | | Conf 9 | TRS.1.2 TDD | | |
| DL initial BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | |
| DL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | |
| UL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note 2 | dBm/15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | |
| | dBm/SCS | Conf 1, 2, 4, 5, 7,8 | -102 | | |
| | | Conf 3, 6, 9 | -99 | | |
| $\hat{E}_s / N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| $\hat{E}_s / I_{ot}$ Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/SCS | Conf 1, 2, 4, 5, 7,8 | -86 | -86 | -86 |
| | | Conf 3, 6, 9 | -83 | -83 | -83 |
| Io Note 3 | dBm/9.36 MHz | Conf 1, 2, 4, 5, 7,8 | -57.9 | -57.9 | -57.9 |
| | dBm/38.16 MHz | Conf 3, 6, 9 | -51.8 | -51.8 | -51.8 |
| Propagation Condition | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | |
| Antenna configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | |
| SUL RSRP threshold (*rsrp-ThresholdSSB-SUL*) | dBm | Conf 1,2,3,4,5,6 | -75 | | |
| | | Conf 7,8,9 | -72 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

NOTE 3: $\hat{E}_s / I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1[2] with configured $BW_{channel}$.

The UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

The UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

## 4.5.5 Link recovery procedures

### 4.5.5.0 Minimum conformance requirements

#### 4.5.5.0.1 Minimum conformance requirements for SSB-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 4.5.5.0.1-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 4.5.5.0.1-1: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR1**

| Configuration | $T_{Evaluate_BFD_SSB}$ (ms) |
|---|---|
| no DRX | $Max(50, Ceil(5 \times P) \times T_{SSB})$ |
| DRX cycle ≤ 320ms | $Max(50, Ceil(7.5 \times P) \times Max(T_{DRX}, T_{SSB}))$ |
| DRX cycle > 320ms | $Ceil(5 \times P) \times T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB in the set $\overline{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement:

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS:
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.2.2 and 8.5.2.3.

#### 4.5.5.0.2 Minimum conformance requirements for CSI-RS-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 4.5.5.0.2-1 for FR1.

For FR1:

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{BFD}$ used in Table 4.5.5.0.2-1 is defined as:

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in set $\bar{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 4.5.5.0.2-1 is defined as:

For each CSI-RS resource in the set $\bar{q}_0$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{BFD}$ = 1,

For each CSI-RS resource in the set $\bar{q}_0$ configured for PSCell in NR-DC

$P_{BFD}$ = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\bar{q}_0$ configured for a SCell

- $P_{BFD}$ = Z in EN-DC or NE-DC or SA.
- $P_{BFD}$ = 2* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 4.5.5.0.2-1: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR1**

| Configuration | $T_{Evaluate_BFD_CSI-RS}$ (ms) |
|---|---|
| no DRX | Max(50, Ceil $(M_{BFD} \times P \times P_{BFD}) \times T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | Max(50, Ceil $(1.5 \times M_{BFD} \times P \times P_{BFD}) \times$ Max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX cycle > 320ms | Ceil $(M_{BFD} \times P \times P_{BFD}) \times T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2 and 8.5.3.3.

#### 4.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

[TS 38.133, clause 8.5.7.1]

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

[TS 38.133, clause 8.5.8.1]

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.7.1 and 8.5.8.1.

#### 4.5.5.0.4 Requirements for beam failure recovery in SCell

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [8], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index $q_{new}$ for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS 38.321 [12], if any, for a corresponding SCell.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.9.

#### 4.5.5.0.5 TRP specific minimum conformance requirements

[TS 38.133, clause 8.18.3]

##### 4.5.5.0.5.1 Requirements for TRP specific SSB based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 4.5.5.0.5.1-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 4.5.5.0.5.1-1: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR1**

| Configuration | $T_{Evaluate_BFD_SSB}$ (ms) |
|---|---|
| no DRX | $Max(50, Ceil(5 \times P) \times T_{SSB})$ |
| DRX cycle ≤ 320ms | $Max(50, Ceil(7.5 \times P) \times Max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $Ceil(5 \times P) \times T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$. $T_{DRX}$ is the DRX cycle length. | |

4.5.5.0.5.2 Requirements for TRP specific SSB based candidate beam detection

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$,estimated over the last $T_{Evaluate_CBD_SSB}$ ms period becomes better than the threshold $Q_{in_LR}$ provided SSB_RP and SSB $\hat{E}s/Iot$ are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in Table 4.5.5.0.5.2-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB}$ is defined in Table 4.5.5.0.5.2-1 for FR1.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $P_{CBD}$ used in Table 4.5.5.0.5.2-1 is defined as

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD} = 1$.

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PSCell in NR-DC

- $P_{CBD} = 2$ if UE is configured for candidate beam detection on SCell, 1 otherwise.

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for a SCell

- $P_{CBD} = Z$ in EN-DC or NE-DC or SA.
- $P_{CBD} = 2^* Z$ in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell
- $P_{CBD}$ is the number of band(s) on which UE is performing candidate beam detection only for SCell.

**Table 4.5.5.0.5.2-1: Evaluation period $T_{Evaluate_CBD_SSB}$ for FR1**

| Configuration | $T_{Evaluate_CBD_SSB}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $Max(25, Ceil(3 \times P \times P_{CBD}) \times T_{SSB})$ |
| DRX cycle > 320ms | $Ceil(3 \times P \times P_{CBD}) \times T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$. $T_{DRX}$ is the DRX cycle length. | |

#### 4.5.5.0.5.3 Requirements for TRP specific beam failure recovery

Provided that UE is configured by *schedulingRequestID-BFR-r17* and/or *schedulingRequestID-BFR2-r17*for BFR set 1 (i.e., TRP1) and BFR set 2 (i.e., TRP2) respectively, a configuration for LRR in a PUCCH transmission, after BFR is triggered on any of the TRPs as described in clause 5.17 of TS 38.321 [12], UE shall be capable of transmit PUCCH with a LRR within a period of T on any of the TRPs where BFR running.Where:

- $T = T_1 \times Ceil((T_2+D)/T_1)$ in which $T_1$, $T_2$ and D are defined as
  - $T_1$ is equal to the periodicity of PUCCH configured with *schedulingRequestID-BFR-r17 for* BFR set 1 schedulingRequestID-BFR2-r17 for BFR set 2.
  - $T_2 = T_{Evaluate_CBD}$ is the evaluation period specified in clause 4.5.5.0.5.2 for SSB based candidate beam detection, that is $T_{Evaluate_CBD_SSB}$ or $T_{Evaluate_CBD_CSI\text{-}RS}$, depending on the applicable reference signal configured for candidate beam detection.
  - D = [2ms] is the UE Processing time.

#### 4.5.5.0.5.4 Scheduling availability of FR1 UE during TRP specific beam failure detection

There are no scheduling restrictions due to TRP specific beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

##### 4.5.5.0.5.4.1 Scheduling availability of UE performing TRP specific beam failure detection with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to TRP specific beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

##### 4.5.5.0.5.4.2 Scheduling availability of UE performing TRP specific beam failure detection with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] [xxx: need further check] there are no restrictions on scheduling availability due to TRP specific beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] [xxx: need further check]the following restrictions apply due to TRP specific beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for TRP specific beam failure detection.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on FR1 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which PCell or PSCell is configured.

#### 4.5.5.0.5.5 Scheduling availability of FR1 UE during TRP specific candidate beam detection

Scheduling availability restrictions when the UE is performing L1-RSRP measurement for TRP specific candidate beam detection are described in the following clauses.

##### 4.5.5.0.5.5.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as TRP specific link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

##### 4.5.5.0.5.5.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] [xxx: need further check]there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as TRP specific link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] [xxx: need further check] the

following restrictions apply due to L1-RSRP measurement based on SSB configured as TRP specific link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on one serving cell apply to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands.

## 4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

### 4.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC and link recovery.

### 4.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.1.

### 4.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.1.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

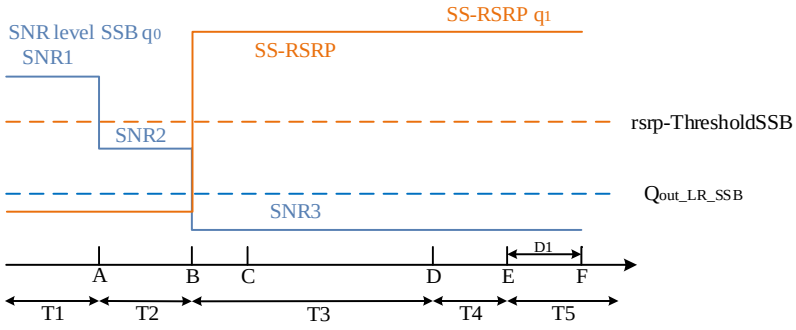


**Figure 4.5.5.1.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 4.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.1.4.1-1.

**Table 4.5.5.1.4.1-1: Supported test configurations for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 4.5.5.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.1.4.1-2.

**Table 4.5.5.1.4.1-2: Initial conditions for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.1.4.1-3.
2. Message contents are defined in clause 4.5.5.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 4.5.5.1.4.1-3: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| #Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2, 5 | | CCR.1.1 TDD | |
| | Config 3, 6 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2, 5 | | SSB.3 FR1 | |
| | Config 3, 6 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 | |
| | Config 3, 6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz | |
| | Config 3, 6 | | 30 KHz | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | CFRA for BFR |
| | Config 3, 6 | | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| gapOffset | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | Config 3, 6 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM RS | | | 0,1 | |
| T310 timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.24 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.14 | |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 4.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.1.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B; and

c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the star of T5),the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” with the following exceptions:

**Table 4.5.5.1.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br><br>Table H.3.1-8 with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition BFD<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.5.1.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.5.1.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 4.5.5.1.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 4.5.5.1.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 4.5.5.1.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

4.5.5.1.5 Test requirements

Tables 4.5.5.1.4.1-3 and 4.5.5.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

**Table 4.5.5.1.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.1.4-1.
NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 140 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

### 4.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, link recovery and long DRX cycle.

### 4.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.2.

### 4.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.
Figure 4.5.5.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

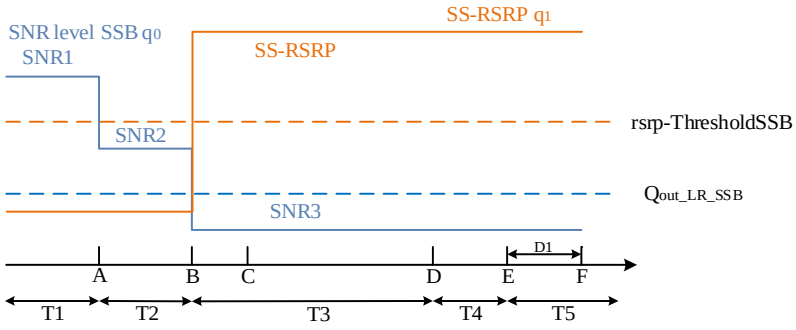


**Figure 4.5.5.2.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in DRX mode**

### 4.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.2.4.1-1.

**Table 4.5.5.2.4.1-1: Supported test configurations for SSB-based beam failure detection and link recovery testing in DRX mode**

| Configuration | Description |
|---|---|
| 4.5.5.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.2.4.1-2.

**Table 4.5.5.2.4.1-2: Initial conditions for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.2.4.1-3.
2. Message contents are defined in clause 4.5.5.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

**Table 4.5.5.2.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET | Config 1, 4 | | CR. 1.1 FDD | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Reference Channel | Config 2, 5 | | CR. 1.1 TDD | |
| | Config 3, 6 | | CR. 2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2, 5 | | CCR.1.1 TDD | |
| | Config 3, 6 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2, 5 | | SSB.3 FR1 | |
| | Config 3, 6 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 | |
| | Config 3, 6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz | |
| | Config 3, 6 | | 30 KHz | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | CFRA for BFR |
| | Config 3, 6 | | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |
| Gap pattern ID | | | N.A. | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| | | | | rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM RS | | | 0,1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 5.17 | |
| T3 | | s | 3.24 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 4.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 4.5.5.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” with the following exceptions:

**Table 4.5.5.2.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.5.2.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.5.2.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 4.5.5.2.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 4.5.5.2.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 4.5.5.2.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

4.5.5.2.5 Test requirements

Tables 4.5.5.2.4.1-3 and 4.5.5.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX.

**Table 4.5.5.2.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
NOTE 4: Void
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.2.4-1.
NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1940 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

#### 4.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 4.5.5.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC, CSI-RS based RLM and link recovery.

#### 4.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.3.

#### 4.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.3.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set $q_0$ in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

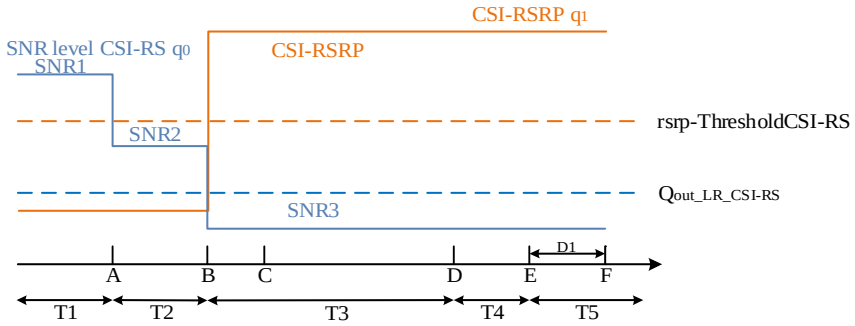


**Figure 4.5.5.3.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

##### 4.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.3.4.1-1.

**Table 4.5.5.3.4.1-1: Supported test configurations for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 4.5.5.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.3-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.3.4.1-2.

**Table 4.5.5.3.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.3.4.1-3.

2. Message contents are defined in clause 4.5.5.3.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 4.5.5.3.4.1-3: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2, 5 | | CCR.1.1 TDD | |
| | Config 3, 6 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2, 5 | | SSB.3 FR1 | |
| | Config 3, 6 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 | |
| | Config 3, 6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz | |
| | Config 3, 6 | | 30 KHz | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.4 FR1 | |
| | Config 3, 6 | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure | | | 0 | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| detection RS in set $q_0$ | | | | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| csi-RS-Index assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.14 | |

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |
| T4 | s | 0 | |
| T5 | s | 0.08 | |
| D1 | s | 0.05 | |
| NOTE: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 4.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B, and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.5.5.3.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.5.3.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.5.3.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 4.5.5.3.4.3-4: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 4.5.5.3.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |

| | | | |
|---|---|---|---|
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 4.5.5.3.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

4.5.5.3.5 Test requirements

Tables 4.5.5.3.4.1-3 and 4.5.5.3.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table 4.5.5.3.5-1: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | |
| NOTE 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. | | | | | | |
| NOTE 4: Void. | | | | | | |
| NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | | |
| NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | |
| NOTE 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. | | | | | | |
| NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1. | | | | | | |
| NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). | | | | | | |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 50 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

### 4.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM, link recovery and long DRX cycle.

### 4.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

### 4.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.
Figure 4.5.5.4.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set $q_0$ in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

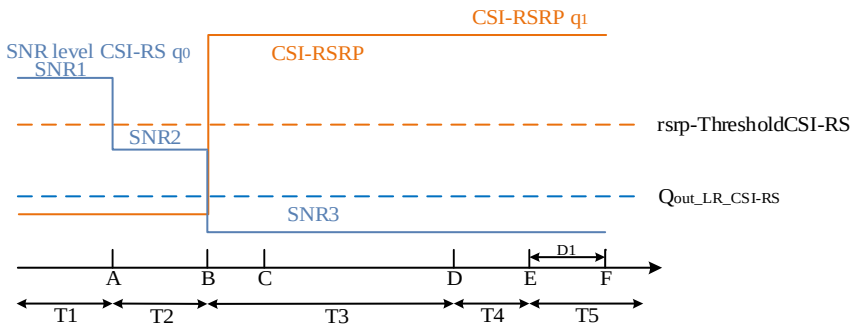


**Figure 4.5.5.4.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

### 4.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

**Table 4.5.5.4.4.1-1: Supported test configurations for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 4.5.5.4-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.5.4-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.5.4-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.5.5.4-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.5.5.4-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.5.5.4-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.4.4.1-2.

**Table 4.5.5.4.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.4.4.1-3.
2. Message contents are defined in clause 4.5.5.4.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1, Cell 2 is configured according to clauses C.1.2 and C.1.3.

**Table 4.5.5.4.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | Test 1 | |
|---|---|---|---|---|
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2, 5 | | CCR.1.1 TDD | |
| | Config 3, 6 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2, 5 | | SSB.3 FR1 | |
| | Config 3, 6 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2, 4, 5 | | SMTC.1 | |
| | Config 3, 6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 KHz | |
| | Config 3, 6 | | 30 KHz | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.4 FR1 | |
| | Config 3, 6 | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| csi-RS-Index assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 8.37 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| NOTE: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table 4.5.5.4.4.1-4: Void**

**Table 4.5.5.4.4.1-5: Void**

**Table 4.5.5.4.4.1-6: Void**

### 4.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI

during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of FR1 PSCell according to T1 in Table 4.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.5.4.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.5.4.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.5.4.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 4.5.5.4.4.3-4: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 4.5.5.4.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 4.5.5.4.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

4.5.5.4.5 Test requirement

Tables 4.5.5.4.4.1-3 and 4.5.5.4.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 4.5.5.4.5-1: Cell specific test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set q0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set q1 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1940 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.5 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

### 4.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 4.5.5.5.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

#### 4.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

#### 4.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.5.4-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure 4.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

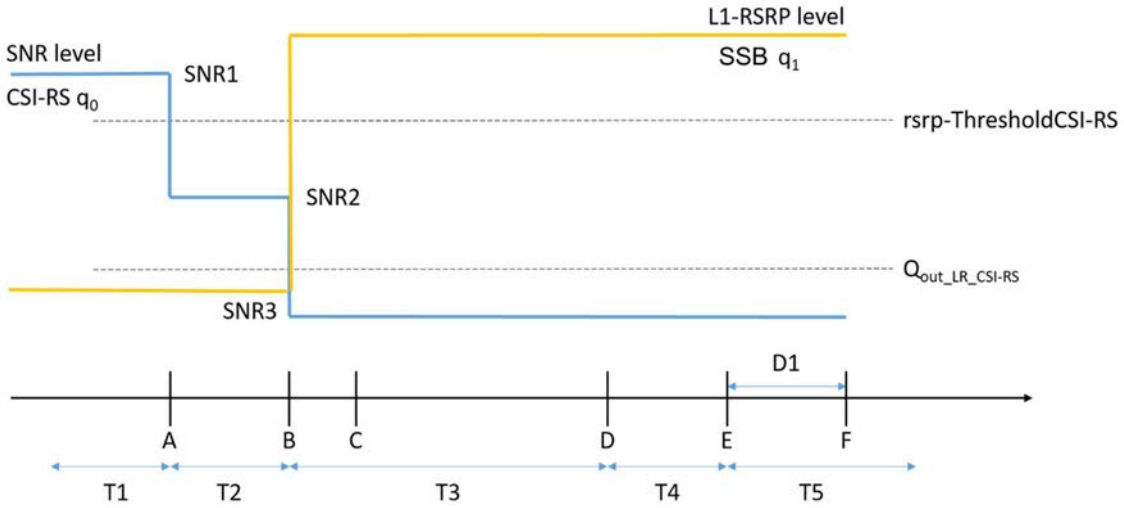


**Figure 4.5.5.5.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

### 4.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

**Table 4.5.5.5.4.1-1: Supported test configurations for EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 4.5.5.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.5.4.1-2.

**Table 4.5.5.5.4.1-2: Initial conditions for EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.5.4.1-3.

2. Message contents are defined in clause 4.5.5.5.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 4.5.5.5.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number for PSCell | | | 2 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number for SCell | | | 3 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BW channel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | A. 1.2 |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 | A.3 |
| | Config 2, 5 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.2 FR1 | |
| SMTC Configuration | Config 1, 2, 3, 4, 5, 6 | | SMTC.1 | A.4 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 3, 6 | | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |

| | | | | |
|---|---|---|---|---|
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdBFRSSB | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | | -95 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for $q_0$ in activated SCell | Config 1, 4 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| csi-RS-Index assigned as RLM RS in PSCell | Config 1, 4 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |

| | | | |
|---|---|---|---|
| T2 | s | 0.18 | |
| T3 | s | 0.14 | |
| T4 | s | 0 | |
| T5 | s | 0.17 | |
| D1 | s | 0.13 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 4.5.5.5.4.2 Test procedure

Same test procedure as described in clause 4.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

#### 4.5.5.5.4.3 Message contents

Same message contents as described in clause 4.5.5.3.4.3 with following exceptions:

**Table 4.5.5.5.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-10 with Condition SSB CBD |

4.5.5.5.5 Test requirements

**Table 4.5.5.5.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 4 | dB | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | Config 1, 4 | dB | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set q1 | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | -98 | | | | |
| | Config 2, 5 | | -98 | -98 | | | | |
| | Config 3, 6 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.6 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

### 4.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS based beam failure in the set $q_0$ configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.6.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery and long DRX cycle.

### 4.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

### 4.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.6.4.1-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure 4.5.5.6.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

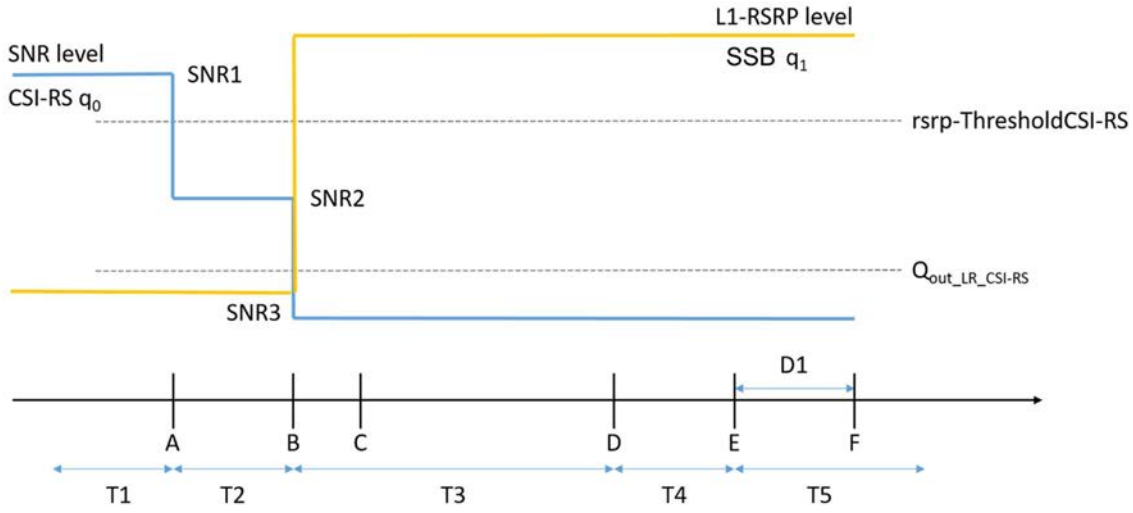


**Figure 4.5.5.6.4.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode**

### 4.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.6.4.1-1.

**Table 4.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell**

| Configuration | Description |
|---|---|
| 4.5.5.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.6.4.1-2.

**Table 4.5.5.6.4.1-2: Initial conditions for EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.6.4.1-3.

2. Message contents are defined in clause 4.5.5.6.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 4.5.5.6.4.1-3: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number for PSCell | | | 2 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number for SCell | | | 3 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | A.1.2 |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 | A.3 |
| | Config 2, 5 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.2 FR1 | |
| SMTC Configuration | Config 1, 2, 3, 4, 5, 6 | | SMTC.1 | A.4 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | |
| | Config 3, 6 | | PRACH.2 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average | dB | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| | | CSI-RS RE energy | | | |
| | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | | DMRS precoder granularity | | REG bundle size | |
| | | REG bundle size | | 6 | |
| DRX | | | | DRX.7 | A.5 |
| Gap pattern ID | | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | | absent | When the field is absent, the UE applies the value 0. ((TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdBFR | Config 1, 2, 4, 5 | | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | | | -95 | |
| powerControlOffsetSS | | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for $q_0$ in activated SCell | Config 1, 4 | | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | | CSI-RS.1.1 FDD | A.1.4 |
| | Config 2, 5 | | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | | TRS.1.1 FDD | |
| | Config 2, 5 | | | TRS.1.1 TDD | |
| | Config 3, 6 | | | TRS.1.2 TDD | |
| csi-RS-Index assigned as RLM RS in PSCell | Config 1, 4 | | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | | CSI-RS.2.2 TDD | |
| T310 Timer | | | ms | 1000 | |
| N310 | | | | 2 | |
| T1 | | | s | 1 | During this time |

| | | | |
|---|---|---|---|
| | | | the UE shall be fully synchronized to cell 1 |
| T2 | s | 8.37 | |
| T3 | s | 6.44 | |
| T4 | s | 0 | |
| T5 | s | 1.97 | |
| D1 | s | 1.93 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 4.5.5.6.4.2 Test procedure

Same test procedure as described in clause 4.5.5.4.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

#### 4.5.5.6.4.3 Message contents

Same message contents as described in clause 4.5.5.4.4.3 with following exceptions:

**Table 4.5.5.6.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-10 with Condition SSB CBD |

4.5.5.6.5 Test requirement

Tables 4.5.5.6.4.1-3 and 4.5.5.6.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 4.5.5.6.5-1: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 4 | dB | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | Config 1, 4 | dB | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set q1 | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/ 15 kHz | -98 | -98 | | | | |
| | Config 2, 5 | | -98 | -98 | | | | |
| | Config 3, 6 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.7 EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TS 38.522 applicability spec update is pending

### 4.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the TRP specific SSB-based beam failure in the set (q0,0), (q0,1) configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set (q1,0) and (q1,1). The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell with *schedulingRequestID-BFR-r17* configured, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.7.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC and link recovery.

### 4.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.7.

### 4.5.5.7.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.7.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.7.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

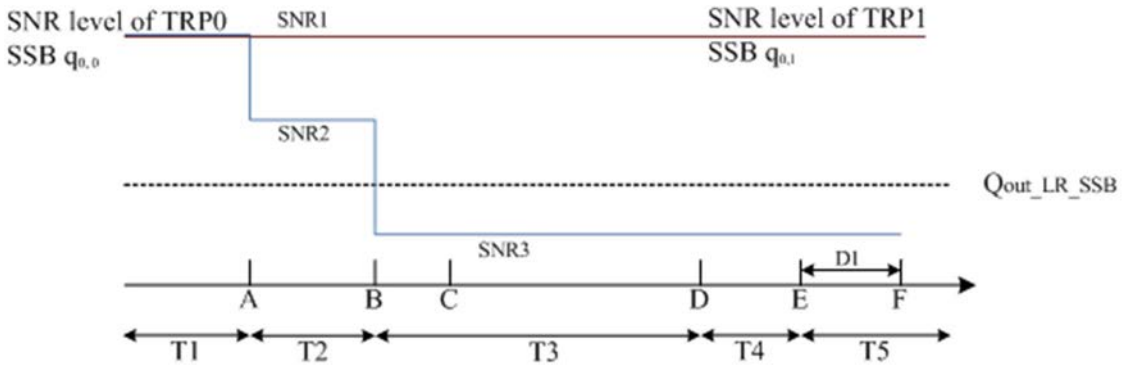


**Figure 4.5.5.7.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

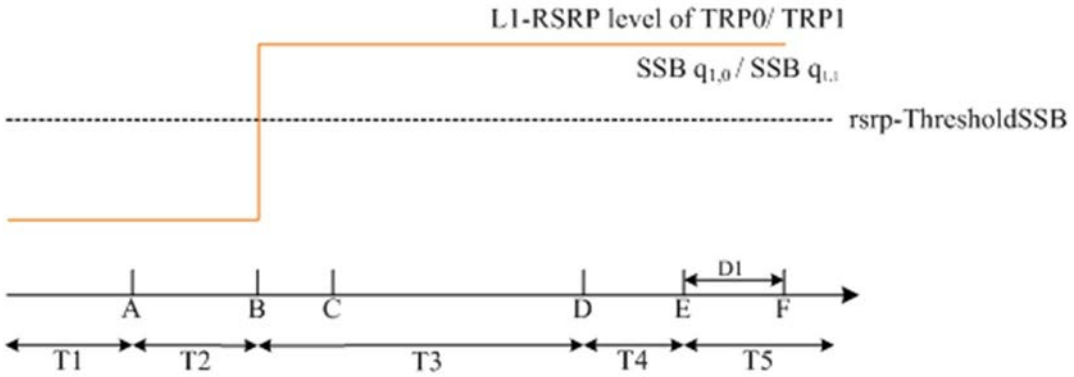


**Figure 4.5.5.7.4-2: L1-RSRP level variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### 4.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.7.4.1-1.

**Table 4.5.5.7.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.7.4.1-2.

**Table 4.5.5.7.4.1-2: Initial conditions for TRP specific EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 4.5.5.7.4.1-3.
2. Message contents are defined in clause 4.5.5.7.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

**Table 4.5.5.7.4.1-3: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number for PSCell | | | 2 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BW channel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| SSB Configuration for TRP0 | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2, 5 | | SSB.3 FR1 | |
| | Config 3, 6 | | SSB.4 FR1 | |
| SSB Configuration for TRP1 | Config 1, 4 | | SSB.7 FR1 | |
| | Config 2, 5 | | SSB.7 FR1 | |
| | Config 3, 6 | | SSB.8 FR1 | |
| SMTC Configuration | Config 1, 2, 3, 4, 5, 6 | kHz | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | CFRA for BFR |
| | Config 3, 6 | | PRACH.2 FR1 | CFRA for BFR |
| SSB Index assigned as BFD RS (q0,0) | | | 0 | |
| SSB Index assigned as CBD RS (q1,0) | | | 1 | |

| | | | | |
|---|---|---|---|---|
| SSB Index assigned as BFD RS (q0,1) | | | 2 | |
| SSB Index assigned as CBD RS (q1,1) | | | 3 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| gapOffset | | | 0 | |
| schedulingRequestID-BFR- r17 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on PSCell | Config 1, 2, 4, 5 | slot | 5 | 5ms |
| | Config 3, 6 | | 10 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdBFR | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | | -95 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| SSB Index assigned as RLM RS | | | 0,1,2,3 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.24 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.13 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 4.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR values of TRP1 and TRP2 to T2 as specified in Table 4.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR values of TRP1 and TRP2 to T3 as specified in Table 4.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR values of TRP1 and TRP2 to T4 as specified in Table 4.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR values of TRP1 and TRP2 to T5 as specified in Table 4.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ before time point F (D1 after the star of T5), the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.5.7.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br><br>Table H.3.1-8A with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition BFD<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.5.5.7.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.5.7.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 4.5.5.7.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 4.5.5.7.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |

| | | | |
|---|---|---|---|
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 4.5.5.7.4.3-6: *MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

### 4.5.5.7.5 Test requirements

Tables 4.5.5.7.4.1-3 and 4.5.5.7.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

**Table 4.5.5.7.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set q0,0 | Config 1, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set q0,1 | Config 7,10 | dB | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 8, 11 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 9, 12 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| SNR_SSB of set q1,0 | Config 1, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3, 6 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SNR_SSB of set q1,1 | Config 7, 10 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 8, 11 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 9, 12 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set q1,0 | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | -84.8 | -84.8 | -84.5 |
| SSB_RP of set q1,1 | Config 7, 10 | dBm/SC | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 8, 11 | | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 9, 12 | | -105.2 | -105.2 | -84.8 | -84.8 | -84.5 |
| $N_{oc}$ | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.7.1-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6 of 38.133. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$ and $q_{1,1}$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.5.8 EN-DC FR1 SCell TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TS 38.522 applicability spec update is pending

### 4.5.5.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the CSI-RS-based beam failure on the TRP using the respective configured BFD set $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$for TRP1. After the BFD is detected for the TRP, the test further verifies whether the UE performs the correct SSB-based link recovery based on the configured beam candidate set $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{1,1}$ for TRP1. In the test one TRP (TRP0) is provided with schedulingRequestID-BFR-r17 and other TRP (TRP1) is not provided with scheduling request ID. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 4.5.5.8.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

### 4.5.5.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.8.

#### 4.5.5.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.8.2-1 shows the SNR of the CSI-RS in set $q_{0,0}$ in the TRP0 to emulate beam failure. Figure 4.5.5.8.2-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_{10}$ and $q_{11}$ of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

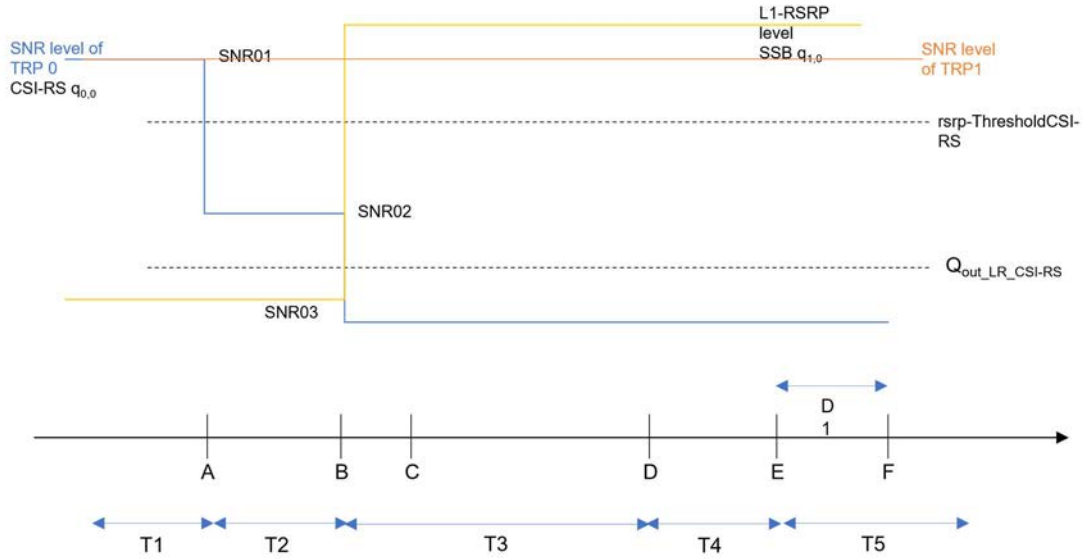


**Figure 4.5.5.8.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for TRP0 in non-DRX mode**

#### 4.5.5.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.8.4.1-1.

**Table 4.5.5.8.4.1-1: Supported test configurations for FR1 PCell and SCell**

| Configuration | Description |
|---|---|
| 4.5.5.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.5.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.5.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.8.4.1-2.

**Table 4.5.5.8.4.1-2: Initial conditions for TRP specific EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.5.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |

1. The general test parameter settings are set up according to Table 4.5.5.8.4.1-3.
2. Message contents are defined in clause 4.5.5.8.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 4.5.5.8.4.1-3: General test parameters for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | Same configuration for both TRP wherever applicable |
| Active PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number for PSCell | | | 2 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number for SCell | | | 3 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| BW channel | Config 1, 4 | MHz | 10: NRB,c = 52 | |
| | Config 2, 5 | | 10: NRB,c = 52 | |
| | Config 3, 6 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | A.1.2 |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 | A.3.10 Same configuration for both TRP |
| | Config 2, 5 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.2 FR1 | |
| SMTC Configuration | Config 1, 2, 3, 4, 5, 6 | kHz | SMTC.1 | A.4, Same configuration for both TRP |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH Configuration | Config 1, 2, 4, 5 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 3, 6 | | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set $q_{00}$ in activated SCell | | | 0 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_{01}$ in activated SCell | | | 2 | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission | DCI format | | 1-0 | |
| | Number of Control OFDM | | 2 | |

| | | | | |
|---|---|---|---|---|
| parameters | symbols | | | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-r17 | | | Configured, 1-2 | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | Config 1, 2, 4, 5 | slot | 5 | 5ms |
| | Config 3, 6 | | 10 | |
| schedulingRequestID-BFR2-r17 | | | absent | When the field is absent, the random access procedure will be triggered for TRP BFR |
| Periodicity of PUCCH for SR configuration for BFR on TRP0 | | Slot | 5 | |
| SSB Index assigned as CBD RS (q10) in activated SCell | | | 1 | |
| SSB Index assigned as CBD RS (q11) in activated SCell | | | 3 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdBFR | Config 1, 2, 4, 5 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3, 6 | | -95 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| BFD-RS (CSI-RS) configuration for $q_{00}$ in activated SCell | Config 1, 4 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| BFD-RS (CSI-RS) configuration for $q_{01}$ in activated SCell | Config 1, 4 | | CSI-RS.1.7 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.6 TDD | |
| | Config 3, 6 | | CSI-RS.2.7 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.1 TDD | |
| | Config 3, 6 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| csi-RS-Index assigned as RLM RS in PSCell | Config 1, 4 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully |

| | | | |
|---|---|---|---|
| | | | synchronized to cell 1 |
| T2 | s | 0.18 | |
| T3 | s | 0.14 | |
| T4 | s | 0 | |
| T5 | s | 0.17 | |
| D1 | s | 0.06 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 4.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 4.5.5.8.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 4.5.5.8.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 4.5.5.8.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 4.5.5.8.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect PUCCH with LRR in the resource configured for BFR on TRP0 on the PCell before time point B

   and

   c) detects PUCCH with LRR in the resource configured for BFR on TRP0, followed by BFR MAC CE containing a beam associated with the candidate beam set q1,0 before time point F (D1 after the start of T5).

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.5.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.5.8.4.3-1: Common Exception messages for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB CBD |

**Table 4.5.5.8.4.3-2: *MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

4.5.5.8.5 Test requirements

**Table 4.5.5.8.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Cell2 | TRP 0/1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_{00}$ | Config 1, 4 | dB | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2, 5 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3, 6 | | 5.8 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_{01}$ | Config 1, 4 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 2, 5 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 3, 6 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| SNR_SSB of set $q_{10}$ | Config 1, 4 | dB | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2, 5 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Config 3, 6 | | -10.2 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_{10}$ | Config 1, 4 | dBm/SCS | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 2, 5 | | -108.2 | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3, 6 | | -105.2 | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | -98 | | | | |
| | Config 2, 5 | | -98 | -98 | | | | |
| | Config 3, 6 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause in clause A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure on both TRP0 and TRP 1 and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$ and $q_{1,1.}$

For TRP0, no later than time point F occurring no later than D1 = 60ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the BFR MAC CE from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.6 Active BWP switch delay

### 4.5.6.1 DCI-based and time-based active BWP switch

#### 4.5.6.1.0 Minimum conformance requirements

##### 4.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP

on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] [xxx: need further check]expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] [xxx: need further check] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13] [xxx: need further check], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 4.5.6.1.0.1-1.

**Table 4.5.6.1.0.1-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| NOTE 1: Depends on UE capability.<br>NOTE 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP:

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP TS 38.321 [12], UE shall be able to complete active BWP switching within:

- $T_{BWPswitchDelay}$, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or

- $T_{BWPswitchDelay}$ + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP

switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

**Table 4.5.6.1.0.1-2: interruption length X**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| NOTE: Void. | | |

**Table 4.5.6.1.0.1-3: Parameters which cause interruption other than SCS**

| Parameters | Comment |
|---|---|
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* | |
| *maxMIMO-Layers-r16* | |

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

DCI-based or timer-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

Uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell may cause an interruption on PCell or on activated SCell(s) in the MCG.

The starting time of interruption due to DCI-based or timer-based downlink BWP and/or uplink BWP switching or due to uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 of TS 38.133 [6].

RRC-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

The interruption due to RRC-based downlink BWP and/or uplink BWP switching is allowed anywhere within the BWP switching delay ($T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$) defined in clause 8.6.3 of TS 38.133 [6]. The interruption due to RRC-based downlink BWP and/or uplink BWP switching defined in this clause is applicable provided that:

- the RRC reconfiguration requires the UE to only switch its active BWP; and
- the BWP switching occurs on only one NR serving cell.

When BWP switch involves SCS changes:

- the UE is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PCell or NR SCell on which the BWP switching occurs.

Otherwise:

- the UE capable of per UE measurement gap [29] [xxx: need further check] is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PSCell or NR SCell on which the BWP switching occurs;

- the UE capable of per FR measurement gap [29] [xxx: need further check] is allowed to cause interruption on PCell or on any activated SCell(s) provided that the NR PSCell or NR SCell on which the BWP switching occurs belongs to FR1.

The interruption on PCell or on any activated SCell(s) shall not exceed:

- 1 subframe in synchronous EN-DC;

- 2 subframes in asynchronous EN-DC.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2, 8.2.1.2.7 and TS 36.133 [23] clause 7.32.2.7.

### 4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

#### 4.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS 36.133 [23] clause 7.32.2.7.

#### 4.5.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 4.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.1.

#### 4.5.6.1.1.4 Test description

##### 4.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.1.1.4.1-1.

**Table 4.5.6.1.1.4.1-1: Supported test configurations for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Config | Description |
|---|---|
| 4.5.6.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.1.4.1-2.

**Table 4.5.6.1.1.4.1-2: Initial conditions for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part | | |

1. The general test parameter settings are set up according to Table 4.5.6.1.1.4.1-3.

2. Message contents are defined in clause 4.5.6.1.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

- UE is configured with a bwp-InactivityTimer timer value for PSCell.

**Table 4.5.6.1.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 4.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SSindicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send a DCI format 1_1 command for PSCell DL BWP switch.

6. The UE shall receive the DCI format 1_1 command in PSCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$); and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+ 1 subframe + k); and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PSCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PSCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PSCell:

   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$); and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+ 1 subframe + k); and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

9. Repeat steps 5-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

"*k*" is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 4.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.6.1.1.4.3-1: Common Exception messages for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 4.5.6.1.1.4.3-1A: *RRCReconfiguration* (Step3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.1.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.1.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-2: *ServingCellConfig* (Table 4.5.6.1.1.4.3-1B)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE | 2 entries | | |

| | | | |
|---|---|---|---|
| (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 4.5.6.1.1.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 4.5.6.1.1.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 4.5.6.1.1.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 4.5.6.1.1.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-3: *BWP-Downlink* (Table 4.5.6.1.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 4.5.6.1.1.4.3-8 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-4: *BWP-Uplink* (Table 4.5.6.1.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-5: *Void***

**Table 4.5.6.1.1.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 4.5.6.1.1.4.3-8)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 4.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 4.5.6.1.1.4.3-7: *Void***

**Table 4.5.6.1.1.4.3-8: *PDSCH-ConfigCommon* (Table 4.5.6.1.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH- | Table | |

| | | | |
|---|---|---|---|
| | TimeDomainResourceAllocationList | 4.5.6.1.1.4.3-6 | |
| } | | | |

4.5.6.1.1.5 Test requirements

Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1 define the primary level settings including test tolerances.

**Table 4.5.6.1.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-2 Configuration | Config 1,4 | | DLBWP.1.3 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-2 Configuration | Config 1,4 | | N/A |
| | Config 2,5 | | ULBWP.1.3 Note 4 |
| | Config 3,6 | | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 | | CCR.1.2 FDD |
| | Config 2,5 | | CCR.1.2 TDD |
| | Config 3,6 | | CCR.2.4 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2,4,5 | dBm/SCS | -104 |
| | Config 3,6 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | -87 |
| | Config 3,6 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$).

During T3, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$).

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in TS 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* [13] [xxx: need further check], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of E-UTRA PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of E-UTRA PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ($i$+ $T_{BWPswitchDelay}$+$k_1$), ($j$+ $T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

#### 4.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirements for NR victim cell defined in TS 38.133 [6] clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [23].

#### 4.5.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

#### 4.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.2.

#### 4.5.6.1.2.4 Test description

##### 4.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.6.1.2.4.1-1. Supported test configurations for NR SCell are shown in Table Table 4.5.6.1.2.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.6.1.2.4.1-1: Supported test configurations for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 4.5.6.1.2-1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.2-2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 4.5.6.1.2-5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 4.5.6.1.2-6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |
| Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1. | |
| Note 3: Void | |
| Note 4: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.6.1.2.4.1-1A: Supported test configurations for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |
| Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in 4.5.6.1.1. | |
| Note 3: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.2.4.1-2.

**Table 4.5.6.1.2.4.1-2: Initial conditions for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 4.5.6.1.2.4.1-3.

2. Message contents are defined in clause 4.5.6.1.2.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Annex A.6. Cell 2 and Cell 3 are configured according to clauses C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

   - UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in SCell.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in PSCell.

   - UE is configured with a bwp-InactivityTimer timer value for SCell.

**Table 4.5.6.1.2.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3 | Two NR radio channel are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | For PCell, PSCell and SCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |

| | | | |
|---|---|---|---|
| Cell3 timing offset to cell2 | μs | 3 | Synchronous cells |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

#### 4.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 3. This message also configures 2 different UE-specific bandwidth parts for Cell 3, BWP-1 and BWP-2,which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id* in SCell, and BWP-0 as the active DL BWP using *firstActiveDownlinkBWP-Id* in PSCell, according to Table 4.5.6.1.2.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send a DCI format 1_1 command for SCell DL BWP switch.

6. The UE shall receive the DCI format 1_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   a) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$); and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+ 1 subframe + $k$); and

   c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+ Interruption length + $k_1$); and

   d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

   e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the SCell on PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1, on SCell:

   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+ 1 subframe + $k$); and

b) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$); and

c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+ Interruption length + $k_1$); and

d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1. Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

9. Repeat steps 5-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.1.2.7-1.

*k* is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

$k_1$ is the timing between NR DL data receiving and acknowledgement as specified in TS 38.214 [9].

If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 4.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.6.1.2.4.3-1: Common Exception messages for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 4.5.6.1.2.4.3-1A: *RRCReconfiguration* (Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.1.2.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.2.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.2.4.3-1A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| sCellConfigDedicated | ServingCellConfig | Table 4.5.6.1.2.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.2.4.3-2: *ServingCellConfig* (Table 4.5.6.1.2.4.3-1B)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 4.5.6.1.2.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 4.5.6.1.2.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |

**Table 4.5.6.1.2.4.3-3: *BWP-Downlink* (Table 4.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 4.5.6.1.2.4.3-9 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.1.2.4.3-4: *Void***

**Table 4.5.6.1.2.4.3-5: Void**

**Table 4.5.6.1.2.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 4.5.6.1.2.4.3-9)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 4.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 4.5.6.1.2.4.3-7: *Void***

**Table 4.5.6.1.2.4.3-8: *Void***

**Table 4.5.6.1.2.4.3-9: *PDSCH-ConfigCommon* (Table 4.5.6.1.2.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 4.5.6.1.2.4.3-6 | |
| } | | | |

### 4.5.6.1.2.5 Test requirements

Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1 and 4.5.6.1.2.5-2 define the primary level settings including test tolerances.

**Table 4.5.6.1.2.5-1: NR Cell specific test parameters for NR PSCell for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 7 |
| $BW_{occupied}$ | Config 1,2,4,5 | RB | 52 Note 5 |
| | Config 3,6 | | 106 Note 6 |
| Active BWP ID | | | 0 |
| Initial DL BWP Configuration | | | DLBWP.0.2 |
| Active DL BWP-0 Configuration | | | DLBWP.0.2 |
| Active DL BWP-1 Configuration | | | N.A. |
| Active DL BWP-2 Configuration | | | N.A. |
| Initial UL BWP Configuration | | | ULBWP.0.2 |
| Active UL BWP-0 Configuration | | | ULBWP.0.2 |
| Active UL BWP-1 Configuration | | | N.A. |
| Active UL BWP-2 Configuration | | | N.A. |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 | | CCR.1.2 FDD |
| | Config 2,5 | | CCR.1.2 TDD |
| | Config 3,6 | | CCR.2.4 TDD |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 5 |
| | Config 3,6 | | OP.1 Note 6 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |

**Table 4.5.6.1.2.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 7 |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 5 |
| | $Config_{SCell}$ 3 | | 106 Note 6 |
| Active BWP ID | | | 1,2 |
| Initial DL BWP Configuration | | | DLBWP.0.2 |
| Active DL BWP-0 Configuration | | | N.A. |
| Active DL BWP-1 Configuration | | | DLBWP.1.3 |
| Active DL BWP-2 Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | N.A. |
| Active UL BWP-0 Configuration | | | N.A. |
| Active UL BWP-1 Configuration | | | N.A. |
| Active UL BWP-2 Configuration | | | N.A. |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.2 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.2 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.4 TDD |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 |
| | $Config_{SCell}$ 3 | | OP.1 Note 6 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/38.16MHz | -52.86 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$).

During T3, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$).

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in [9]. [xxx: need further check]

Depending on UE capability *bwp-SwitchingDelay* [13] [xxx: need further check], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [23].

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell and PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$), ($j$+$T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 4.5.6.2 RRC-based active BWP switch

### 4.5.6.2.0 Minimum conformance requirements

#### 4.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

NR Slot length is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

### 4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

#### 4.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.3.

#### 4.5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards supporting EN-DC, BWP adaptation of at least 2BWPs.

#### 4.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.2.1.

#### 4.5.6.2.1.4 Test description

##### 4.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.2.1.4.1-1.

**Table 4.5.6.2.1.4.1-1: Supported test configurations for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Config | Description |
|---|---|
| 4.5.6.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.5.6.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.5.6.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.2.1.4.1-2.

**Table 4.5.6.2.1.4.1-2: Initial conditions for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 4.5.6.2.1.4.1-3.
2. Message contents are defined in clause 4.5.6.2.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.
4. By step 4 of the test procedure:
   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell

**Table 4.5.6.2.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |

| | | | |
|---|---|---|---|
| T1 | s | 0.2 | |

#### 4.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 4.5.6.2.1.5-1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 4.5.6.2.1.5-1.T1 starts.

6. The UE shall receive the *RRCConnectionReconfiguration* in PSCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration:

7 If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot $i+X+k_1$then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where,

   - X = 26 for test configuration 4.5.6.2-1, 4.5.6.2-2, 4.5.6.2-4 and 4.5.6.2-5;

- X = 52 for test configuration 4.5.6.2-3 and 4.5.6.2-6.

8. After the SS receives the ACK/NACK in step 5) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 6 or step 7 fails, switch off and on the UE and go to step 1.

10. Repeat steps 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the RRCConnectionReconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

#### 4.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.6.2.1.4.3-1: Common Exception messages for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 4.5.6.2.1.4.3-1A: *RRCReconfiguration* (Step 3, Step 5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.2.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.2.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.2.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.2.1.4.3-1C | |
| } | | | |
| } | | | |

**Table 4.5.6.2.1.4.3-1C: *ServingCellConfig* (Table 4.5.6.2.1.4.3-1B)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 4.5.6.2.1.4.3-1D | |
| } | | | |

| | | | |
|---|---|---|---|
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 4.5.6.2.1.4.3-1E | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 4.5.6.2.1.4.3-1D: *BWP-Downlink* (Table 4.5.6.2.1.4.3-1C)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 4.5.6.2.1.4.3-1E: *BWP-Uplink* (Table 4.5.6.2.1.4.3-1C)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 4.5.6.2.1.4.3-2: Void**

### 4.5.6.2.1.5 Test requirements

Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1 define the primary level settings including test tolerances.

**Table 4.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | | Unit | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1,4 | | FDD |
| | | Config 2,3,5,6 | | TDD |
| TDD configuration | | Config 1,4 | | Not Applicable |
| | | Config 2,5 | | TDDConf.1.1 |
| | | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1,4 | | DLBWP.0.2 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial UL BWP Configuration | | Config 1,4 | | ULBWP.0.2 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial Condition | Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.3 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.3 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Final Condition | Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.1 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.1 Note4 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| PDSCH Reference measurement channel | | Config 1,4 | | SR.1.1 FDD |
| | | Config 2,5 | | SR.1.1 TDD |
| | | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 | | CR.1.1 FDD |
| | | Config 2,5 | | CR.1.1 TDD |
| | | Config 3,6 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 | | CCR.1.2 FDD |
| | | Config 2,5 | | CCR.1.2 TDD |
| | | Config 3,6 | | CCR.2.4 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2,4,5 | | SSB.1 FR1 |
| | | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1,4 | | TRS.1.1 FDD |
| | | Config 2,5 | | TRS.1.1 TDD |
| | | Config 3,6 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Io[Note3] | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall be ready for the reception of uplink grant on PSCell from the first DL slot occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$, and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k_1$

Where,

$T_{\text{RRCprocessingDelay}}$ = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{\text{BWPSwitchDelayRRC}}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 1ms for SCS = 15kHz, and NR slot length = 0.5 ms for SCS = 30kHz.

*k1* is the timing between DL data receiving and acknowledgement as specified in [12]. [xxx: need further check]

Which gives $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} =$

26 slots, for SCS = 15kHz,

52 slots, for SCS = 30kHz.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

### 4.5.6.3.0 Minimum conformance requirements

#### 4.5.6.3.0.1 Minimum conformance requirements for simultaneous DCI-based and timer-based active BWP switch on multiple CCs

The delay requirements for simultaneous DCI based BWP switch on multiple CCs in this clause apply only if the timing difference among the first symbol of slot carrying DCI for all CCs is received within the MRTD for inter-band CA as defined in TS 38.133 [6] clause 7.6.4.

For DCI-based BWP switch on multiple CCs, after the UE receives BWP switching request, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{\text{MultipleBWPswitchDelay}}$ which starts from the beginning of DL slot n, where slot n is slot which UE receives the earliest BWP switching request among CCs on which UE is performing simultaneous DCI-based BWP switching.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{\text{MultipleBWPswitchDelay}}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on

the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths on any serving cell.

UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay} + Y$, which is defined as:

$$T_{MultipleBWPswitchDelay} = T_{BWPswitchDelay} + D*(N-1)$$

Where:

- $T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in TS 38.133 [6] Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* [13] [xxx: need further check]. $T_{BWPswitchDelay}$ shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, $T_{BWPswitchDelay}$ should be based on the smallest SCS among all SCS values of all involved CCs.

- D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [11] [xxx: need further check]for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* [11] [xxx: need further check]for switching between non-dormant and dormant BWPs.

- For UE which is capable of per-FR gap, and no BWP switch involves SCS change, N is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing, N is the number of CCs undergoing simultaneous BWP switch.

- Y=0, if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell.

  Y equals to the length of one slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

If the BWP switch is triggered on multiple CCs simultaneously within or outside DRX active time, and one of the two BWPs on each CC in a BWP switching is a dormant BWP TS 38.321 [12], UE shall be able to complete active BWP switching within the time duration of

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay}+X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay} +X+Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- $T_{MultipleBWPswitchDelay}$ is defined above corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs;

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where DCI for dormancy indication is received.

The number of CCs, N, on which the UE can simultaneously switch BWPs while still meeting the requirements, if any, related to allocations on downlink, uplink, or transmission of HARQ-ACK, depends on the UE reported capabilities related to BWP switching, the network configuration and the BWP switch method.

The delay requirements for simultaneous timer-based BWP switch on multiple CCs in this clause apply only if the timing difference among the beginning of the slot where timer based BWP switching starts for all CCs is within the MRTD for inter-band CA as defined in TS 38.133 [6] clause 7.6.4.

For timer-based BWP switch on multiple CCs, UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (in FR1) or DL half-subframe ((in FR2) immediately after the earliest BWP-inactivity timer *bwp-InactivityTimer* [2] [xxx: need further check] expiration occurs on multiple serving cells, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where $T_{MultipleBWPswitchDelay}$ is defined as above.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{MultipleBWPswitchDelay}$ after *bwp-InactivityTimer* [2] [xxx: need further check] expires on the cell where timer-based BWP switch occurs.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

The normative reference for this requirement is TS 38.133 [6] clause 8.6.2A.1 and clause 8.6.2B.1.

### 4.5.6.3.1 Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs

Editor's note: This test case is incomplete in following aspects:

- Test parameters are still in brackets.

#### 4.5.6.3.1.1 Test purpose

To verify the requirements of DL BWP switch delay on multiple CCs in TS 38.133 [6] clause 8.6.2A.1, and interruption requirement for E-UTRA victim cell defined in TS 36.133 [23] clause 7.32.2.7.

#### 4.5.6.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, incremental delay for DCI and timer based active BWP switching on multiple CCs simultaneously and 2DL CA.

#### 4.5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.3.1.

#### 4.5.6.3.1.4 Test description

##### 4.5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.6.3.1.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.6.3.1.4.1-2. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.6.3.1.4.1-1: Supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.6.3.1.4.1-2: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.3.1.4.1-3.

**Table 4.5.6.3.1.4.1-3: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 4.5.6.3.1.4.1-4.
2. Message contents are defined in clause 4.5.6.3.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
   - UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
   - UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.

- UE is configured with a bwp-InactivityTimer timer value for PSCell and SCell.

**Table 4.5.6.3.1.4.1-4: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2,3 | Two NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | [200] | For both PSCell and SCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | µs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 4.5.6.3.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 3 is added as the SCell and activated.

2. Set the parameters according to Tables 4.5.6.3.1.4.1-4, Table 4.5.6.3.1.5-1 and Table 4.5.6.3.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of NR Cell 2 and NR Cell 3. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB for NR Cell 2 and NR Cell 3. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.3.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell (Cell 2) and SCell (Cell 3).

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1), PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send a DCI format 1_1 command on PSCell (Cell 2) to trigger PSCell DL BWP switch and a DCI format 1_1 command on SCell (Cell 2) to trigger SCell DL BWP switch. Two DCI format 1_1 commands should be sent in the same slot.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the DCI format 1_1 commands in PSCell and SCell, then the UE shall switch its bandwidth part from BWP-1 to BWP-2.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$); and

b) the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$); and

c) the number of consecutive missing ACK/NACK for PCell is no more than 1; and

d) no missing ACK/NACK for PCell is observed from the first UL subframe that occurs after the beginning of the DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$).

then count a success for the event "DCI based BWP switch" and go to step 8, otherwise count a fail for the event "DCI based BWP switch", switch off/on the UE and go to step 1.

8. T2 starts when the SS receives valid ACK/NACK for the PSCell and SCell on BWP-2. The SS stops sending PDCCHs scheduling new transmissions on PSCell and SCell.

9. T3 starts from the first slot (denoted as slot #j) of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send PDCCHs scheduling new transmissions on PSCell and SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PSCell and SCell.

   If the SS observes that,

   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($j+ T_{MultipleBWPswitchDelay} +k_1$); and

   b) If the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot ($j+ T_{MultipleBWPswitchDelay} +k_1$); and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

   d) no missing ACK/NACK for PCell is observed from the first UL subframe that occurs after the beginning of the DL slot ($j+T_{MultipleBWPswitchDelay}+k_1$).

   then count a successes for the event "Timer based BWP switch" and go to step 10. Otherwise, count a fail for the event "Timer based BWP switch", switch off/on the UE and go to step 1.

10. Repeat steps 5-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Each of the events "DCI based BWP switch" and "Timer based BWP switch" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 4.5.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.6.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 4.5.6.3.1.4.3-2: *RRCReconfiguration* (Test procedure, step3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.3.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.3.1.4.3-3: *CellGroupConfig* (Table 4.5.6.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.3.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell | | |
| sCellConfigDedicated | ServingCellConfig | Table 4.5.6.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.3.1.4.3-4: *ServingCellConfig* (Table 4.5.6.3.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 4.5.6.3.1.4.3-5 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 4.5.6.3.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |

| | | | |
|---|---|---|---|
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 4.5.6.3.1.4.3-6 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 4.5.6.3.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.3.1.4.3-5: *BWP-Downlink* (Table 4.5.6.3.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 4.5.6.3.1.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.3.1.4.3-6: BWP-Uplink (Table 4.5.6.3.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 4.5.6.3.1.4.3-7: PDSCH-ConfigCommon (Table 4.5.6.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 4.5.6.3.1.4.3-8 | |
| } | | | |

**Table 4.5.6.3.1.4.3-8: PDSCH-TimeDomainResourceAllocationList (Table 4.5.6.3.1.4.3-7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 4.5.6.3.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

### 4.5.6.3.1.5 Test requirements

Tables 4.5.6.3.1.4.1-4, 4.5.6.3.1.5-1 and 4.5.6.3.1.5-2 define the primary level settings including test tolerances.

**Table 4.5.6.3.1.5-1: NR Cell specific test parameters for PSCell (NR Cell 2)**

| **Parameter** | | **Unit** | **Cell 2** |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-2 Configuration | Config 1,4 | | DLBWP.1.3 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-2 Configuration | Config 1,4 | | ULBWP.1.3 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 | | CCR.1.2 FDD |
| | Config 2,5 | | CCR.1.2 TDD |
| | Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | Config 1,2,4,5 | dBm/SCS | [-104] |
| | Config 3,6 | | [-101] |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
| | Config 3,6 | | [-84] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | [-59] |
| | Config 3,6 | dBm/ 38.16MHz | [-61.9] |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 4.5.6.3.1.5-2: NR Cell specific test parameters for SCell (NR Cell 3)**

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |

| | | | |
|---|---|---|---|
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | $Config_{SCell}$ 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | $Config_{SCell}$ 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | $Config_{SCell}$ 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1,2 |
| Initial DL BWP Configuration | $Config_{SCell}$ 1 | | DLBWP.0.2 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| Active DL BWP-1 Configuration | $Config_{SCell}$ 1 | | DLBWP.1.1 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| Active DL BWP-2 Configuration | $Config_{SCell}$ 1 | | DLBWP.1.3 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| Initial UL BWP Configuration | $Config_{SCell}$ 1 | | ULBWP.0.2 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| Active UL BWP-1 Configuration | $Config_{SCell}$ 1 | | ULBWP.1.1 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| Active UL BWP-2 Configuration | $Config_{SCell}$ 1 | | ULBWP.1.3 Note 4 |
| | $Config_{SCell}$ 2 | | |
| | $Config_{SCell}$ 3 | | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | $Config_{SCell}$ 1,2 | dBm/SCS | [-104] |
| | $Config_{SCell}$ 3 | | [-101] |
| $N_{oc}$ Note 2 | | dBm/15kHz | [-104] |
| SS-RSRP Note 3 | $Config_{SCell}$ 1,2 | dBm/SCS | [-87] |
| | $Config_{SCell}$ 3 | | [-84] |
| $\hat{E}_s/I_{ot}$ | | dB | [17] |
| $\hat{E}_s/N_{oc}$ | | dB | [17] |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | [-59] |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | [-61.9] |
| Propagation Condition | | | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

During T1, the UE shall start to send the ACK/NACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{MultipleBWPswitchDelay}$+$k_1$).

During T3, the UE shall start to send the ACK/NACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{MultipleBWPswitchDelay}$+$k_1$).

Where,

$k_1$ is the timing between PDSCHs on PSCell and SCell and their corresponding acknowledgement as specified in TS 38.214 [9].

$T_{MultipleBWPswitchDelay}$ = $T_{BWPswitchDelay}$ + D, is the simultaneous BWP switching delay on multiple CCs specified in TS 38.133 [6] clause 8.6.2A.1.

$T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in TS 38.133 [6] Table 8.6.2-1 and depends on UE UE capability *bwp-SwitchingDelay* [13]. [xxx: need further check]

D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [13]. [xxx: need further check]

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of E-UTRA PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay and the interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] clause 7.32.2.7.

During T3, the start time of E-UTRA PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay and the interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell active BWP switch interruption to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ($i$+ $T_{BWPswitchDelay}$+$k_1$), ($j$+ $T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 4.5.6.4 Simultaneous RRC-based active BWP switch on multiple CCs

### 4.5.6.4.0 Minimum conformance requirements

#### 4.5.6.4.0.1 Minimum conformance requirements for simultaneous RRC-based BWP switch delay on multiple CCs

The requirements in this clause only apply to the case when the same type of BWP switch (RRC based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

The requirements in this clause shall apply:

- Active BWP switching or parameter change of its active BWPs for SpCell

- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCells

Requirements in this clause apply only if RRC based BWP switching on multiple CCs for NR-CA is triggered by a single RRC command.

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWPs, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}*(N-1)}{NR\ slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ and $T_{BWPswitchDelayRRC}$ are defined in TS 38.133 [6] clause 8.6.3, and

$D_{RRC} = 0$ for UE which is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [11] [xxx: need further check]. $D_{RRC} = D$ for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [11] [xxx: need further check], where D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability [11] [xxx: need further check].

N is the number of CCs within the NR-CA configured for performing simultaneous BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (N - 1)$ on the cells where RRC-based BWP switch occurs.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3A and 8.6.3A.1.

#### 4.5.6.4.0.2 Minimum conformance requirements for DCI and timer-based BWP switch delay on a single CC

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n, where

- Y=0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.
- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, $T_{BWPswitchDelay}$ + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 KHz.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* TS 38.331 [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* TS 38.331 [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 4.5.6.4.0.2-1.

**Table 4.5.6.4.0.2-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP TS 38.321 [12], UE shall be able to complete active BWP switching within the time duration of

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is receiveds, or
- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X + Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{BWPswitchDelay}$ is defined in Table 4.5.6.4.0.2-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs;
- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 KHz.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of $T_{dormantBWPswitchDelay}$ which starts from the beginning of DL slot n.

#### 4.5.6.4.0.3 Minimum conformance requirements for interruption for NR victim cell

[TS 38.133, clause 8.2.1.2.15]

##### 4.5.6.4.0.3.1 Interruptions due to SCell dormancy switch

When one SCell in SCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy TS 38.321 [12] when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in SCG as defined in clause 8.2.1.2.7 in TS 38.133 [6], except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP.
- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2 in TS 38.133 [6].

When multiple SCells in SCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

##### 4.5.6.4.0.3.2 Interruptions due to CQI measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

##### 4.5.6.4.0.3.3 Interruptions due to RRM measurements during SCell dormancy

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

#### 4.5.6.4.0.4 Minimum conformance requirements for interruption for E-UTRA victim cell

[TS36.133, clause 7.32.2.7]

The requirements in this clause shall apply for the UE configured with only NR PSCell or with NR PSCell and one or more NR SCells. The requirements in the clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

DCI-based or timer-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

Uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell may cause an interruption on PCell or on activated SCell(s) in the MCG.

The starting time of interruption due to DCI-based or timer-based downlink BWP and/or uplink BWP switching or due to uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 of TS 38.133 [6] when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ +Y as defined in clause 8.6.2A.1 of TS 38.133 [6] when DCI-based BWP switch occurs on multiple CCs. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ as defined in clause 8.6.2B.1 of TS 38.133 [6] when timer-based BWP switch occurs on multiple CCs simultaneously or $T_{MultipleBWPswitchDelayTotal}$ as defined in clause 8.6.2B.2 of TS 38.133 [6] when timer-based BWP switch occurs on multiple CCs over partially overlapping time period.

RRC-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

The interruption due to RRC-based downlink BWP and/or uplink BWP switching is allowed anywhere within the BWP switching delay ($T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$) defined in clause 8.6.3 of TS 38.133 [6] when BWP switch occurs on a single CC. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ + $D_{RRC}$*(N-1) as defined in clause 8.6.3A of TS 38.133 [6] when BWP switch occurs on multiple CCs. The interruption due to RRC-based downlink BWP and/or uplink BWP switching defined in this clause is applicable provided that:

- the RRC reconfiguration requires the UE to only switch its active BWP and

When BWP switch involves SCS changes,

the UE is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PCell or NR SCell on which the BWP switching occurs.

Otherwise,

the UE capable of per UE measurement gap TS 36.331 [29] is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PSCell or NR SCell on which the BWP switching occurs;

the UE capable of per FR measurement gap TS 36.331 [29] is allowed to cause interruption on PCell or on any activated SCell(s) provided that the NR PSCell or NR SCell on which the BWP switching occurs belongs to FR1.

The interruption on PCell or on any activated SCell(s) shall not exceed:

- 1 subframe in synchronous EN-DC,
- 2 subframes in asynchronous EN-DC.

### 4.5.6.4.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs

Editor's note: This test case is incomplete in following aspects:

- Test parameters are still in brackets.

#### 4.5.6.4.1.1 Test purpose

To verify the DL BWP switch delay requirement on multiple CCs for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.3A.1.

#### 4.5.6.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, RRC-based active BWP switching on multiple CCs simultaneously and 2DL CA.

#### 4.5.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.4.1.

#### 4.5.6.4.1.4 Test description

##### 4.5.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.6.4.1.4.1-1. Supported test configurations for NR SCell are shown in Table

4.5.6.4.1.4.1-2. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 4.5.6.4.1.4.1-1: Supported test configurations for LTE PCell and NR PSCell**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 4.5.6.4.1.4.1-2: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.4.1.4.1-3.

**Table 4.5.6.4.1.4.1-3: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 4.5.6.4.1.4.1-4.

2. Message contents are defined in clause 4.5.6.4.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

   - UE has dedicated bandwidth part BWP-1 in its RRC configuration for PSCell (Cell 2) and SCell (Cell 3)

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell (Cell 2) and SCell (Cell 3).

**Table 4.5.6.4.1.4.1-4: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2,3 | Two NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | µs | 3 | Synchronous cells |
| T1 | s | 0.2 | |

#### 4.5.6.4.1.4.2 Test procedure

The test consists of 1 time periods with durations of T1. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 3 is added as the SCell and activated.

2. Set the parameters according to Tables 4.5.6.4.1.4.1-4, Table 4.5.6.4.1.5-1 and Table 4.5.6.4.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* on NR Cell 2 and NR Cell 3. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 4.5.6.4.1.5-1 and Table 4.5.6.4.1.5-2 for NR Cell 2 and NR Cell 3, respectively.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell and SCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 4.5.6.4.1.5-1 and Table 4.5.6.4.1.5-2.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the RRC message reconfiguring PSCell and SCell BWP, then it reconfigures its bandwidth part with the updated bandwidth part configuration.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$; and

   b) the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$,

   then count a success for the test, otherwise count a fail for the test.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 8 or step 9 fails, switch off and on the UE and go to step 1.

10. Repeat steps 3-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.6.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 4.5.6.4.1.4.3-2: *RRCReconfiguration* (Test procedure, step 3 and step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 4.5.6.4.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.4.1.4.3-3: *CellGroupConfig* (Table 4.5.6.4.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig | Table 4.5.6.4.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell | | |
| sCellConfigDedicated | ServingCellConfig | Table 4.5.6.4.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.4.1.4.3-4: *ServingCellConfig* (Table 4.5.6.4.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1<br>Table 4.5.6.4.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1<br>Table 4.5.6.4.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.6.4.1.4.3-5: *BWP-Downlink* (Table 4.5.6.4.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

**Table 4.5.6.4.1.4.3-6: BWP-Uplink (Table 4.5.6.4.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

4.5.6.4.1.5 Test requirements

Tables 4.5.6.4.1.4.1-4, 4.5.6.4.1.5-1 and 4.5.6.4.1.5-2 define the primary level settings including test tolerances.

**Table 4.5.6.4.1.5-1: NR Cell specific test parameters for PSCell (NR Cell 2)**

| Parameter | | | Unit | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1,4 | | FDD |
| | | Config 2,3,5,6 | | TDD |
| TDD configuration | | Config 1,4 | | Not Applicable |
| | | Config 2,5 | | TDDConf.1.1 |
| | | Config 3,6 | | TDDConf.1.2 |
| $BW_{channel}$ | | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1,4 | | DLBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial UL BWP Configuration | | Config 1,4 | | ULBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial Condition | Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.3 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.3 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Final Condition | Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.1 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.1 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| PDSCH Reference measurement channel | | Config 1,4 | | SR.1.1 FDD |
| | | Config 2,5 | | SR.1.1 TDD |
| | | Config 3,6 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 | | CR.1.1 FDD |
| | | Config 2,5 | | CR.1.1 TDD |
| | | Config 3,6 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 | | CCR.1.1 FDD |
| | | Config 2,5 | | CCR.1.1 TDD |
| | | Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2,4,5 | | SSB.1 FR1 |
| | | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1,4 | | TRS.1.1 FDD |
| | | Config 2,5 | | TRS.1.1 TDD |
| | | Config 3,6 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 |
| Propagation Condition | | | | AWGN |

| | | | |
|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | [-59] |
| | Config 3,6 | dBm/ 38.16MHz | [-61.9] |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

**Table 4.5.6.4.1.5-2: NR Cell specific test parameters for SCell (NR Cell 3)**

| Parameter | | | Unit | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | $Config_{SCell}$ 1 | | FDD |
| | | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | | $Config_{SCell}$ 1 | | Not Applicable |
| | | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | | $Config_{SCell}$ 3 | | TDDConf.1.2 |
| $BW_{channel}$ | | $Config_{SCell}$ 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | $Config_{SCell}$ 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | $Config_{SCell}$ 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | | 1 |
| Initial DL BWP Configuration | | $Config_{SCell}$ 1 | | DLBWP.0.2 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| Initial UL BWP Configuration | | $Config_{SCell}$ 1 | | ULBWP.0.2 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| Initial Condition | Active DL BWP-1 Configuration | $Config_{SCell}$ 1 | | DLBWP.1.3 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| | Active UL BWP-1 Configuration | $Config_{SCell}$ 1 | | ULBWP.1.3 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| Final Condition | Active DL BWP-1 Configuration | $Config_{SCell}$ 1 | | DLBWP.1.1 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| | Active UL BWP-1 Configuration | $Config_{SCell}$ 1 | | ULBWP.1.1 |
| | | $Config_{SCell}$ 2 | | |
| | | $Config_{SCell}$ 3 | | |
| PDSCH Reference measurement channel | | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | | $Config_{SCell}$ 3 | | SR2.1 TDD |
| RMSI CORESET parameters | | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | | $Config_{SCell}$ 3 | | CR2.1 TDD |

| | | | |
|---|---|---|---|
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | [-59] |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | [-61.9] |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$.

where,

$k_1$ is the timing between PDSCHs on PSCell and SCell and their corresponding acknowledgement as specified in TS 38.214 [9].

$T_{RRCprocessingDelay} = 20$ ms, is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29],

$T_{BWPswitchDelayRRC} = 6$ ms, is the time used by the UE to perform BWP switch as defined in TS 38.133 [6] clause 8.6.3,

$D_{RRC} = 0$ if the UE is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [11] [xxx: need further check]. $D_{RRC} = D$ for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [2] [xxx: need further check]

D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [13]. [xxx: need further check]

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

#### 4.5.6.5 SCell dormancy switch

## 4.5.7 PSCell addition and release delay

### 4.5.7.0 Minimum conformance requirements

#### 4.5.7.0.1 NR PSCell addition delay requirement

The requirements in this clause shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving NR PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards NR PSCell no later than in subframe $n + T_{config\ PSCell}$:

Where:

$T_{config_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 36.331 [29].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing}$ = 20 ms if NR PSCell is in FR1, $T_{processing}$ = 40 ms if NR PSCell is in FR2.

$T_{search}$ is the time for AGC settling and PSS/SSS detection.

- For NR PSCell in FR1: if the target cell is a known cell, $T_{search}$ = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot $\geq$ -2 dB, then $T_{search}$ = 3* Trs ms;
- For NR PSCell in FR2: if the target cell is a known cell, $T_{search}$ = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot $\geq$ -2 dB, then $T_{search}$ = 24* Trs ms.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = 1*Trs ms for a known or unknown PSCell.

$T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the NR PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the Table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the NR PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the NR PSCell configuration command:

- the UE has sent a valid measurement report for the NR PSCell being configured and
- One of the SSBs measured from the NR PSCell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of TS 38.133 [6],

- One of the SSBs measured from NR PSCell being configured also remains detectable during the NR PSCell configuration delay according to the cell identification conditions specified in clause 9.3 of TS 38.133 [6].

otherwise it is unknown.

The PCell interruption specified in clause 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

#### 4.5.7.0.2 NR PSCell release delay requirement

The requirements in this clause shall apply for a UE which is configured with PCell and NR PSCell, and may also be configured with one or more SCells and/or NR SCells.

Upon receiving NR PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 36.331 [29] no later than in subframe $n+ T_{RRC_delay}$:

Where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 36.331 [29].

The PCell interruption specified in clause 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

### 4.5.7.1 EN-DC FR1 addition and release delay of known PSCell

#### 4.5.7.1.1 Test purpose

The purpose of this test is to verify that the PSCell addition and release delay for an NR PSCell is within the specified limits and the CSI transmissions are according to the requirements.

#### 4.5.7.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.7.0.1 and 4.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.7.1.

#### 4.5.7.1.4 Test description

##### 4.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.7.1.4.1-1.

**Table 4.5.7.1.4.1-1: Test configurations**

| Test Case ID | Description |
|---|---|
| 4.5.7.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.5.7.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.5.7.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.5.7.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.5.7.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.5.7.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.7.1.4.1-2.

**Table 4.5.7.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part | A.3.2.3.4 | |

| | | | |
|---|---|---|---|
| | 2Rx | | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.5.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4.5.7.1.4.1-3.

**Table 4.5.7.1.4.1-3: General Test Parameters for PSCell Addition and Release**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP | dBm | -96 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| | Time to Trigger | S | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | | | FR1 PRACH configuration 1 | Captured in A.3.8.2.1 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1.5 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 3 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 0.5 | During this time the UE adds the PSCell. |
| T5 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 0.5 | During this time the UE releases the PSCell. |

### 4.5.7.1.4.2 Test procedure

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 4.5.7.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration message* with event B1 configured.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall set T2 parameters according to Table 4.5.7.1.5-1 as appropriate. T2 starts.
6. The UE shall transmit a *MeasurementReport* message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.
7. The SS shall transmit an *RRCConnectionReconfiguration* message to release measurement gap. T3 starts.
8. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
9. During T3 the SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). T4 starts from the instant when the SS sends the last TTI containing the RRC message.
10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
11. The UE shall send a PRACH to PSCell during T4. The UE shall send PRACH no later than 82ms from the start of T4, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.
12. T5 starts.
13. During T5 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.
14. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T6 starts from the instant when the SS sends the last TTI containing the RRC message.
15. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
17. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.
18. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 20, otherwise switches off the UE.
19. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
20. Repeat step 2-19 until a test verdict has been achieved.

#### 4.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.7.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 for step 3<br>Table H.3.4-1 for step 6.<br>Table H.3.4-4 with condition INTER-RAT NR and EVENT B1<br>Table H.3.4-5 with condition Pattern#0 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 4.5.7.1-1, 4.5.7.1-2, 4.5.7.1-4, 4.5.7.1-5 | Table H.3.4-6 with condition SMTC.1 and SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 4.5.7.1-3, 4.5.7.1-6 | Table H.3.4-6 with condition SMTC.1 and SSB.2 FR1 |

**Table 4.5.7.1.4.3-2: Void**

**Table 4.5.7.1.4.3-3: Void**

### 4.5.7.1.5 Test requirements

Table 4.5.7.1.5-1 defines the primary level settings including test tolerances.

**Table 4.5.7.1.5-1: Cell Specific Parameters for PSCell Addition and Release**

| Parameter | Unit | Config | Test | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| E-UTRA RF Channel Number | | 1,2,3,4,5,6 | 1 | | | | | |
| NR RF Channel Number | | 1,2,3,4,5,6 | 2 | | | | | |
| TDD configuration | | 1,4 | Not Applicable | | | | | |
| | | 2,5 | TDDConf.1.1 | | | | | |
| | | 3,6 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | | | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | | | | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 | | | | | |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD | | | | | |
| | | 2,5 | SR.1.1 TDD | | | | | |
| | | 3,6 | SR.2.1 TDD | | | | | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | | | | | |
| | | 2,5 | CR.1.1 TDD | | | | | |
| | | 3,6 | CR.2.1 TDD | | | | | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | | | | | |
| | | 2,5 | CCR.1.1 TDD | | | | | |
| | | 3,6 | CCR.2.1 TDD | | | | | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | | | | | |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 | | | | | |
| | | 3,6 | SSB.2 FR1 | | | | | |
| SMTC configuration | | 1,2,4,5 | SMTC.1 | | | | | |
| | | 3,6 | SMTC.1 | | | | | |
| TRS Configuration | | 1,4 | TRS.1.1 FDD | | | | | |
| | | 2,5 | TRS.1.1 TDD | | | | | |
| | | 3,6 | TRS.1.2 TDD | | | | | |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD | | | | | |
| | | 2,5 | CSI-RS.1.1 TDD | | | | | |
| | | 3,6 | CSI-RS.2.1 TDD | | | | | |
| reportConfigType | | 1,2,3,4,5,6 | periodic | | | | | |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | | | |
| | | 3,6 | 10 | | | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | | | |
| | | 3,6 | 4 | | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | | | | |

| Parameter | Unit | Config | Test | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,4,5 | N/A | -85 | | | | |
| | | 3,6 | N/A | -89 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | N/A | -85 | | | | |
| | | 3,6 | N/A | -86 | | | | |
| $\hat{E}_s / I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 0 | | | | |
| $\hat{E}_s / N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 0 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -infinity | -85 | | | | |
| | | 3,6 | -infinity | -86 | | | | |
| Io Note3 | dBm/9.36MHz | 1,2,4,5 | N/A | -54 | | | | |
| | dBm/38.1MHz | 3,6 | N/A | -51.9 | | | | |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall transmit the PRACH to PSCell no later than 82 ms Note1 from the start of T4.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T5.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T5.

The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

NOTE: The PSCell addition delay can be expressed as follows as specified in clause 4.7.5.0.1:

$$T_{config_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell_DU} + 2ms$$

Where:

$T_{RRC_delay}$ = 20ms

$T_{processing}$ = 20ms

$T_{search}$ = 0

$T_{\Delta}$ = 20ms

$T_{PSCell_DU}$ = 1*10+10 = 20ms

## 4.5.8 UL switching

### 4.5.8.0 Minimum conformance requirements

[TS 38.133, clause 8.2.1.2.14]

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where E-UTRA UL carrier is capable of one transmit antenna connector and NR UL carrier is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13] [xxx: need further check]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in NR carrier. The DL interruption lengths of X for NR carrier(s) are defined in Table 4.5.8.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band EN-DC configurations as specified in clause 5.5B.4 of TS 38.101-3 [4].

**Table 4.5.8.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | |
|---|---|---|---|
| | | 35us | 140us |
| 0 | 1 | 2 | 3 |
| 1 | 0.5 | 3 | 6 |
| 2 | 0.25 | 4 | 10 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod.* | | | |

### 4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

#### 4.5.8.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

#### 4.5.8.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards supporting dynamic UL Tx switching in case of inter-band EN-DC.

#### 4.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.8.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.8.

#### 4.5.8.1.4 Test description

##### 4.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.8.1.4.1-1.

**Table 4.5.8.1.4.1-1: Test configurations**

| Test Case ID | PSCell (Cell2) |
|---|---|
| 4.5.8.1-1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 4.5.8.1.4.1-2.

**Table 4.5.8.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.8.1.4.1-3
2. Message contents are defined in clause 4.5.8.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in Annex C.1.1.

**Table 4.5.8.1.4.1-3: General Test Parameters for DL Interruptions at switching between two uplink carriers in EN-DC**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for the test. |
| Active cell | | Config 1 | Cell 1: E-UTRAN FDD PCell<br>Cell 2: FR1 PSCell | E-UTRAN FDD PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

#### 4.5.8.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is E-UTRAN PCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and *uplinkTxSwitching* is indicated to the UE.

UE is configured to transmit SRS on PSCell on the last 2 symbols of special slot. DL interruption is expected to take place prior of the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [25] clause 4.6 with the message content exceptions defined in clause 4.5.8.1.4.3. *UplinkTxSwitching* is configured to the UE.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. Set the parameters according to T1 in Tables 4.5.8.1.5-1. T1 starts.
6. SS schedules UL transmission on PCell continuously on the subframes which only overlap with DL slots of PSCell.
7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting (6dB) on following symbol on the 1st special slot on of every radio frame PSCell.

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

   - otherwise,

     - symbol#5 if UE capability uplinkTxSwitchingPeriod is 140us or

     - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.
8. The UE shall send L1-RSRP report containing L1-RSRP of CSI-RS#0 after the reception of DCI trigger while meeting the test requirements given in Table 4.5.8.1.5-3, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
11. If any of the reconfigurations fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5
12. Repeat step 3-11 until a test verdict has been achieved.

#### 4.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.8.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 1T-2T, and sCellToAddModList = Not present;<br>Table H.3.11-3 with condition 1T-2T, and uplinkTxSwitchingPeriodLocation-r16 = true;<br>Table H.3.11-4 with condition 2TX and SwitchTo, and c-SRS = 0;<br>Table H.3.11-11 |

**Table 4.5.8.1.4.3-2 - Table 4.5.8.1.4.3-5: Void**

**Table 4.5.8.1.4.3-6: *CSI-MeasConfig***

| Derivation Path: Table H.3.11-5 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-MeasConfig::= SEQUENCE { | | | |
| csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig { | 1 entry | | |
| CSI-ReportConfig[1] | CSI-ReportConfig | entry 1<br>Table 4.5.8.1.4.3-9 | |
| } | | | |
| reportTriggerSize | 1 | | |
| aperiodicTriggerStateList CHOICE { | | | |
| setup | CSI-AperiodicTriggerStateList | Table H.3.11-10 | |
| } | | | |
| } | | | |

**Table 4.5.8.1.4.3-7 - Table 4.5.8.1.4.3-8: *Void***

**Table 4.5.8.1.4.3-9: *CSI-ReportConfig***

| Derivation Path: TS 38.508-1 [14], Table H.3.11-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigId | 0 | | |
| carrier | Not present | | |
| reportConfigType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF INTEGER { | | | |
| INTEGER | 4 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.8.1.4.3-10: CSI-AperiodicTriggerStateList (Table 4.5.8.1.4.3-6)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-12J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-AperiodicTriggerStateList ::= SEQUENCE (SIZE (1..maxNrOfCSI-AperiodicTriggers)) OF CSI-AperiodicTriggerState { | 1 entries | | |

| | | | |
|---|---|---|---|
| CSI-AperiodicTriggerState[1] SEQUENCE { | | entry 1 | |
| associatedReportConfigInfoList SEQUENCE (SIZE(1..maxNrofReportConfigPerAperiodicTrigger)) OF CSI-AssociatedReportConfigInfo { | 1 entry | | |
| CSI-AssociatedReportConfigInfo[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 0 | | |
| resourcesForChannel CHOICE { | | | |
| nzp-CSI-RS SEQUENCE { | | | |
| resourceSet | 0 | | |
| qcl-info SEQUENCE (SIZE(1..maxNrofAP-CSI-RS-ResourcesPerSet)) OF TCI-StateId { | 1 entry | | |
| TCI-StateId[1] | 0 | QCL to SSB #0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.8.1.4.3-11: Physical layer parameters for DCI format 0_1 (Test procedure, step 7)**

| Derivation Path: TS 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

### 4.5.8.1.5 Test requirements

Table 4.5.8.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions at switching between two uplink carriers.

**Table 4.5.8.1.5-1: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)**

| Parameter | | Unit | Cell2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that:<br>S='11DL: 1GP:2UL';<br>*nrofDownlinkSymbols: 11*<br>*nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| SRS configuration | | | SRSConf.4 in Table 4.5.8.1.5-2 |
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD |
| RMSI CORESET parameters | Confiq 1 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/SCS | 84 |
| $\hat{E}_s/I_{ot}$ | | dB | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -55.78 |
| Time offset to Cell1 Note 5 | | µs | 0 |
| Propagation Condition | | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Void<br>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | |

**Table 4.5.8.1.5-2: SRS Configuration for DL Interruptions at switching between two uplink carriers**

| | Field | SRSConf.4 | Comments |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | |
| | srs-ResourceIdList | 0 | |
| | resourceType | Periodic | |
| | Usage | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | |
| | nrofSRS-Ports | Port2 | |
| | transmissionComb | n2 | |
| | combOffset-n2 | 0 | |
| | cyclicShift-n2 | 0 | |
| | resourceMapping startPosition | 1 | |
| | resourceMapping nrofSymbols | n2 | |
| | resourceMapping repetitionFactor | n1 | |
| | freqDomainPosition | 0 | |
| | freqDomainShift | 0 | |
| | freqHopping c-SRS | 0 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | |
| | freqHopping b-hop | 0 | |
| | groupOrSequenceHopping | Neither | |
| | resourceType | Periodic | |
| | periodicityAndOffset-p | sl20, 3 | |
| | sequenceId | 0 | |

The UE shall send L1-RSRP report for Cell 2 after the reception of DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.5.8.1.5-3.

**Table 4.5.8.1.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#0) | 65 |
| Highest reported value (CSI-RS#0) | 86 |

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.9 UE specific CBW change

### 4.5.9.0 Minimum conformance requirements

#### 4.5.9.0.1 Minimum conformance requirements for UE specific CBW change delay

[TS 38.133, clause 8.13.2]

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in clause 11.2 in TS 36.331 [29] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [13], and

$T_{CBWchangeDelayRRC} = 6ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed, where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

### 4.5.9.1 UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN-DC

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing

#### 4.5.9.1.1 Test purpose

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13 in TS 38.133 [6].

#### 4.5.9.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR1. The requirements in this test apply for a UE which receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

#### 4.5.9.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.9.1.

#### 4.5.9.1.4 Test description

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table 4.5.9.1.4.1-3. All cells have constant signal levels throughout the test. The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

During T1 the SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The SS verifies the UE specific CBW switching delay in PSCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received (RRC Reconfiguration Complete message).

##### 4.5.9.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.9.1.4.1-1.

**Table 4.5.9.1.4.1-1: UE specific CBW change supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.9.1.4.1-2.

**Table 4.5.9.1.4.1-2: Initial conditions for EN-DC PSCell FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.9.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.1.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.5.9.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 in TS 38.133 [6], cell-specific parameters of NR PSCell are specified in Table 4.5.9.1.5-1 below.

2. Message contents are defined in clause 4.5.9.1.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 4.5.9.1.4.1-3: General test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |

| | | | |
|---|---|---|---|
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |

#### 4.5.9.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC). UE has been configured via RRC-configuration (*SCS-SpecificCarrier* in TS 38.331 [13]) with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP in PSCell. Set the parameters according to Tables 4.5.9.1.4.1-3 and 4.5.9.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 2.

3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

4. T1 starts from the beginning of slot *i*, where slot *i* is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5. The UE shall reconfigure its CBW with the updated CBW of final condition (CBW-2).

6. The SS verifies the UE specific CBW change time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

7. If the UE starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot ($i+ \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$) then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. If it is successful, continue to step 10. Otherwise continue to step 9.

9. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

10. Repeat steps 2-9 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.9.1.4.3 Message contents

TBD

### 4.5.9.1.5 Test requirement

Table 4.5.9.1.5-1 defines the primary level settings for all tests.

**4.5.9.1.5-1: NR Cell specific test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| **Frequency Range** | | | **FR1** |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |

| | | | | |
|---|---|---|---|---|
| | | Config 3,6 | | TDDConf.1.2 |
| $BW_{channel}$ | | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | | 0 |
| Initial DL BWP Configuration (BWP-1) before and after UE specific CBW change | | Config 1,4 | | DLBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial UL BWP (BWP-1) Configuration before and after UE specific CBW change | | Config 1,4 | | ULBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial Condition | Active DL CBW Configuration (CBW-1) | Config 1,4 | | DLCBW.1.1 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL CBW Configuration (CBW-1) | Config 1,4 | | ULCBW.1.1 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Final Condition | Active DL CBW Configuration (CBW-2) | Config 1,4 | | DLCBW.1.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| | Active UL CBW Configuration (CBW-2) | Config 1,4 | | ULCBW.1.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| PDSCH Reference measurement channel | | Config 1,4 | | SR.1.1 FDD |
| | | Config 2,5 | | SR.1.1 TDD |
| | | Config 3,6 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 | | CR.1.1 FDD |
| | | Config 2,5 | | CR.1.1 TDD |
| | | Config 3,6 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 | | CCR.1.1 FDD |
| | | Config 2,5 | | CCR.1.1 TDD |
| | | Config 3,6 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2,4,5 | | SSB.1 FR1 |
| | | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1,4 | | TRS.1.1 FDD |
| | | Config 2,5 | | TRS.1.1 TDD |
| | | Config 3,6 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |

| | | | |
|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ($i+ \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$).

All of the above test requirements shall be fulfilled in order for the observed PSCell UE specific CBW change delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 4.5.10 PSCell activation and deactivation delay

### 4.5.10.0 Minimum conformance requirements

#### 4.5.10.0.1 Minimum conformance requirements for PSCell activation and deactivation delay

[TS 36.133, clause 7.38]

The requirements in this clause shall apply for the UE configured with one deactivated SCG in EN-DC, and when PSCell in one SCG is being activated.

The delay within which the UE shall be able to activate the deactivated SCG depends upon the specified conditions.

Upon receiving SCG activation command in slot *n*, the UE shall be capable to transmit PRACH preamble or PUCCH towards PSCell no later than in slot n + $\frac{T_{activation_time}}{NR\ slot\ length}$ ,

where:

$T_{activation_time} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. When PSCell is activated from deactivated state, if any PSCell parameter is modified, $T_{processing}$ = [20ms]. Otherwise, $T_{processing}$ = [5 or 10ms].

$T_{search}$ is the time for AGC settling and PSS/SSS detection.

For RACH based PSCell activation, if the target cell is a known NR FR1 or FR2 PSCell, $T_{search}$ = 0 ms. If the target cell is an unknown FR1 PSCell and Es/Iot ≥ -2 dB, $T_{search}$ = 3* $T_{rs}$ ms. If the target cell is an unknown FR2 PSCell and Es/Iot ≥ -2 dB, then $T_{search}$ = 24* $T_{rs}$ ms.

For RACH-less based PSCell activation, if RLM and BFD are configured and no failure is detected, $T_{search}$ = 0 ms if the target cell is a known FR2 PSCell. There are no requirements if PSCell is unknown.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target PSCell. $T_{\Delta}$ = 1*Trs ms.

$T_{IU}$: When RACH based PSCell activation is configured, it is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{IU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

When RACH-less based PSCell activation is configured, it is the uncertainty in acquiring the first PUSCH transmission occasion [or SR on PUCCH].

Trs is the SMTC periodicity of the PSCell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the SCG activation command:
  - the UE has sent a valid measurement report for the PSCell being activated and
  - One of the SSBs measured from the PSCell being activated remains detectable according to the cell identification conditions specified in clause 9.3.
- One of the SSBs measured from PSCell being activated also remains detectable during the PSCell activation delay $T_{config_PSCell}$ according to the cell identification conditions specified in clause 9.3.

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [13].[xxx: need further check]

The requirements in this clause shall apply for a UE which is configured with at least PCell and PSCell.

Upon receiving SCG deactivation command in subframe n, the UE shall accomplish the deactivation actions specified in TS 38.331 [13] no later than in slot $n + \frac{T_{RRC_delay}}{\text{NR slot length}}$:

where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [13]. [xxx: need further check]

FFS: MAC CE based SCG deactivation delay requirements.

The normative reference for this requirement is TS 36.133 [23] clause 7.38.2 and 7.38.3.

## 4.5.10.1 EN-DC FR1 PSCell activation and deactivation delay

### 4.5.10.1.1 Test purpose

This test is to verify that the NR PSCell activation and deactivation delay under EN-DC are within the requirements, for the case when UE configured with one deactivated SCG and when PSCell in one SCG is being activated where the PSCell is known by the UE at the time of activation.

### 4.5.10.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting activation and deactivation on SCG.

### 4.5.10.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.10.0.1.

The normative reference for this requirement is TS 36.133 [23] 7.38 and TS 38.133 [6] clause A.4.5.10.1.

#### 4.5.10.1.4 Test description

##### 4.5.10.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.10.1.4.1-1.

**Table 4.5.10.1.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.10.1-1 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 4.5.10.1-2 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 4.5.10.1-3 | LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| 4.5.10.1-4 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 4.5.10.1-5 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 4.5.10.1-6 | LTE TDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 4.5.10.1.4.1-2 and Table 4.5.10.1.4.1-3.

**Table 4.5.10.1.4.1-2: Initial conditions for PSCell activation and deactivation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.10.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.10.1.4.1-3: General Test Parameters for PSCell activation and deactivation**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Deactivated cell | | Cell2 | To be activated PSCell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Deactivated cell | | Cell2 | PSCell deactivated on RF channel number 2. |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Scheduling request resource periodicity | | | 20ms | At the starting of period T3, UE sends a SR on PUCCH for PSCell |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE adds the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | | s | 1 | During this time the UE releases the PSCell. |

1. Message contents are defined in clause 4.5.10.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cells. Cell 2 is the deactivated PSCell.

#### 4.5.10.1.4.2 Test procedure

The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. The UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and PSCell (Cell2) is in deactivated state. During T1, both Cell1 and Cell2 are known to UE and UE performs measurement on deactivated PCell. Before the test starts the UE is configured RLM and BFD on deactivated PSCell. During T1, UE performs RLM and BFD on the deactivated PSCell and TCI state is known.

The test system shall send an RRC message to the UE to activate PSCell (Cell 2) on radio channel 2, where no any PSCell parameter is modified in the RRC message. The RRC message (to activate PSCell) also includes a request for the UE to transmit scheduling request on PUCCH for the PSCell after the PSCell has been successfully activated. The RRC message to activate PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to activate PSCell (Cell2) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for PSCell during T3. The point in time at which the UE has sent scheduling request on PUCCH for PSCell (Cell 2) defines the start of period T3.

The test system shall send an RRC message to the UE to deactivate PSCell (Cell 2) on radio channel 2. The RRC message to deactivate PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to deactivate PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.5.10.1.5-1 and Table A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall transmit RRCConnectionReconfiguration message with condition DeactivatedSCG according to TS 36.508 [25] Table 4.6.1-8 to deactivate NR cell (PSCell).

3a. The UE shall transmit RRCConnectionReconfigurationComplete message. After 1s, the SS should transmit *RRCConnectionReconfiguration* message to activate PSCell. T2 starts.

4. The UE shall send SR on PUCCH for PSCell no later than 65ms from the start of T2, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 10.

5. T3 starts.

6. During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 10.

7. The SS shall transmit RRCConnectionReconfiguration message with condition DeactivatedSCG according to TS 36.508 [25] Table 4.6.1-8 to deactivate PSCell after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2) during T3.

8. The UE shall transmit an RRCConnectionReconfigurationComplete message. T4 stars.

9. The UE shall stop sending PUSCH for PSCell no later than 20ms into T4, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

10. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for the next iteration of the test procedure loop.

11. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 13, otherwise switches off the UE.

12. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters Connectivity E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until a test verdict has been achieved.

#### 4.5.10.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3 with following exceptions:

**Table 4.5.10.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-8 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 4.6.3-19 in TS 38.508-1 [14] with condition RLM_BFD_PSCell<br>Table 4.6.3-167 in TS 38.508-1 [14] with condition SCG_Activate |
| Specific message contents exceptions for Test Configuration 4.5.10.1-1, 4.5.10.1-2, 4.5.10.1-4, 4.5.10.1-5 | Table H.3.1-3 with condition SSB.1 FR1 and SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.5.10.1-3, 4.5.10.1-6 | Table H.3.1-3 with condition SSB.2 FR1 and SMTC.1 |

**Table 4.5.10.1.4.3-2: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| schedulingRequestResourceId | SchedulingRequestResourceId | | |
| schedulingRequestID | SchedulingRequestId | | |
| periodicityAndOffset CHOICE { | | | |
| sl20 | 9 | With SCS = kHz15 results in repetition every 20 ms | Config 1, 2, 4, 5 |
| sl40 | 19 | With SCS = kHz30 results in repetition every 20 ms | Config 3, 6 |
| } | | | |
| } | | | |

#### 4.5.10.1.5 Test requirement

Table 4.5.10.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.10.1.5-1: Cell Specific Parameters for PSCell activation and deactivation**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA RF Channel Number | | 1,2,3,4,5,6 | 1 | | | |
| NR RF Channel Number | | 1,2,3,4,5,6 | 2 | | | |
| TDD configuration | | 1,4 | Not Applicable | | | |
| | | 2,5 | TDDConf.1.1 | | | |
| | | 3,6 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 | | | |
| PDSCH Reference | | 1,4 | SR.1.1 FDD | | | |

| | | | | |
|---|---|---|---|---|
| measurement channel | | 2,5 | SR.1.1 TDD | |
| | | 3,6 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | |
| | | 2,5 | CR.1.1 TDD | |
| | | 3,6 | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | |
| | | 2,5 | CCR.1.1 TDD | |
| | | 3,6 | CCR.2.1 TDD | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 | |
| | | 3,6 | SSB.2 FR1 | |
| SMTC configuration | | 1,2,4,5 | SMTC.1 | |
| | | 3,6 | SMTC.1 | |
| TRS Configuration | | 1,4 | TRS.1.1 FDD | |
| | | 2,5 | TRS.1.1 TDD | |
| | | 3,6 | TRS.1.2 TDD | |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD | |
| | | 2,5 | CSI-RS.1.1 TDD | |
| | | 3,6 | CSI-RS.2.1 TDD | |
| reportConfigType | | 1,2,3,4,5,6 | periodic | |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | |
| | | 3,6 | 10 | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | |
| | | 3,6 | 4 | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | N/A | -88.6 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | N/A | -88.6 |
| | | 3,6 | N/A | -85.6 |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -infinity | -88.6 |
| | | 3,6 | -infinity | -85.6 |
| Io Note3 | dBm/9.36MHz | 1,2,4,5 | N/A | -60.6 |
| | dBm/38.1MHz | 3,6 | N/A | -54.6 |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at

| each receiver antenna port. |
|---|

The UE performs RACH-less based PSCell activation. UE shall transmit the SR on PUCCH for PSCell at latest 67 ms[Note1] into T2.

The UE shall send at least one PUSCH on PSCell during T3.

The UE shall stop transmit PUSCH for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell activation delay and PSCell deactivation delay to be counted as correct. The rate of correct observed PSCell activation delay and PSCell deactivation delay during repeated tests shall be at least 90%.

Note1: The PSCell activation delay can be expressed as follows as specified in clause 7.38 in TS 36.133 [23]:

$T_{activation_time} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

Where:

$T_{RRC_delay} = 20$ms

$T_{processing} = 5$ ms

$T_{search} = 0$ ms

$T_{\Delta} = 20$ms

$T_{IU}$= max 20 ms

## 4.5.11 PSCell addition and release delay

### 4.5.11.0 Minimum conformance requirements

[TS 38.133, clause 8.9A]

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

Upon receiving conditional PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards PSCell no later than in subframe $n + T_{config_PSCell_Addition_Conditional}$:

Where:

$T_{config_PSCell_Addition_Conditional} = T_{RRC_delay} + T_{Event_DU} + T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

$T_{RRC_delay}$ is the RRC processing delay defined in clause 11.2 in 36.331 [29] which is the corresponding RRC message embedded in E-UTRA RRC message, otherwise it is the RRC procedure delay defined in clause 12 in TS 38.331 [13] for processing the conditional PSCell addition command.

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional PSCell addition command until a condition exists at the measurement reference point which will trigger the conditional PSCell addition.

$T_{measure}$ is the measurements time stated in clause 4.5.11.0.1.

$T_{UE_preparation}$ is the UE preparation time for conditional PSCell addition, and starts after UE realizes the condition of PSCell addition is met and identity of the PSCell is determined. $T_{UE_preparation}$ is up to 10 ms.

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing}$ = 20 ms when PSCell is in FR1, and $T_{processing}$ = 40 ms when PSCell is in FR2.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = 1*Trs ms.

$T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only after the UE starts to execute a conditional PSCell addition.

#### 4.5.11.0.1 Measurement time

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a PSCell addition and interruption time starts.

The measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ defined in clause 9.3.4 of TS 38.133 [6]. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_inter_with_index}$ for PSCell addition. If a cell, which has been detectable at least for the time period $T_{identify_inter_with_index}$ for PSCell addition, becomes undetectable for a period and then the cell becomes detectable again and triggers a PSCell addition, the measurement time delay shall be less than $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

### 4.5.11.1 EN-DC FR1 addition and release delay of PSCell

#### 4.5.11.1.1 Test purpose

The purpose of this test is to verify that the NR conditional PSCell addition delays under EN-DC are within the requirements stated in TS 38.133 [6] clause 8.9A.2.

#### 4.5.11.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting conditional PSCell addition in EN-DC.

#### 4.5.11.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.11.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.9A.

#### 4.5.11.1.4 Test description

##### 4.5.11.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.11.1.4.1-1.

**Table 4.5.11.1.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.5.11.1-1 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 4.5.11.1-2 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 4.5.11.1-3 | LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| 4.5.11.1-4 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 4.5.11.1-5 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 4.5.11.1-6 | LTE TDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| NOTE: The UE is only required to pass in one of the supported test | |

| configurations in FR1. |
|---|

Configure the test equipment and the DUT according to the parameters in Table 4.5.11.1.4.1-2 and Table 4.5.11.1.4.1-3.

**Table 4.5.11.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.11.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.5.11.1.4.1-3: General Test Parameters for Conditional PSCell Addition**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP Config 1,2,4,5 | dBm | -96 | Actual RSRP threshold for event B1. Value modified in test tolerance analysis in TR 38.903. |
| | Threshold RSRP Config 3, 6 | dBm | -93 | Actual RSRP threshold for event B1. |
| | Time to Trigger | s | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | | | FR1 PRACH configuration 1 | Captured in TS 38.133 [6] A.3.8.2.1 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | | s | ≤7 | During this time Cell 2 meets the addition condition and UE adds this PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for Cell 2. And the test system shall send an RRC message instructing the UE to release the PSCell. |
| T4 | | s | 1 | During this time the UE releases the Cell 2. |

1. Message contents are defined in clause 4.5.11.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4.5.11.1.4.1-3.

#### 4.5.11.1.4.2 Test procedure

The test consists of four successive time periods with duration of T1, T2, T3 and T4 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

At the start of time duration T1, the UE does not have any timing information of Cell 2. The network shall configure a condition and the target PSCell configuration implying addition of cell 2 during T1, at a time earlier than $T_{RRC_delay}$ before the beginning of T2.

At the start of T2, cell 2 becomes detectable and meets the addition condition. UE shall be able to measure and detect that the condition is fulfilled during time Tmeasure. After which it will transmit the PRACH preamble. Reception by the test system of the PRACH preamble defines the start of T3.

During T3, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send an RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines during T4.

During T4, the UE shall release the PSCell.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 4.5.11.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with condition CPA according to TS 36.508 [25] Table 4.6.1-8 including *RRCConnectionReconfiguration* message and associated execution condition. The *RRCConnectionReconfiguration** message contains PSCell configuration in *RRCReconfiguration***. And measurement gap pattern #0 is configured for the UE.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message indicating reception of the conditional configuration T1 expiring.

5. T2 starts. The execution condition of PSCell (Cell2) becomes satisfied, the UE applies *RRCConnectionReconfiguration* message corresponding to PSCell (Cell2) and releases measurement gap and UE sends *RRCConnectionReconfigurationComplete* message with condition MCG_SCG and CPA including *RRCReconfigurationComplete* message from the selected candidate PSCell.

6. The UE shall send PRACH to PSCell no later than 1112 ms from the start of T2, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 12.

7. T3 starts.

8. During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 12.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2).

10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. T4 starts.

11. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T4, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

12. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.

13. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 15, otherwise switches off the UE.

14. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat step 2-14 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.5.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.5.11.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-5 with condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.5.11.1-1, 4.5.11.1-2, 4.5.11.1-4, 4.5.11.1-5 | Table H.3.4-6 with condition SMTC.1 and SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 4.5.11.1-3, 4.5.11.1-6 | Table H.3.4-6 with condition SMTC.1 and SSB.2 FR1 |

**Table 4.5.11.1.4.3-2: RRCConnectionReconfiguration (step 3)**

| Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Table 4.5.11.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.5.11.1.4.3-3: MeasConfig-DEFAULT**

| Derivation Path: Table H.3.4-4 with Condition INTER-RAT NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig-DEFAULT ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT SEQUENCE { | | | |
| condReconfigurationTriggerNR-r17 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventB1-NR-r17 SEQUENCE { | | | |
| b1-ThresholdNR-r17 CHOICE { | | | |
| nr-RSRP-r15 | 61 | | Config 1,2,4,5 |

| | | | |
|---|---|---|---|
| | 64 | | Config 3,6 |
| } | | | |
| hysteresis-r17 | 0 | | |
| timeToTrigger-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4.5.11.1.5 Test requirement

Table 4.5.11.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.5.11.1.5-1: Cell Specific Parameters for Conditional PSCell Addition**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA RF Channel Number | | 1,2,3,4,5,6 | 1 | | | |
| NR RF Channel Number | | 1,2,3,4,5,6 | 2 | | | |
| TDD configuration | | 1,4 | Not Applicable | | | |
| | | 2,5 | TDDConf.1.1 | | | |
| | | 3,6 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 | | | |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD | | | |
| | | 2,5 | SR.1.1 TDD | | | |
| | | 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | | | |
| | | 2,5 | CR.1.1 TDD | | | |
| | | 3,6 | CR.2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | | | |
| | | 2,5 | CCR.1.1 TDD | | | |
| | | 3,6 | CCR.2.1 TDD | | | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | | | |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 | | | |
| | | 3,6 | SSB.2 FR1 | | | |
| SMTC configuration | | 1,2,4,5 | SMTC.1 | | | |
| | | 3,6 | SMTC.1 | | | |
| TRS Configuration | | 1,4 | TRS.1.1 FDD | | | |
| | | 2,5 | TRS.1.1 TDD | | | |
| | | 3,6 | TRS.1.2 TDD | | | |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD | | | |
| | | 2,5 | CSI-RS.1.1 TDD | | | |
| | | 3,6 | CSI-RS.2.1 TDD | | | |
| reportConfigType | | 1,2,3,4,5,6 | periodic | | | |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | |
| | | 3,6 | 10 | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | |
| | | 3,6 | 4 | | | |
| EPRE ratio of PSS to SSS | | | | | | |
| EPRE ratio of PBCH DMRS to | | | | | | |

| | | | | |
|---|---|---|---|---|
| SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | dB | 1,2,3,4,5,6 | 0 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,4,5 | N/A | -85 |
| | | 3,6 | N/A | -88.6 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | N/A | -85 |
| | | 3,6 | N/A | -85.6 |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -infinity | -85 |
| | | 3,6 | -infinity | -85.6 |
| Io Note3 | dBm/9.36MHz | 1,2,4,5 | N/A | -54 |
| | dBm/38.1MHz | 3,6 | N/A | -51.5 |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

$T_{RRC_delay} + T_{Event_DU}$ occurs during T1 as the addition condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2$ ms = 1040 ms + 10 ms + 62 ms = 1112 ms from the start of T2.

The UE shall transmit at least one periodic CSI report for PSCell during T3.

The UE shall stop transmitting CSI reports for PSCell at latest 20 ms into T4.

All of the above test requirements shall be fulfilled in order for the observed conditional PSCell addition delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

# 4.6 Measurement procedures

## 4.6.1 Intra-frequency measurements

### 4.6.1.0 Minimum conformance requirements

#### 4.6.1.0.1 Minimum conformance requirements for event-triggered reporting without gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index}$. It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in Table 4.6.1.0.1-1, Table 4.6.1.0.1-2, Table 4.6.1.0.1-4 (deactivated SCell) or Table 4.6.1.0.1-5 (deactivated SCell)

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in Table 4.6.1.0.1-3 or Table 4.6.1.0.1-6 (deactivated SCell)

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in Table 4.6.1.0.1-7, Table 4.6.1.0.1-8, Table 4.6.1.0.1-9 (deactivated SCell), Table 4.6.1.0.1-10(deactivated SCell), or Table 4.6.1.0.1-11 ()

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

- according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.
- if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync}$=40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ = 24

$M_{meas_period_w/o_gaps}$: For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ = 24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, $K_p$=1

When intra-frequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol

before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 4.6.1.0.1-1, Table 4.6.1.0.1-2, Table 4.6.1.0.1-3, Table 4.6.1.0.1-4, Table 4.6.1.0.1-5 and Table 4.6.1.0.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 4.6.1.0.1-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 [Note 2]x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |
| NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraRAT-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |

**Table 4.6.1.0.1-2: Time period for PSS/SSS detection, (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period) [note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 4.6.1.0.1-3: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 [Note 2] x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |
| NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |
| NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, | |

| |
|---|
| M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. |

**Table 4.6.1.0.1-4: Time period for PSS/SSS detection, deactivated SCell (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | 5 x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.1-5: Time period for PSS/SSS detection, deactivated SCell (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | $M_{pss/sss_sync_w/o_gaps}$ x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | $M_{pss/sss_sync_w/o_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | $M_{pss/sss_sync_w/o_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.1-6: Time period for time index detection, deactivated SCell (FR1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | 3 x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 3 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 3 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.1-7: Time period for PSS/SSS detection, deactivated SCell (FR1), when *highSpeedMeasCA-Scell-r17* is configured**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | Ceil(5 x $K_p$) x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | Ceil(5 x $K_p$) x max(measCycleSCell, M2 [Note 1]xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | Ceil(5 x $K_p$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |

**Table 4.6.1.0.1-8: Time period for time index detection, deactivated SCell (FR1)，when *highSpeedMeasCA-Scell-r17* is configured**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | Ceil(3 x $K_p$) x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | Ceil(3 x $K_p$) x max(measCycleSCell, M2 [Note 1]xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | Ceil(3 x $K_p$)x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |

The measurement period for intra-frequency measurements without gaps is as shown in Table 4.6.1.0.1-9, Table 4.6.1.0.1-10, Table 4.6.1.0.1-11 (deactivated SCell) or Table 4.6.1.0.1-12 (deactivated SCell). When *highSpeedMeasFlag-r16* is configured, $T_{SSB_measurement_period_intra}$ is specified in Table 4.6.1.0.1-13.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$.

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 4.6.1.0.1-7, Table 4.6.1.0.1-10, Table 4.6.1.0.1-11 and Table 4.6.1.0.1-12 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

**Table 4.6.1.0.1-9: Measurement period for intra-frequency measurements without gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max( 200ms, ceil( 5 x $K_p$) x SMTC period ) [Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 4.6.1.0.1-10: Measurement period for intra-frequency measurements without gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max( 400ms, ceil($M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period) [Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil($M_{meas_period_w/o_gaps}$ x$K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 4.6.1.0.1-11: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | 5 x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.1-12: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | $M_{meas_period\ with_gaps}$ x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | $M_{meas_period\ with_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | $M_{meas_period\ with_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.1-13: $T_{SSB_measurement_period_intra}$ When *highSpeedMeasFlag-r16* is configured (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX [Note 2] | max(200ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 160ms | max(200ms, ceil(5 x M2 [Note 2] x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 [Note 2] x $K_p$) x max(SMTC period,DRX cycle) x |

| | $CSSF_{intra}$ |
|---|---|
| DRX cycle>320ms | ceil( $Y^{Note\ 3} \times K_p$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |
| NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |
| NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms. | |
| NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 5: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to measurements of secondary component carrier with active SCell. | |

**Table** 4.6.1.0.1-14**: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1), when highSpeedMeasCA-Scell-r17 is configured**

| **DRX cycle** | **$T_{SSB_measurement_period_intra}$** |
|---|---|
| No DRX | ceil( 5 x $K_p$) x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 160ms | ceil(5 x $K_p$) x max(measCycleSCell, $M2^{Note\ 1}$ x DRX cycle) x $CSSF_{intra}$ |
| 160ms < DRX cycle≤ 320ms | ceil(4 x $K_p$) x max(measCycleSCell, $M2^{Note\ 1}$ x DRX cycle) |
| DRX cycle>320ms | ceil( $Y^{Note\ 2} \times K_p$ ) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |
| NOTE 2: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

### 4.6.1.0.2 Minimum conformance requirements for event-triggered measurements with gap

TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \text{ ms}$$

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in Table 4.6.1.0.2 or Table 4.6.1.0.2.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in Table 4.6.1.0.2.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in Table 4.6.1.0.2 or Table 4.6.1.0.2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24.

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If SCG DRX is in use, intra-frequency cell identification requirements specified in TS 38.133 [6] Table 9.2.6.1-1, Table 9.2.6.1-2, and Table 9.2.5.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 4.6.1.0.2: Time period for PSS/SSS detection (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.2-2: Time period for PSS/SSS detection (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.2: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, 3 x max(MGRP, SMTC period) ) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil(1.5x 3) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$) |
| DRX cycle>320ms | 3 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133, clause 9.2.6.3]

The measurement period for FR1 intra-frequency measurements with gaps is as shown in Table 4.6.1.0.2-4.

The measurement period for FR2 intra-frequency measurements with gaps is as shown in Table 4.6.1.0.2-5.

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 4.6.1.0.2-4 and Table 4.6.1.0.2-5, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 4.6.1.0.2-4: Measurement period for intra-frequency measurements with gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | Max(200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 4.6.1.0.2-5: Measurement period for intra-frequency measurements with gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{Measurement_Period,\ Intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.6.2, 9.2.6.3 and 9.2.4.3.

## 4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX

### 4.6.1.1.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap within the intra-frequency cell search requirements.

### 4.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 4.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.1.

#### 4.6.1.1.4 Test description

##### 4.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.1.4.1-1.

**Table 4.6.1.1.4.1-1: supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.1.4.1-2 and Table 4.6.1.1.4.1-3.

**Table 4.6.1.1.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.6.1.1.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | E-UTRAN Cell 1 and NR Cell 2 | |
| Neighbour cell | | 1, 2, 3 | NR Cell 3 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | N/A | OFF |
| Time offset between PCell and PSCell | | 1, 2, 3 | 3 μs | Synchronous EN-DC |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

1. Message contents are defined in clause 4.6.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

#### 4.6.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.1.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.2.

5. The SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.1.4.1-2.

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 802 the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

9. The SS waits until the MeasurementReport message is received or when T2 expires.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 3) mod 1008)] for next iteration of the test procedure loop.

12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

14. Repeat steps 3-13 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.1.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-4 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-1 and 4.6.1.1-4 | Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-2 and 4.6.1.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.1-3 and 4.6.1.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

#### 4.6.1.1.5 Test requirement

Table 4.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.1.1.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -Infinity | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -Infinity | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -Infinity | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured test requirement is expressed as:

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra}$ = max[600ms, ceil(5 x $K_p$) x SMTC period] x $CSSF_{intra}$ = 600ms

$T_{SSB_measurement_period_intra}$ = max[200ms, ceil(5 x $K_p$) x SMTC period] x $CSSF_{intra}$ = 200 ms

Which:

$K_p$ = 1;

SMTC period as defined in Table 4.6.1.1.4.1-3;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; 2x$TTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX

### 4.6.1.2.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap in DRX within the intra-frequency cell search requirements.

### 4.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

#### 4.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.2.

#### 4.6.1.2.4 Test description

##### 4.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.2.4.1-1.

**Table 4.6.1.2.4.1-1: supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.2.4.1-2 and Table 4.6.1.2.4.1-3.

**Table 4.6.1.2.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.6.1.2.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3 | E-UTRAN Cell 1 and NR Cell 2 | | |
| Neighbour cell | | 1, 2, 3 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | |
| SSB configuration | | 1 | SSB.1 FR1 | | |
| | | 2 | SSB.1 FR1 | | |
| | | 3 | SSB.2 FR1 | | |
| SMTC configuration | | 1 | SMTC.2 | | |
| | | 2 | SMTC.1 | | |
| | | 3 | SMTC.1 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.1 | DRX.7 | Annex A.5 Table A.5-1 |
| Time offset between PCell and PSCell | | 1, 2, 3 | 3 µs | | Synchronous EN-DC |

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Time offset between serving and neighbour cells | | 1 | 3 ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2 | 3 µs | | Synchronous cells |
| | | 3 | 3 µs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 5 | 10 | |

1. Message contents are defined in clause 4.6.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

#### 4.6.1.2.4.2 Test procedure

Same test procedure as in clause 4.6.1.1.4.2 with Step 8 is replaced by following:

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

#### 4.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.2.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.7-1 with Condition DRX.1 and Offset for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Offset for Test 2<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4 | Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

#### 4.6.1.2.5 Test requirement

Table 4.6.1.2.4.1-2 and Table 4.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.1.2.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP. 0.1 ULBWP.0.1 | | DLBWP. 0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ note 2 | dBm/15 KHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -Infinity | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -Infinity | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -Infinity | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 1 with DRX 40ms as:

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = \max[600ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 600ms$

$T_{SSB_measurement_period_intra} = \max[200ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 320$ ms

Which:

$K_p = 1$;

SMTC period as defined in Table 4.6.1.2.4.1-3;

DRX cycle = 40;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; 2x$TTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 922 ms in test 1 (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6402 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 2 with DRX 640ms as:

$T_{identify_intra_without_index}$ = ($T_{PSS/SSS_sync_intra}$ + $T_{SSB_measurement_period_intra}$) ms

$T_{PSS/SSS_sync_intra}$ = ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra}$= 3200ms

$T_{SSB_measurement_period_intra}$ = ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{intra}$ = 3200 ms

Which:

$K_p$ = 1;

DRX cycle = 640;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; 2x$TTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 6402 ms in test 2 (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX

### 4.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the TDD intra-frequency cell search requirements.

### 4.6.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

### 4.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.3.

### 4.6.1.3.4 Test description

#### 4.6.1.3.4.1 Initial conditions

Test 4.6.1.3 can be run in one of the configurations defined in Table 4.6.1.3.4.1-1.

**Table 4.6.1.3.4.1-1: Supported test configurations for NR FR1 Cell**

| Configuration | Description |
|---|---|
| 4.6.1.3-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.3-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.3-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.6.1.3-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.3-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.3-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

**Table 4.6.1.3.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.6.1.3.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.3.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

**Table 4.6.1.3.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1-6 | E-UTRAN Cell 1 and NR Cell 2 | |
| Neighbour cell | | 1-6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number | | 1-6 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| Measurement gap type | | 1-6 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1-6 | 40 | |
| Measurement gap length | ms | 1-6 | 6 | |
| Measurement gap offset | ms | 1-6 | 39 | |
| SSB configuration | | 1,4 | SSB.1 FR1 | |
| | | 2,5 | SSB.1 FR1 | |
| | | 3,6 | SSB.2 FR1 | |
| SMTC configuration | | 1,4 | SMTC.2 | |
| | | 2,5 | SMTC.1 | |
| | | 3,6 | SMTC.1 | |
| CSI-RS parameters | | 1,4 | CSI-RS.1.2 FDD resource #0 | |
| | | 2,5 | CSI-RS.1.2 TDD resource #0 | |
| | | 3,6 | CSI-RS.2.2 TDD resource #0 | |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| A3-Offset | dB | 1-6 | -4.5 | |
| CP length | | 1-6 | Normal | |
| Hysteresis | dB | 1-6 | 0 | |
| Time To Trigger | s | 1-6 | 0 | |
| Filter coefficient | | 1-6 | 0 | L3 filtering is not used |
| DRX | | 1-6 | N/A | OFF |
| Time offset between PCell and PSCell | | 1-6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1,4 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2,5 | 3 μs | Synchronous cells |
| | | 3,6 | 3 μs | Synchronous cells |
| T1 | s | 1-6 | 5 | |
| T2 | s | 1-6 | 5 | |

#### 4.6.1.3.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.3.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.3.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.6.1.3.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.5-8 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4 | Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.6.1.3.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

**Table 4.6.1.3.4.3-3**

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

4.6.1.3.5 Test requirement

Tables 4.6.1.3.4.1-3 and 4.6.1.3.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

**Table 4.6.1.3.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,4 | N/A | | N/A | |
| | | 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1,4 | SR.1.1 FDD | | N/A | |
| | | 2,5 | SR.1.1 TDD | | | |
| | | 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2,5 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3,6 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1,4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2,5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1-6 | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | TRS.1.1 FDD | | N/A | |
| | | 2,5 | TRS.1.1 TDD | | N/A | |
| | | 3,6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1-6 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1-6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1-6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1-6 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,4 | -98 | | | |
| | | 2,5 | -98 | | | |
| | | 3,6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,4 | -98 | | | |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1,4 | 4 | 4 | -Infinity | 4 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1,4 | -94 | -94 | -Infinity | -94 |
| | | 2,5 | -94 | -94 | -Infinity | -94 |
| | | 3,6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1-6 | AWGN | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_ntra}$ = max (600ms, ceil (5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ = max (600ms, ceil (5 x 1) x 20ms) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil (5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ = max (200ms, ceil (5 x 1) x 20ms) x 1 = 200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX

### 4.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the intra-frequency cell search requirements.

### 4.6.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

### 4.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.4.

### 4.6.1.4.4 Test description

#### 4.6.1.4.4.1 Initial conditions

Test 4.6.1.4 can be run in one of the configurations defined in Table 4.6.1.4.4.1-1.

**Table 4.6.1.4.4.1-1: Supported test configurations for NR FR1 Cell**

| Configuration | Description |
|---|---|
| 4.6.1.4-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.4-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.4-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.6.1.4-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.6.1.4-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.6.1.4-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.4.4.1-2.

**Table 4.6.1.4.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.6.1.4.4.3.

2. The general test parameter settings are set up according to Table 4.6.1.4.4.1-3.

3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

**Table 4.6.1.4.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1-6 | E-UTRAN Cell 1 and NR Cell 2 | | |
| Neighbour cell | | 1-6 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1-6 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | |
| Measurement gap type | | 1-6 | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1-6 | 40 | | |
| Measurement gap length | ms | 1-6 | 6 | | |
| Measurement gap offset | ms | 1-6 | 39 | | |
| SSB configuration | | 1,4 | SSB.1 FR1 | | |
| | | 2,5 | SSB.1 FR1 | | |
| | | 3,6 | SSB.2 FR1 | | |
| SMTC configuration | | 1,4 | SMTC.2 | | |
| | | 2,5 | SMTC.1 | | |
| | | 3,6 | SMTC.1 | | |
| CSI-RS parameters | | 1,4 | CSI-RS.1.2 FDD resource #0 | | |
| | | 2,5 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3,6 | CSI-RS.2.2 TDD resource #0 | | |
| A3-Offset | dB | 1-6 | -4.5 | | |
| CP length | | 1-6 | Normal | | |
| Hysteresis | dB | 1-6 | 0 | | |
| Time To Trigger | s | 1-6 | 0 | | |
| Filter coefficient | | 1-6 | 0 | | L3 filtering is not used |
| DRX | | 1-6 | DRX.1 | DRX.7 | |
| Time offset between PCell and PSCell | | 1-6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1,4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| | | 2,5 | 3 µs | | Synchronous cells |
| | | 3,6 | 3 µs | | Synchronous cells |
| T1 | s | 1-6 | 5 | | |
| T2 | s | 1-6 | 5 | 10 | |

#### 4.6.1.4.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters of NR cells according to T1 in Table 4.6.1.4.5-1.
3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.
4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.4.5-1. T2 starts.
6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.
11. Repeat step 1-10 for each sub-test in Table 4.6.1.4.4.1-3 as appropriate.

#### 4.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.7-1 with Condition DRX.1 and Gap for test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap for test 2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.5-8 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4 | Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.6.1.4.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

**Table 4.6.1.4.4.3-3**

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

### 4.6.1.4.5 Test requirement

Tables 4.6.1.4.4.1-3 and 4.6.1.4.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

**Table 4.6.1.4.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,4 | N/A | | N/A | |
| | | 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1,4 | SR.1.1 FDD | | N/A | |
| | | 2,5 | SR.1.1 TDD | | | |
| | | 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2,5 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3,6 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1,4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2,5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1-6 | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | TRS.1.1 FDD | | N/A | |
| | | 2,5 | TRS.1.1 TDD | | N/A | |
| | | 3,6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1-6 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1-6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1-6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1-6 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,4 | -98 | | | |
| | | 2,5 | -98 | | | |
| | | 3,6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1,4 | -98 | | | |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1,4 | 4 | 4 | -Infinity | 4 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1,4 | -94 | -94 | -Infinity | -94 |
| | | 2,5 | -94 | -94 | -Infinity | -94 |
| | | 3,6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1-6 | AWGN | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

For Test 1:

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_ntra}$ = max (600ms, ceil(1.5x 5 x $K_p$) x max (SMTC period,DRX cycle)) x $CSSF_{intra}$ = max (600ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil(1.5x 5 x $K_p$) x max (SMTC period,DRX cycle)) x $CSSF_{intra}$ = max (200ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x1 = 320ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2:

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_ntra}$ = ceil (5 x $K_p$) x DRX cycle x $CSSF_{intra}$ = ceil (5 x1) x 640ms x 1 = 3200ms

$T_{SSB_measurement_period_intra}$ = ceil (5 x $K_p$ ) x DRX cycle x $CSSF_{intra}$ = ceil (5 x1) x 640ms x 1 = 3200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 6402 ms in this test case (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection

#### 4.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

#### 4.6.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

#### 4.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.5.

#### 4.6.1.5.4 Test description

##### 4.6.1.5.4.1 Initial conditions

Test 4.6.1.5 can be run in one of the configurations defined in Table 4.6.1.5.4.1-1.

**Table 4.6.1.5.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 4.6.1.5-1 | LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.5-2 | LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

**Table 4.6.1.5.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.6.1.5.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.5.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

**Table 4.6.1.5.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2 | E-UTRAN Cell 1 and NR Cell 2 | |
| Neighbour cell | | 1,2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| SMTC configuration | | 1,2 | SMTC.2 | |
| A3-Offset | dB | 1,2 | -4.5 | |
| CP length | | 1,2 | Normal | |
| Hysteresis | dB | 1,2 | 0 | |
| Time To Trigger | s | 1,2 | 0 | |
| Filter coefficient | | 1,2 | 0 | L3 filtering is not used |
| DRX | | 1,2 | N/A | OFF |
| Time offset between PCell and PSCell | | 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1,2 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1,2 | 5 | |
| T2 | s | 1,2 | 5 | |

4.6.1.5.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.5.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.5.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.5.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition SSB.1 FR1 and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |

4.6.1.5.5 Test requirement

Tables 4.6.1.5.4.1-3 and 4.6.1.5.5-1 define the primary level settings including test tolerances for EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection.

**Table 4.6.1.5.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,2 | N/A | | N/A | |
| PDSCH RMC configuration | | 1,2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1,2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Patterns | | 1,2 | OP.1 | | OP.1 | |
| TRS configuration | | 1,2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1,2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1,2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1,2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1,2 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1,2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1,2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition | | 1,2 | AWGN | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})$ ms

- $T_{PSS/SSS_sync_intra}$ = max (600ms, ceil (5 x $K_p$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

- $T_{SSB_measurement_period_intra}$ = max (200ms, ceil ( 5 x $K_p$) x SMTC period )$^{Note\ 1}$ x $CSSF_{intra}$ = max (200ms, ceil( 5 x 1) x 20ms) x 1 = 200ms

- $T_{SSB_time_index_intra}$ = max (120ms, ceil (3 x $K_p$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (120ms, ceil ( 3 x 1 ) x 20ms) x 1 = 120ms

  TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection

### 4.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

### 4.6.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

### 4.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.6.

### 4.6.1.6.4 Test description

#### 4.6.1.6.4.1 Initial conditions

Test 4.6.1.6 can be run in one of the configurations defined in Table 4.6.1.6.4.1-1.

**Table 4.6.1.6.4.1-1: Supported test configurations for NR FR1 Cell**

| Configuration | Description |
|---|---|
| 4.6.1.6-1 | LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.6-2 | LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.6.4.1-2.

**Table 4.6.1.6.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 4.6.1.6.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.6.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

**Table 4.6.1.6.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2 | E-UTRAN Cell 1 and NR Cell 2 | |
| Neighbour cell | | 1,2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| Measurement gap type | | 1,2 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1,2 | 40 | |
| Measurement gap length | ms | 1,2 | 6 | |
| Measurement gap offset | ms | 1,2 | 39 | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| SMTC configuration | | 1,2 | SMTC.2 | |
| CSI-RS parameters | | 1,2 | CSI-RS.1.2 FDD resource #0 | |
| A3-Offset | dB | 1,2 | -4.5 | |
| CP length | | 1,2 | Normal | |
| Hysteresis | dB | 1,2 | 0 | |
| Time To Trigger | s | 1,2 | 0 | |
| Filter coefficient | | 1,2 | 0 | L3 filtering is not used |
| DRX | | 1,2 | N/A | OFF |
| Time offset between PCell and PSCell | | 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1,2 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1,2 | 5 | |
| T2 | s | 1,2 | 5 | |

### 4.6.1.6.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters of NR cells according to T1 in Table 4.6.1.6.5-1.
3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.
4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.6.5-1. T2 starts.
6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.6.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 4.6.1.6-1<br>Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.5-8 |

**Table 4.6.1.6.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| **Condition** | **Explanation** |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

4.6.1.6.5 Test requirement

Tables 4.6.1.6.4.1-3 and 4.6.1.6.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading.

**Table 4.6.1.6.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,2 | N/A | | N/A | |
| PDSCH RMC configuration | | 1,2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1,2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| OCNG Patterns | | 1,2 | OP.1 | | OP.1 | |
| TRS configuration | | 1,2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1,2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1,2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1,2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1,2 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,2 | -98 | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1,2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s / N_{oc}$ | dB | 1,2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1,2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 | -62.25 | -64.60 | -62.25 |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Propagation Condition | | 1,2 | AWGN | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})$ ms

$T_{PSS/SSS_sync_ntra}$ = max (600ms, ceil (5 x $K_p$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil ( 5 x $K_p$) x SMTC period )$^{Note\ 1}$ x $CSSF_{intra}$ = max (200ms, ceil( 5 x 1) x 20ms) x 1 = 200ms

$T_{SSB_time_index_intra}$ = max (120ms, ceil (3 x $K_p$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (120ms, ceil ( 3 x 1 ) x 20ms) x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

### 4.6.1.7.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with *highSpeedMeasFlag-r16*. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

### 4.6.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, long DRX cycle, measurement enhancements in HST.

### 4.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.7.

### 4.6.1.7.4 Test description

#### 4.6.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.7.4.1-1.

**Table 4.6.1.7.4.1-1: supported test configurations for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Configuration | Description |
|---|---|
| 4.6.1.7-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.1.7-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.1.7-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.1.7-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.7.4.1-2 and Table 4.6.1.7.4.1-3.

**Table 4.6.1.7.4.1-2: Initial conditions for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 4.6.1.7.4.1-3: General test parameters for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| *highSpeedMeasFlag-r16* | | 1,2,3,4,5,6 | Present | To enable high speed measurement enhancements |
| Active cell | | 1, 2, 3,4,5,6 | E-UTRAN Cell 1 and NR Cell 2 | |
| Neighbour cell | | 1, 2, 3,4,5,6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3,4,5,6 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| SSB configuration | | 1,4 | SSB.1 FR1 | |
| | | 2,5 | SSB.1 FR1 | |
| | | 3,6 | SSB.2 FR1 | |
| SMTC configuration | | 1,4 | SMTC.2 | |
| | | 2,5 | SMTC.1 | |
| | | 3,6 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3,4,5,6 | -4.5 | |
| CP length | | 1, 2, 3,4,5,6 | Normal | |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Hysteresis | dB | 1, 2, 3,4,5,6 | 0 | |
| Time To Trigger | s | 1, 2, 3,4,5,6 | 0 | |
| Filter coefficient | | 1, 2, 3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3,4,5,6 | DRX.7. | 640ms DRX cycle |
| Time offset between PCell and PSCell | | 1, 2, 3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1,4 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2,5 | 3 μs | Synchronous cells |
| | | 3,6 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3,4,5,6 | 5 | |
| T2 | s | 1, 2, 3,4,5,6 | 6 | |

1. Message contents are defined in clause 4.6.1.7.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

#### 4.6.1.7.4.2 Test procedure

Same test procedure as in clause 4.6.1.1.4.2 with Step 1 and 8 are replaced by following:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE is configured with *highSpeedMeasFlag-r16.*

8. UE shall transmit a *MeasurementReport* message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 5122 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

#### 4.6.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.7.4.3-0: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.7-1 with Condition DRX.7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4 | Table H.3.1-3 with Condition SSB.1 FR1 and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.6.1.7.4.3-1: Void**

**Table 4.6.1.7.4.3-2: Void**

**Table 4.6.1.7.4.3-3: CellGroupConfig (Step 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex for Cell 2 | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon | ServingCellConfigCommon | Table 4.6.1.7.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.1.7.4.3-4: ServingCellConfigCommon (Table 4.6.1.7.4.3-3)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| highSpeedConfig-r16 SEQUENCE { | | | |
| highSpeedMeasFlag-r16 | true | | |
| } | | | |
| } | | | |

4.6.1.7.5 Test requirement

Table 4.6.1.7.4.1-2 and Table 4.6.1.7.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.1.7.5-1: NR Cell specific test parameters for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,4 | N/A | | N/A | |
| | | 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1,4 | SR.1.1 FDD | | N/A | |
| | | 2,5 | SR.1.1 TDD | | | |
| | | 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1,4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2,5 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3,6 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1,4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2,5 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3,4,5,6 | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | TRS.1.1 FDD | | N/A | |
| | | 2,5 | TRS.1.1 TDD | | N/A | |
| | | 3,6 | TRS.1.2 TDD | | N/A | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Initial BWP configuration | | 1, 2, 3,4,5,6 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3,4,5,6 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3,4,5,6 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3,4,5,6 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,4 | -98 | | | |
| | | 2,5 | -98 | | | |
| | | 3,6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,4 | -98 | | | |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1,4 | 4 | 4 | -Infinity | 4 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1,4 | -94 | -94 | -Infinity | -94 |
| | | 2,5 | -94 | -94 | -Infinity | -94 |
| | | 3,6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2,4,5 | AWGN | | AWGN 1944 Hz Note 4 | |
| | | 3,6 | AWGN | | AWGN 3334 Hz Note 5 | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
NOTE 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index} + 2 \times TTI_{DCCH}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$, is the measurement reporting delay.

$T_{PSS/SSS_sync_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200$ ms, is the time period used in PSS/SSS detection defined in TS 38.133 [6] clause 9.2.5.1

$T_{SSB_measurement_period_intra} = ceil(Y \times K_p) \times DRX\ cycle \times CSSF_{intra} = 1920$ ms, equal to a measurement period of SSB based measurement defined in TS 38.133 [6] clause 9.2.5.2.

Where:

$K_p = 1$ for intra-frequency SMTC which is fully non-overlapping with measurement gaps;

DRX cycle = 640 as given in Table 4.6.1.7.4.1-3;

$CSSF_{intra}$ = 1 when only 1 intra-frequency layer is configured.

Y = 3 for DRX cycle =640 ms and SMTC period = 20 ms as given in Table 4.6.1.7.4.1-3.

$TTI_{DCCH}$ = 1 ms, is the TTI insertion uncertainty.

That gives a total of 5122 ms.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

## 4.6.1.8 EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

### 4.6.1.8.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasCA-Scell-r17. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.

### 4.6.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced NR CA measurement requirements in high-speed scenario.

### 4.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.8.

### 4.6.1.8.4 Test description

#### 4.6.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.8.4.1-1.

**Table 4.6.1.8.4.1-1: Supported PCell and PSCell test configurations for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Configuration | Description |
|---|---|
| 4.6.1.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.8-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.1.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.1.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.1.8-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

**Table 4.6.1.8.4.1-1A: Supported SCell test configurations for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| $Configuration_{SCell}$ | Description |
|---|---|
| 4.6.1.8-1A | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.1.8-2A | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.1.8-3A | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

| | |
|---|---|
| Note 2: | The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. |
| Note 3: | NR Cell 4 has the same SCS, BW and duplex mode as NR Cell 3. |

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.8.4.1-2.

**Table 4.6.1.8.4.1-2: Initial conditions for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.6.1.8.4.1-3.
2. Message contents are defined in clause 4.6.1.8.4.3.
3. There are four cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as deactivated SCell in FR1 on NR RF channel 2 and NR cell 4 as neighbour cell on NR RF channel 2.

**Table 4.6.1.8.4.1-3: General test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| highSpeedMeasCA-Scell-r17 | | Config 1,2,3,4,5,6 | Present | To enable high speed measurement enhancements |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Deactivated Scell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 4 | NR cell 4 is on NR RF channel number 2. |
| A6-Offset | dB | Config 1,2,3,4,5,6 | -4.5 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| Measurement gap pattern Id | | | OFF | |
| SCell measurement cycle (measCycleSCell) | | Config 1,2,3,4,5,6 | 160 ms | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering not used |

| | | | | |
|---|---|---|---|---|
| DRX | | Config 1,2,3,4,5,6 | DRX.14 | |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between PSCell and deactivated SCell | | Config 1,4 | 3 ms | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 1 | |

#### 4.6.1.8.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3 and cell 4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.
3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) and the deactivated SCell (NR Cell 3) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.8.4.3.
4. Set the parameters according to T1 in Table 4.6.1.8**.**4.1**-**2. Propagation conditions are set according to Annex C clauses C.2.2.
5. The SS shall transmit an *RRCConnectionReconfiguration* message with event A6 configured for NR cell 4.
6. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. T1 starts.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.8**.**4.1**-**2.
8. UE shall transmit a *MeasurementReport* message triggered by Event A6 for NR Cell 4 on PCell (LTE Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 1602 ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement, then the number of failure tests is increased by one.
9. The SS waits until the *MeasurementReport* message is received or when T2 expires.
10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 3) mod 1008)] for next iteration of the test procedure loop.
12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
13. If any the reconfiguration fails, switch off and on the UE and proceed with step 1. Otherwise proceed with step 2.
14. Repeat steps 2-12 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.1.8.4.3-1: Common Exception messages for Additional EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.7-1 with Condition DRX.14<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-1 and 4.6.1.8-4 | Table H.3.1-3 with Condition SSB.1 FR1 and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-2 and 4.6.1.8-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.6.1.8-3 and 4.6.1.8-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.6.1.8.4.3-2: *ReportConfigNR-DEFAULT*(a6-offset): NR report configuration for event A6**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA6 SEQUENCE { | | | |
| a6-Offset CHOICE { | | | |
| rsrp | -9 | The actual value is field value * 0.5 dB. | |
| } | | | |
| hysteresis | 0 | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.1.8.4.3-3: *ServingCellConfigCommon***

| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| HighSpeedConfig-v1700 SEQUENCE { | | | |
| highSpeedMeasCA-Scell-r17 | true | | |
| } | | | |
| } | | | |

**Table 4.6.1.8.4.3-4: *MeasObjectNR-DEFAULT*: measCycleSCell configuration for SCell intra-frequency measurements**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

4.6.1.8.5 Test requirement

Table 4.6.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 event triggered reporting.

**Table 4.6.1.8.5-1: NR cell specific test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | Cell 4 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | | FDD | |
| | | Config 2,3,5,6 | TDD | | | | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | DLBWP.1.1 | | DLBWP.1.1 | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | | NA | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | NA | | NA | |
| | | Config 2,5 | TRS.1.1 TDD | | NA | | NA | |
| | | Config 3,6 | TRS.1.2 TDD | | NA | | NA | |
| OCNG Patterns defined in clause A.3.2.1.1 (OP.1) | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | SR.1.1 FDD | | SR.1.1 FDD | |
| | | Config 2,5 | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | | Config 3,6 | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | CR.1.1 FDD | | CR.1.1 FDD | |
| | | Config 2,5 | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | | Config 3,6 | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | Config 2,5 | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | | SSB.5 FR1 | |
| | | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | | SSB.5 FR1 | |
| | | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.5 | | SMTC.5 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | | | |
| | | Config 3,6 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15kHz | | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/ SCS | Config 1,2,4,5 | -98 | | -98 | | -98 | |
| | | Config 3,6 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2,4,5 | -94 | -94 | -94 | -94 | -Infinity | -94 |
| | | Config 3,6 | -91 | -91 | -91 | -91 | -Infinity | -91 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | 4 | 4 | -Infinity | 4 |
| Io Note3 | dBm/ 9.36 MHz | Config 1,2,4,5 | -64.59 | -64.59 | -64.59 | -62.26 | -64.59 | -62.26 |
| | dBm/ 38.16 MHz | Config 3,6 | -58.49 | -58.49 | -58.49 | -56.15 | -58.49 | -56.15 |
| Propagation Condition | | Config 1,2,4,5 | AWGN | | AWGN | | AWGN 1944Hz Note 5 | |
| | | Config 3,6 | AWGN | | AWGN | | AWGN 3334Hz Note 6 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.

Note 6: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 1600 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test is 2ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.2 Inter-frequency measurements

### 4.6.2.0 Minimum conformance requirements for inter-frequency measurements

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,

- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to clause B.2.3 for a corresponding Band.

[TS 38.133-f50, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in Table 4.6.2.0-1 and Table 4.6.2.0-4 when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in Table 4.6.2.0-3 and Table 4.6.2.0-5 when *highSpeedMeasInterFreq* is configured and UE supports measurementEnhancementInterFreq-r17.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in Table 4.6.2.0-6.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in Table 4.6.2.0-6 and Table 4.6.2.0-7 when *highSpeedMeasInterFreq* is configured and UE supports [measurementEnhancementInterFreq-r17.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

**Table 4.6.2.0-1: Time period for PSS/SSS detection, (FR1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $Max(600ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(600ms, Ceil(8*1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $8 \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1.<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 4.6.2.0-2 FFS**

**Table 4.6.2.0-3: Time period for time index detection (FR1)**

| Condition NOTE1,2 | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | $Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(120ms, Ceil(3 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $3 \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1.<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 4.6.2.0-4: Time period for PSS/SSS detection when highSpeedMeasInterFreq-r17 is configured (FR1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $max(600ms, N1 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |

| | |
|---|---|
| | N1 = 7 |
| DRX cycle ≤ 160ms | max(600ms, ceil(N2) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$<br>N2 = 7 x M2 |
| 160ms < DRX cycle ≤ 320ms | ceil(N3) x DRX cycle x $CSSF_{inter}$<br>N3 = 7 x M2 |
| DRX cycle>320ms | N4 x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.<br>NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.<br>NOTE 3: N4=6 if SMTC periodicity > 40 ms, otherwise N4=5. | |

**Table 4.6.2.0-5: Time period for time index detection when highSpeedMeasInterFreq-r17 is configured (FR1)**

| Condition NOTE1,2 | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 NOTE3) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320ms | 3 × DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1.<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.<br>NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |

[TS 38.133-f50, clause 9.3.5]

When measurement gaps are provided for inter-frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in Table 4.6.2.0-6. When *highSpeedMeasInterFreq-r17* is configured, and UE supports *measurementEnhancementInterFreq-r17*, $T_{SSB_measurement_period_inter}$ is specified in Table 4.6.2.0-7:

**Table 4.6.2.0-6: Measurement period for inter-frequency measurements with gaps (FR1)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320ms | 8 × DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 4.6.2.0-7: Measurement period for inter-frequency measurements with gaps when highSpeedMeasInterFreq-r17 is configured (FR1)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, 7 × Max(MGRP, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 160ms | max(200ms, ceil(7 x M2 NOTE3) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| 160ms < DRX cycle ≤ 320ms | ceil(7 x M2 NOTE3) x DRX cycle x $CSSF_{inter}$ |
| DRX cycle>320ms | 4 x M2 NOTE3 x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.<br>NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |

[TS 38.133, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. Both $T_{identify_inter_without_index}$ and $T_{identify_inter_with_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

## 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX

### 4.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

### 4.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 4.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.1.

### 4.6.2.1.4 Test description

#### 4.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.1.4.1-2. Test environment parameters are given in Table 4.6.2.1.4.1-3.

**Table 4.6.2.1.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

**Table 4.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 1 | |

**Table 4.6.2.1.4.1-3: Test environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

#### 4.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.1.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 920 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting tests in non-DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-1 and 4.6.2.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-2 and 4.6.2.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.1-3 and 4.6.2.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 4.6.2.1.4.3-2: SchedulingRequest-Config for E-UTRAN PCell**

| Derivation Path: 36.508 [25], Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 23 | | TDD |
| } | | | |
| } | | | |

4.6.2.1.5 Test requirement

Table 4.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | |
| | | Config 2,3,5,6 | TDD | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | NA | |
| | | Config 2,5 | TRS.1.1 TDD | | NA | |
| | | Config 3,6 | TRS.1.2 TDD | | NA | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | | Config 3,6 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | | - | |
| | | Config 2,5 | CCR.1.1 TDD | | | |
| | | Config 3,6 | CCR 2.1 TDD | | | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| | | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the

reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX

### 4.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

### 4.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

### 4.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.2.

### 4.6.2.2.4 Test description

#### 4.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.2.4.1-2. Test environment parameters are given in Table 4.6.2.2.4.1-3.

**Table 4.6.2.2.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.2.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations. | |
| NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

**Table 4.6.2.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | As specified in A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 11 | |

**Table 4.6.2.2.4.1-3: Test environment parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

### 4.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 4.6.2.2.4.1-2 and Table 4.6.2.2.5-1.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.2.5-1. T2 starts.
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1 or 10240 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.2.2.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting with SSB test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2<br><br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 4.6.2.2-1 and 4.6.2.2-4 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.2-2 and 4.6.2.2-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.2-3 and 4.6.2.2-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 4.6.2.2.4.3-2: SchedulingRequest-Config for E-UTRAN PCell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 23 | | TDD |
| } | | | |
| } | | | |

4.6.2.2.5 Test requirement

Table 4.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| **Parameter** | **Unit** | **Test configuration** | **Cell 2** | | **Cell 3** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | |
| | | Config 2,3,5,6 | TDD | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | NA | |
| | | Config 2,5 | TRS.1.1 TDD | | NA | |
| | | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | | - | |
| | | Config 2,5 | CCR.1.1 TDD | | | |
| | | Config 3,6 | CCR 2.1 TDD | | | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| | | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.2.3 Void

### 4.6.2.4 Void

### 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

#### 4.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

#### 4.6.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 4.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.3.

#### 4.6.2.5.4 Test description

##### 4.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.5.4.1-2. Test environment parameters are given in Table 4.6.2.5.4.1-3.

**Table 4.6.2.5.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.2.5 -1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.5 -2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.5 -5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.5 -6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

**Table 4.6.2.5.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | As specified in TS 38.133 clause 9.1.2-1. |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | |

**Table 4.6.2.5.4.1-3: Test environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.2.5.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

#### 4.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.5.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.5.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1040 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.)

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting tests in non-DRX with SSB test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-1 and 4.6.2.5-4 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-2 and 4.6.2.5-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.5-3 and 4.6.2.5-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 4.6.2.5.4.3-2: SchedulingRequest-Config for E-UTRAN PCell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 23 | | TDD |
| } | | | |
| } | | | |

4.6.2.5.5 Test requirement

Table 4.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | |
| | | Config 2,3,5,6 | TDD | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | NA | |
| | | Config 2,5 | TRS.1.1 TDD | | NA | |
| | | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | | - | |
| | | Config 2,5 | CCR.1.1 TDD | | | |
| | | Config 3,6 | CCR 2.1 TDD | | | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| | | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection

#### 4.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

#### 4.6.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

#### 4.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.6.

#### 4.6.2.6.4 Test description

##### 4.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.6.4.1-2. Test environment parameters are given in Table 4.6.2.6.4.1-3.

**Table 4.6.2.6.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.2.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.6-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.2.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.2.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.2.6-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

**Table 4.6.2.6.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 1.3 | 13.5 | |

**Table 4.6.2.6.4.1-3: Test environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.2.6.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

### 4.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.6.4.1-2 and Table 4.6.2.6.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1 or 12160 ms for Test 2, then the number of successful tests is increased by one. If the

UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting in DRX with SSB test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-1 and 4.6.2.6-4 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-2 and 4.6.2.6-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.6-3 and 4.6.2.6-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 4.6.2.6.4.3-2: SchedulingRequest-Config for E-UTRAN PCell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 23 | | TDD |
| } | | | |
| } | | | |

4.6.2.6.5 Test requirement

Table 4.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | |
| | | Config 2,3,5,6 | TDD | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | | - | |
| | | Config 2,5 | CCR.1.1 TDD | | | |
| | | Config 3,6 | CCR 2.1 TDD | | | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | | |
| | | Config 3,6 | TDDConf.2.1 | | | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | N/A | |
| | | Config 2,5 | TRS.1.1 TDD | | N/A | |
| | | Config 3,6 | TRS.1.2 TDD | | N/A | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| | | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. with a confidence level of 95%.

In test 1 and 2, UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.2.7 Void

## 4.6.2.8 Void

## 4.6.2.9 EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

### 4.6.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasInterFreq-r17. This test will partly verify the EN-DC inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

#### 4.6.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward supporting enhanced inter-frequency NR measurement requirements in high-speed scenario (measurementEnhancementInterFreq-r17, as defined in TS 38.306).

#### 4.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause 4.6.2.9.

#### 4.6.2.9.4 Test description

##### 4.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.9.4.1-1.

**Table 4.6.2.9.4.1-1: Supported test configurations for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Configuration | Description |
|---|---|
| 4.6.2.9-1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.2.9-2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.2.9-5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.2.9-6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.2.9.4.1-2.

**Table 4.6.2.9.4.1-2: Initial conditions for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 4.6.2.9.4.1-3.
2. Message contents are defined in clause 4.6.2.9.4.3.
3. There are three cells in the test, LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

**Table 4.6.2.9.4.1-3: General test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies is used. |

| | | | | |
|---|---|---|---|---|
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.14 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 3 | |

#### 4.6.2.9.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.2.9.4.3.

4. Set the parameters according to T1 in Table 4.6.2.9.4.1-2 and Table 4.6.2.9.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

5. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 with event A3 configured for NR cell 3.

6. The UE shall transmit *RRCConnectionReconfigurationComplete* message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.9.5-1. T2 starts.

8. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2242 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

9. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25]

Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE proceeds with step 1. Otherwise proceed with step 2.

11. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.2.9.4.3-1: Common Exception messages for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.14<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-1 and 4.6.2.9-4 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-2 and 4.6.2.9-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 4.6.2.9-3 and 4.6.2.9-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 4.6.2.9.4.3-2: ServingCellConfigCommon**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| HighSpeedConfig-v1700 SEQUENCE { | | | |
| highSpeedMeasInterFreq-r17 | true | | |
| } | | | |
| } | | | |

#### 4.6.2.9.5 Test requirement

Table 4.6.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17.

**Table 4.6.2.9.5-1: NR cell specific test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | | |

| | | | | |
|---|---|---|---|---|
| | | Config 2,3,5,6 | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | NA |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | NA |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | NA |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | NA |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | NA |
| | | Config 2,5 | TRS.1.1 TDD | NA |
| | | Config 3,6 | TRS.1.2 TDD | NA |
| OCNG Patterns defined in clause A.3.2.1.1 (OP.1) | | Config 1,2,3,4,5,6 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | - |
| | | Config 2,5 | SR.1.1 TDD | |
| | | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | - |
| | | Config 2,5 | CR.1.1 TDD | |
| | | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 | CCR.1.1 FDD | - |
| | | Config 2,5 | CCR.1.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | |
| SSB parameters | | Config 1,4 | SSB.1 FR1 | SSB.5 FR1 |
| | | Config 2,5 | SSB.1 FR1 | SSB.5 FR1 |
| | | Config 3,6 | SSB.2 FR1 | SSB.6 FR1 |
| SMTC configuration | | Config 1,4 | SMTC.2 | SMTC.5 |
| | | Config 2,3,5,6 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | |
| | | Config 3,6 | 30 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | -98 |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | -98 |
| | | Config 3,6 | -95 | -95 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16 MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2, 4,5 | AWGN | | AWGN 1944Hz Note 5 | |
| | | Config 3,6 | | | AWGN 3334Hz Note 6 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 6: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test is 2ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.3 Void

## 4.6.4 L1-RSRP measurement for beam reporting

### 4.6.4.0 Minimum conformance requirements

#### 4.6.4.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 4.6.4.0.1-1 for FR1,

where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

For FR1,

- $P=\frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

$T_{SSB}$ = ssb-periodicityServingCell

$T_{SMTCperiod}$ = the configured SMTC period

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 4.6.4.0.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| NOTE 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: K = 1 when $T_{SSB}$ ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.214 [24] [xxx: need further check].

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If SSB and CSI-RS have different SCS,

  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

#### 4.6.4.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 4.6.4.0.2-1for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-RSRP measurement

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 4.6.4.0.2-1: Measurement period $T_{L1-RSRP_Measurement_Period_CSI-RS}$ for FR1**

| Configuration | $T_{L1-RSRP_Measurement_Period_CSI-RS}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320ms | ceil(M*P)*$T_{DRX}$ |
| NOTE 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.<br>NOTE 3: K = 1 when $T_{CSI-RS}$ ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 36.300 [24] [xxx: need further check].

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

## 4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX

### 4.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 4.6.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 4.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.1.

### 4.6.4.1.4 Test description

#### 4.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.1.4.1-2. Test environment parameters are given in Table 4.6.4.1.4.1-3.

**Table 4.6.4.1.4.1-1: EN-DC SSB based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.4.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.1-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.4.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.1-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.4.1.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |

| Parameter | Config | Unit | Value |
|---|---|---|---|
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| DRX configuration | 1~6 | | Off |
| reportConfigType | 1~6 | | periodic |
| reportQuantity | 1~6 | | ssb-Index-RSRP |
| Number of reported RS | 1~6 | | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.4.1.4.1-3: Test environment parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.4.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

#### 4.6.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.6.4.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 4.6.4.1.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.4.1.5-1. T2 starts.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.1.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.1.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.4.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table H.3.6-10<br>Table H.3.4-1 |

**Table 4.6.4.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.6.4.1.5 Test requirement

Table 4.6.4.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.4.1.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3,6 | | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |

The UE shall send L1-RSRP report every 80 slots. After 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.1.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.1.5-4 for all test configurations.

**Table 4.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 4.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 4.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX

### 4.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 4.6.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

### 4.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.2.

### 4.6.4.2.4 Test description

#### 4.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.2.4.1-2. Test environment parameters are given in Table 4.6.4.2.4.1-3.

**Table 4.6.4.2.4.1-1: EN-DC SSB based L1-RSRP measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.4.2.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | periodic |
| reportQuantity | 1~6 | | ssb-Index-RSRP |
| Number of reported RS | 1~6 | | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.4.2.4.1-3: Test environment parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.4.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.2.4.1-2.

### 4.6.4.2.4.2 Test procedure

Same test procedure as in clause 4.6.4.1.4.2 with Table 4.6.4.1.4.1-2 and Table 4.6.4.1.5-1 replaced by Table 4.6.4.2.4.1-2 and Table 4.6.4.2.5-1.

### 4.6.4.2.4.3 Message contents

Same message content as in clause 4.6.4.1.4.3 with the following exception:

**Table 4.6.4.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

### 4.6.4.2.5 Test requirement

Table 4.6.4.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.4.2.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3,6 | | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for | | | | | | |

$N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.2.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.2.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.2.5-4 for all test configurations.

**Table 4.6.4.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 4.6.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 4.6.4.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX

### 4.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

### 4.6.4.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 4.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.3.

### 4.6.4.3.4 Test description

#### 4.6.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.3.4.1-2. Test environment parameters are given in Table 4.6.4.3.4.1-3.

**Table 4.6.4.3.4.1-1: EN-DC CSI-RS based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.6.4.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.3-3 | LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| 4.6.4.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 4.6.4.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 4.6.4.3-6 | LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.4.3.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| CSI-RS configuration | 1,4 | | CSI-RS 1.3 FDD |
| | 2,5 | | CSI-RS 1.3 TDD |
| | 3,6 | | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | Off |
| reportConfigType | 1~6 | | aperiodic |
| reportQuantity | 1~6 | | cri-RSRP |
| Number of reported RS | 1~6 | | 2 |
| qcl-Info | 1~6 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |

| Parameter | Config | Unit | Value |
|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.4.3.4.1-3: Test environment parameters for EN-DC CSI-RS L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.4.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

### 4.6.4.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 4.6.4.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.4.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 2 for configuration 1,4, slot 5 for config 2,5 and slot 8 for configuration 3,6. The corresponding CSI-RS set is transmitted with the offset of 0 slots after the DCI trigger.

4. The SS shall check following requirements:

   R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.3.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for

CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 4.6.4.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. Void

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.4.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | TBD |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and APERIODIC<br>Table H.3.4-1<br>TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC |

**Table 4.6.4.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

**Table 4.6.4.3.4.3-3: Physical layer parameters for DCI format 1_1**

| Derivation Path: TS 38.508-1 [14], Table 7.2.2.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| PDSCH-to-HARQ_feedback timing indicator | K1 = 3 if mod(i,10) = 8<br><br>where i is slot index per frame; i = {0,…,9} | - | Config1,4 (NR FDD) |

| | | | |
|---|---|---|---|
| PDSCH-to-HARQ_feedback timing indicator | K1 = 6 if mod(i,20) = 11<br><br>where i is slot index per frame; i = {0,…,19} | - | Config3,6 (NR TDD30kHz) |

4.6.4.3.5 Test requirement

Table 4.6.4.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.4.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS L1-RSRP measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s / I_{ot}$ | 1~6 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.15 |
| | 3,6 | | -91.65 | -88.14 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.59 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 0 | 3.5 |
| NOTE 1: Void.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the beginning of T2. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 4.6.4.3.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.3.5-4 for all test configurations.

**Table 4.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

**Table 4.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

**Table 4.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX

### 4.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

### 4.6.4.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

### 4.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.4.

### 4.6.4.4.4 Test description

#### 4.6.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.4.4.1-2. Test environment parameters are given in Table 4.6.4.4.4.1-3.

**Table 4.6.4.4.4.1-1: EN-DC CSI-RS based L1-RSRP measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.4.4.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |

| Parameter | Config | Unit | Value |
|---|---|---|---|
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| CSI-RS configuration | 1,4 | | CSI-RS 1.3 FDD |
| | 2,5 | | CSI-RS 1.3 TDD |
| | 3,6 | | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | aperiodic |
| reportQuantity | 1~6 | | cri-RSRP |
| Number of reported RS | 1~6 | | 2 |
| qcl-Info | 1~6 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| NOTE: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.4.4.4.1-3: Test environment parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.4.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.4.4.1-2.

#### 4.6.4.4.4.2 Test procedure

Same test procedure as in clause 4.6.4.3.4.2 with Table 4.6.4.3.4.1-2 and Table 4.6.4.3.5-1 replaced by Table 4.6.4.4.4.1-2 and Table 4.6.4.4.5-1.

#### 4.6.4.4.4.3 Message contents

Same message content as in clause 4.6.4.3.4.3 with the following exception:

**Table 4.6.4.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 and Offset |

#### 4.6.4.4.5 Test requirement

Table 4.6.4.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.4.4.5-1: CSI-RS specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.15 |
| | 3,6 | | -91.65 | -88.14 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.59 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | 0 | 3.5 |
| NOTE 1: Void. | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.4.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.4.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.4.5-4 for all test configurations.

**Table 4.6.4.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 |
|---|---|

| | |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

**Table 4.6.4.4.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

**Table 4.6.4.4.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feasibility of configuring different channel models to different SSBs needs further study.

- The TT analysis may need to be redone after concluding if the new test configuration is testable.

### 4.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*.

To verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in TS 38.133 [6] clause 9.5.4.1.

### 4.6.4.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, HST enhancement and long DRX cycle.

### 4.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.5.

### 4.6.4.5.4 Test description

#### 4.6.4.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.5.4.1-2. Test environment parameters are given in Table 4.6.4.5.4.1-3.

**Table 4.6.4.5.4.1-1: Supported test configurations for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16**

| Config | Description |
|---|---|
| 4.6.4.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.4.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4.6.4.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.4.5-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.4.5.4.1-2: General test parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | periodic |
| reportQuantity | 1~6 | | ssb-Index-RSRP |
| Number of reported RS | 1~6 | | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 2 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |

| Parameter | Config | Unit | Value |
|---|---|---|---|
| DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| NOTE: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.4.5.4.1-3: Test environment parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.4.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.4.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.5.4.1-2.

### 4.6.4.5.4.2 Test procedure

Same test procedure as in clause 4.6.4.1.4.2 with Table 4.6.4.1.4.1-2 and Table 4.6.4.1.5-1 replaced by Table 4.6.4.5.4.1-2 and Table 4.6.4.5.5-1. Step 7 is also replaced by the following step.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.5.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.5.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.5.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 4.6.4.5.4.3 Message contents

In addition to the same message contents as clause 4.6.4.2.4.3, the following exceptions are also needed:

**Table 4.6.4.5.4.3-1: Void**

**Table 4.6.4.5.4.3-2: Void**

**Table 4.6.4.5.4.3-3: CellGroupConfig (Step 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex for Cell 2 | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon | ServingCellConfigCommon | Table 4.6.4.5.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.4.5.4.3-4: ServingCellConfigCommon (Table 4.6.4.5.4.3-3)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| highSpeedConfig-r16 SEQUENCE { | | | |
| highSpeedMeasFlag-r16 | true | | |
| } | | | |
| } | | | |

#### 4.6.4.5.5 Test requirement

Table 4.6.4.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.4.5.5-1: SSB specific test parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3,6 | | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | 0 | 0 | -Infinity | 3.5 |
| Propagation conditions | 1,2,4,5 | | AWGN | | AWGN 1944 Hz Note4 | |
| | 3,6 | | AWGN | | AWGN 3334 Hz Note5 | |
| NOTE 1 The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |

| | |
|---|---|
| NOTE 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz. |
| Note 5: | The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz. |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.5.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.5.5-4 for all test configurations.

**Table 4.6.4.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 4.6.4.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 4.6.4.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.5 CLI measurements

### 4.6.5.0 Minimum conformance requirements

#### 4.6.5.0.1 Minimum conformance requirements for SRS-RSRP measurement

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

**Table 4.6.5.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$**

| Configuration | $T_{SRS_measurement_period}$ (ms) |
|---|---|
| No DRX | Max(60, 3 X $T_{SRS}$) |
| DRX cycle ≤ 320ms | Max(60, Ceil(1.5 X 3) X max($T_{SRS}$, $T_{DRX}$)) |
| DRX cycle > 320ms | 3 X $T_{DRX}$ |
| NOTE: $T_{SRS}$ is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and $T_{DRX}$ is the DRX cycle length. | |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements apply, provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 of TS 38.133 [6] for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 of TS 38.133 [6] for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 of TS 38.133 [6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5, 9.7.2.1, 9.7.2.2 and 9.7.2.3.3.

#### 4.6.5.0.2 Minimum conformance requirements for CLI-RSSI measurement with non-DRX

The UE shall be capable of performing CLI-RSSI measurement based on the configured measurement resource within TCLI_RSSI_measurement_period. The UE shall be able to provide a single RSSI sample for each measurement resource configured for CLI-RSSI measurement occurring with a configured periodicity. The CLI-RSSI measurement period TCLI_RSSI_measurement_period corresponds to the CLI-RSSI measurement resource periodicity, which is configured for by higher layers via RSSI-PeriodicityAndOffset.

If the CLI-RSSI measurement resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for TCLI_RSSI_measurement_period.

The UE shall send CLI-RSSI reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when CLI-RSSI report is configured.

The requirements apply, provided:

- The measurement resources configured for CLI-RSSI measurements are measurable.

A measurement resource configured for CLI-RSSI shall be considered measurable when for each relevant CLI-RSSI resource the following conditions are met:

- CLI-RSSI related side conditions given in clauses 10.1.22.2 of TS 38.133 [6] for FR1 and FR2 for a corresponding band.

The UE shall report the CLI-RSSI value as a 7-bit value in the range [-100, -25] dBm with 1dB step size according to clause 10.1.22.2 of TS 38.133 [6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clauses 9.7.3.5, 9.7.3.1 and 9.7.3.3.2.

## 4.6.5.1 EN-DC FR1 SRS-RSRP measurement with non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Test Requirements and length of T2 are in brackets as they need further study.

### 4.6.5.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 4.6.5.0.

### 4.6.5.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting NR EN-DC and CLI-based SRS-RSRP measurements.

### 4.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.1.

### 4.6.5.1.4 Test description

The test scenario comprises of one E-UTRA anchor cell (Cell 1), one serving NR FR1 PSCell (Cell 2) and one virtual intra-frequency UE transmitting SRS periodically, which are the target of the CLI measurement report evaluated in the test. The test parameters for PSCell are given in Table 4.6.5.1.4.1-3 and Table 4.6.5.1.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with event I1 is used. No gap pattern is configured in the test.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 4.6.5.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 4.6.5.1.5-2. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

#### 4.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.1.4.1-1.

**Table 4.6.5.1.4.1-1: Supported test configurations for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Configuration | Description |
|---|---|
| 4.6.5.1-1 | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.6.5.1-2 | NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.5.1.4.1-2.

**Table 4.6.5.1.4.1-2: Initial conditions for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.5.1.4.3.

2. Cell 1 is the E-UTRA anchor cell for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with power levels and settings according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.

3. The test parameters are given in Table 4.6.5.1.4.1-3.

**Table 4.6.5.1.4.1-3: General test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1, 2 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.1 | |
| | | 2 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table 4.6.5.1.5-3 |
| | | 2 | SRSConf.2 | |
| CP length | | 1, 2 | Normal | |
| i1-Threshold | dBm | 1 | -97 | |
| | | 2 | -95 | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | Non-DRX |
| Time offset between DL from serving cell and SRS from test system | µs | 1,2 | 17.67 | |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | [1] | |

### 4.6.5.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During T1 only the serving NR PCell is powered on, but at the start of T2 the virtual UE is powered on and starts transmitting on SRS resources, in addition to the serving NR cell which is kept powered on. The purpose of the test is to evaluate the event i1 reporting delay upon a newly powered up virtual UE, from the start of T2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.5.1.4.1-3, Table 4.6.5.1.5-1 and Table 4.6.5.1.5-2.

3. The SS shall transmit an *RRCReconfiguration* message, embedded in an *RRCConnectionReconfiguration* message, configuring a CLI measurement object with a CLI event I1 trigger, as specified in clause 4.6.5.1.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message, embedded in an *RRCConnectionReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.5.1.4.1-3, Table 4.6.5.1.5-1 and Table 4.6.5.1.5-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message, embedded in an *ULInformationTransferMRDC* message, triggered by event I1, as specified in clause 4.6.5.1.4.3. If the overall delay measured from the beginning of time period T2 is less than [62] ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall requirement delay, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Repeat steps 1-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 4.6.5.1.4.3-1: Common Exception messages for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 4.6.5.1.4.3-2: *MeasObjectToAddModList* for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectCLI-r16 | MeasObjectCLI-r16 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.5.1.4.3-3: *MeasObjectCLI-r16* for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectCLI-r16 ::= SEQUENCE { | | | |
| cli-ResourceConfig-r16 SEQUENCE { | | | |
| srs-ResourceConfig-r16 CHOICE { | | | |
| setup SEQUENCE { | | | |
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry | | |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1 |
| | SRSConf.2 | entry 1 | Config 2 |
| srs-SCS-r16 | kHz15 | | Config 1 |
| | kHz30 | | Config 2 |
| refServCellIndex-r16 | 0 | PCell | |
| refBWP-r16 | 0 | BWP-0 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.5.1.4.3-4: *ReportConfigNR* for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| cli-EventTriggered-r16 SEQUENCE { | | | |
| eventId-r16 CHOICE { | | | |
| eventI1-r16 SEQUENCE { | | Event I1 | |
| i1-Threshold CHOICE { | | | |
| srs-RSRP-r16 | 43 | 43 = -97-(-140) | Config 1 |
| srs-RSRP-r16 | 45 | 45 = -95-(-140) | Config 2 |
| } | | | |
| reportOnLeave-r16 | False | | |
| hysteresis-16 | 0 | | |
| timeToTrigger-r16 | ms0 | | |
| } | | | |
| } | | | |
| reportInterval-r16 | ms120 | Not critical to the test | |
| reportAmount-r16 | r2 | Similar to other measurement tests | |
| maxReportCLI-r16 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.5.1.4.3-5: *MeasResultCLI-r16* for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultCLI-r16 ::= SEQUENCE { | | | |
| measResultsListSRS-r16 CHOICE { | | | |
| srs-ResourceId-r16 | SRS-ResourceId | | |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) | |
| } | | | |
| } | | | |

### 4.6.5.1.5 Test requirement

Table 4.6.5.1.5-1 and Table 4.6.5.1-2 define the primary level settings including test tolerances for EN-DC FR1 SRS-RSRP measurement with non-DRX. Table 4.6.5.1.5-3 defines the SRS resource configurations.

**Table 4.6.5.1.5-1: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 | |
| | | 2 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 TDD | |
| | | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 TDD | |
| | | 2 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 TDD | |
| | | 2 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2 | OP.1 | |

| Parameter | Unit | Test | Cell 2 |
|---|---|---|---|
| TRS Configuration | | 1 | TRS.1.1 TDD |
| | | 2 | TRS.1.2 TDD |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 |
| | | 2 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 |
| | | 2 | -95 |
| Propagation Condition | | 1, 2 | AWGN |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 4.6.5.1.5-2: Neighbor UE specific test parameters for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| Parameter | Unit | Test configuration | Neighbour cell UE | |
|---|---|---|---|---|
| | | | T1 | T2 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | |
| | | 2 | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | |
| | | 2 | -95 | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | -infinity | 9.25 |
| | | 2 | | 8.75 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | -infinity | 9.25 |
| | | 2 | | 8.75 |
| SRS-RSRP Note 3 | dBm/SCS | 1 | -infinity | -88.75 |
| | | 2 | -infinity | -86.25 |
| Io | dBm/9.36 MHz | 1 | -70.05 | -60.62 |
| | dBm/38.16 MHz | 2 | -63.96 | -57.51 |
| Propagation Condition | | 1, 2 | AWGN | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 4.6.5.1.5-3: SRS configurations for EN-DC FR1 SRS-RSRP measurement with non-DRX**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | |
| | resourceType | Periodic | Periodic | |
| | Usage | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | |

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| | cyclicShift-n2 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | |
| | freqDomainShift | 0 | 0 | |
| | freqHopping c-SRS | 12 | 12 | |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset | sl20, 9 | sl40, 19 | |
| | sequenceId | 0 | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than [60] ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX.

## 4.6.5.2 EN-DC FR1 CLI-RSSI measurement in non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Message contents are missing.
- Test Procedure might need update.
- Test applicability needs to be updated

### 4.6.5.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5.

### 4.6.5.2.2 Test applicability

FFS.

### 4.6.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.2.

### 4.6.5.2.4 Test description

#### 4.6.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.5.2.4.1-2. Test environment parameters are given in Table 4.6.5.2.4.1-3.

**Table 4.6.5.2.4.1-1: EN-DC FR1 CLI-RSSI measurement in non-DRX test configurations**

| Configuration | Description |
|---|---|
| 1 | NR 15 kHz SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | NR 30 kHz SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.5.2.4.1-2: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1, 2 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.1 | |
| | | 2 | SMTC.1 | |
| CLI-RSSI configuration | | 1 | CLI-RSSIConf.1 | Table 4.6.5.2.5-2 |
| | | 2 | CLI-RSSIConf.2 | |
| CP length | | 1, 2 | Normal | |
| i1-Threshold | dBm | 1 | -93 | |
| | | 2 | -93 | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | Non-DRX |
| Time offset between DL from serving cell and OCNG from test system | μs | 1,2 | 17.67 | |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 1 | |

**Table 4.6.5.2.4.1-3: Test environment parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.6.5.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used.

### 4.6.5.2.4.2 Test procedure

FFS

#### 4.6.5.2.4.3 Message contents

FFS

### 4.6.5.2.5 Test requirement

Table 4.6.5.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.5.2.5-1: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 | |
| | | 2 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 TDD | |
| | | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 TDD | |
| | | 2 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 TDD | |
| | | 2 | CCR.2.1 TDD | |
| OCNG Patterns Note 3 | | 1, 2 | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 TDD | |
| | | 2 | TRS.1.2 TDD | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -116 | -108 |
| | | 2 | | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -116 | -108 |
| | | 2 | -113 | -105 |
| Io on CLI-RSSI measurement resource | dBm/9.36 MHz | 1 | -88.05 | 79.55 |
| | dBm/38.16 MHz | 2 | -81.96 | 73.5 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -97.43 | 88.93 |
| | dBm/1.08 MHz | 2 | -97.44 | 88.94 |
| Propagation Condition | | 1, 2 | AWGN | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: OCNG is not transmitted in the CLI-RSSI measurement resources.

**Table 4.6.5.2.5-2: CLI-RSSI measurement resource configuration for measurement reporting**

| | Field | CLI-RSSIConf.1 | CLI-RSSIConf.2 |
|---|---|---|---|
| RSSI-Resource | rssi-ResourceId | 0 | 0 |
| | rssi-SCS | 15 | 30 |
| | startPRB | 0 | 0 |
| | nrofPRBs | 52 | 106 |
| | startPosition | 3 | 3 |
| | nrofSymbols | 11 | 11 |
| | rssi-PeriodicityAndOffset | sl20, 9 | sl40, 19 |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.6 Measurements with autonomous gaps

### 4.6.6.0 Minimum conformance requirements

#### 4.6.6.0.1 Minimum conformance requirements for measurements with autonomous gaps

[TS 36.133, clause 8.1.2.4.27 and clause 8.1.2.4.28]

##### 4.6.6.0.1.1 Minimum conformance requirements for E-UTRA FDD - NR measurements with autonomous gaps

###### 4.6.6.0.1.1.1 Introduction

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC_CONNECTED state, and
- configured with LTE-FDD standalone

The overall CGI reporting delay is defined in clause 4.6.6.0.1.1.3.

###### 4.6.6.0.1.1.2 CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of 'reportCGI'. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may make autonomous gaps in both downlink reception and uplink transmission of both E-UTRA and NR serving cell(s) for receiving MIB and SIB1 message according to clause 5.5.3 in TS 38.331 [13]. Note that E-UTRAN does not configure si-RequestForHO if *reportConfig* is linked to a *measObject* set to *measObjectNR*. The UE shall be able to identify a new CGI of a known NR cell within:

$$T_{identify_CGI_NR} = ( T_{MIB_NR} + T_{SIB1_NR}) \text{ ms}$$

Where:

$T_{MIB_NR}$ is the maximum time to acquire MIB message. $T_{MIB_NR} = 6 * T_{SMTC}$ ms for NR cells on FR1 or $25 * T_{SMTC}$ ms, for NR cells on FR2.

$T_{SIB1_NR}$ is the maximum time period to acquire SIB1 message. $T_{SIB1_NR} = 6 * T_{RMSI\text{-}scheduling}$ ms, where $T_{RMSI\text{-}scheduling}$ is the periodicity with which the SIB1 is actually transmitted by the NR target cell.

The requirement for identifying the CGI of an NR cell within $T_{identify_CGI_NR}$ is applicable when no DRX is used as well as when any of the DRX or eDRX_CONN cycles specified in TS 36.331 [29] is used.

Within the time $T_{identify_CGI_NR}$, over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in clause 7.37 in TS 36.133.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the NR target cell and
- During MIB decoding at least reported SSBs remains detectable according to the SSB Es/Iot conditions specified in clause 9.2 or 9.3 in TS 38.133 [6], and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the SSB Es/Iot conditions specified in clause 9.2 or 9.3 in TS 38.133 [6], and
- During MIB decoding, the SSB for MIB decoding remains detectable with SNR $\geq$ -3dB

- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with SNR ≥ -3dB

#### 4.6.6.0.1.1.3 CGI reporting delay

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI_NR}$ defined in clause 4.6.6.0.1.1.2 plus RRC procedure delay defined in clause 11 in TS 36.331 [29], an additional 30ms margin, and additional 20ms margin if NR target cell is on FR2.

### 4.6.6.0.1.2 Minimum conformance requirements for E-UTRA TDD - NR measurements with autonomous gaps

#### 4.6.6.0.1.2.1 Introduction

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC_CONNECTED state, and
- configured with LTE-TDD standalone

The overall CGI reporting delay is defined in clause 4.6.6.0.1.2.3.

#### 4.6.6.0.1.2.2 CGI identification of an NR cell with autonomous gaps

The requirements in clause 4.6.6.0.1.1.2 shall apply.

#### 4.6.6.0.1.2.3 CGI reporting delay

The requirements in clause 4.6.6.0.1.1.3 shall apply.

## 4.6.6.1 EN-DC intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing

### 4.6.6.1.1 Test purpose

The purpose of this test is to verify the requirements for intra-frequency identification of a new CGI of NR FR1 cell with autonomous gaps in clause 8.1.2.4.27 and 8.1.2.4.28 in 36.133 [23] for EN-DC.

### 4.6.6.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR1 and supporting acquisition of CGI from neighbor NR cell using autonomous gap, which is controlled by PICS pc_nr_CGI_Reporting.

### 4.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.6.1.

### 4.6.6.1.4 Test description

The test scenario comprises of one E-UTRA carrier and one NR FR1 carrier. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) on E-UTRA RF channel 1, NR FR1 PSCell (Cell 2) and NR FR1 neighbour cell (Cell 3) on NR RF channel 1.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 3. Starting T2, Cell 3 becomes detectable and the UE is expected to detect and send a measurement report.

#### 4.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.6.1.4.1-1.

**Table 4.6.6.1.4.1-1: Intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DN**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

Configure the test equipment and the DUT according to the parameters in Table 4.6.6.1.4.1-2.

**Table 4.6.6.1.4.1-2: Initial conditions for EN-DC PSCell FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for NR Cells are given in Table 4.6.6.1.4.1-3 below. The test parameters and applicability for the E-UTRAN PCell are defined in Table A.3.7.2.1-1 in TS 38.133 [6]. Cell-specific parameters of NR PSCell are specified in Table 4.6.6.1.5-1.

2. Message contents are defined in clause 4.6.6.1.4.3.

3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 4.6.6.1.4.1-3: General test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN radio channel is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One NR FR1 radio channel is used. |

| | | | | |
|---|---|---|---|---|
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR Cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR Cell 3 | NR Cell 3 is on NR RF channel number 1. |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -4.5 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | ≤10 | |
| T3 | s | Config 1,2,3,4,5,6 | 5 | |

#### 4.6.6.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on E-UTRAN RF channel 1 (PCC) and to Cell 2 (PSCell) on NR RF channel 1 (PSCC). NR Cell 3 is on NR RF channel 1. Set the parameters according to Tables 4.6.6.1.4.1-3 and 4.6.6.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 2.

3. T1 starts. At this moment, the UE does not have any timing information of Cell 3.

4. After 5 seconds, T2 starts. A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* which *cellForWhichToReportCGI* set to the physical cell identity of Cell 3.

5. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading of the neighbour cell (Cell 3) using autonomous gap is sent to the UE.

6. If the UE transmits a measurement report containing the cell global identifier of Cell 3 within 260 ms from the start of T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If it is successful, continue to step 9. Otherwise continue to step 8.

8. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

9. Repeat steps 2-8 for all subtests until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.6.1.4.3 Message contents

TBD

#### 4.6.6.1.5 Test requirement

Table 4.6.6.1.5-1 defines the cell specific test parameters.

**Table 4.6.6.1.5-1: Cell specific test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Parameter | Unit | Test configuration | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | | Config 1,4 | FDD | | | | | |
| | | Config 2,3,5,6 | TDD | | | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | | | |
| TDD configuration | | Config 1,4 | N/A | | | N/A | | |
| | | Config 2,5 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | Config 3,6 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | | NA | | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | | NA | | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | | NA | | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | | NA | | |
| TRS configuration | | Config 1,4 | TRS.1.1 FDD | | | NA | | |
| | | Config 2,5 | TRS.1.1 TDD | | | | | |
| | | Config 3,6 | TRS.1.2 TDD | | | | | |
| OCNG Patterns defined in clause A.3.2.1.1 (OP.1) in TS 38.133 [6] | | Config 1,2,3,4,5,6 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | | NA | | |
| | | Config 2,5 | SR.1.1 TDD | | | | | |
| | | Config 3,6 | SR2.1 TDD | | | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | | NA | | |
| | | Config 2,5 | CR.1.1 TDD | | | NA | | |
| | | Config 3,6 | CR2.1 TDD | | | NA | | |
| RMC CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | | | NA | | |
| | | 2, 5 | CCR.1.1 TDD | | | NA | | |
| | | 3, 6 | CCR.2.1 TDD | | | NA | | |
| SSB parameters | | Config 1,2,4,5 | SSB.1 FR1 | | | | | |
| | | Config 3,6 | SSB.2 FR1 | | | | | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | | | | |
| | | Config 2,3,5,6 | SMTC.1 | | | | | |
| RMSI scheduling periodicity | ms | Config 1,2,3,4,5,6 | 20ms | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | | | |
| | | Config 3,6 | 30 | | | | | |
| RLM-RS | | Config 1,2,3,4,5,6 | SSB | | | SSB | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | | -98 | | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | | -98 | | |
| | | Config 3,6 | -95 | | | -95 | | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -94 | -Infinity | -94 | -94 |
| | | Config 3,6 | -91 | -91 | -91 | -Infinity | -91 | -91 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | -1.46 | -1.46 | -Infinity | -1.46 | -1.46 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | 4 | -Infinity | 4 | 4 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.60 | -62.25 | -62.25 | -64.60 | -62.25 | -62.25 |
| | dBm/38.16MHz | Config 3,6 | -58.50 | -56.16 | -56.16 | -58.50 | -56.16 | -56.16 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall transmit a measurement report containing the cell global identifier of Cell 3 within 257 ms from the start of T3.

Test requirement = RRC Procedure delay + $T_{identify_CGI_NR}$ + reporting delay

= 15 + 240 + 2

= 257 ms, allow 260 ms.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 257 ms the number of interrupted slots shall not exceed the allowed number specified in TS 38.133 clause 8.2.1.2.16 [6].

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.7 L1-SINR measurement for beam reporting

### 4.6.7.0 Minimum conformance requirements

#### 4.6.7.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 4.6.7.0.1-1 for FR1, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 4.6.7.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI-RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI-RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [9].

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.2.

#### 4.6.7.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 4.6.7.0.2-1for FR1, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of $P_{CMR}$ shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 4.6.7.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle | |

| | |
|---|---|
| | length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2: | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

The UE shall transmit the periodic L1-SINR reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [9].

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

For FR1, when the SSB configured as CMR for L1-SINR measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-SINR measurement is expected, and no requirements are defined.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

#### 4.6.7.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 4.6.7.0.3-1 for FR1, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of $P_{CMR}$ and $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 4.6.7.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.<br>Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [9].

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

## 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

### 4.6.7.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement based on CSI-RS CMR without dedicated IMR in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

### 4.6.7.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and L1-SINR measurement.

### 4.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.1.

### 4.6.7.1.4 Test description

#### 4.6.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.1.4.1-2. Test environment parameters are given in Table 4.6.7.1.4.1-3.

**Table 4.6.7.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.7.1.4.1-2: General test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| CSI-RS configuration | 1,4 | | CSI-RS.1.3 FDD |
| | 2,5 | | CSI-RS.1.3 TDD |
| | 3,6 | | CSI-RS.2.3 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | Off |
| reportConfigType | 1~6 | | aperiodic |

| | | | |
|---|---|---|---|
| reportQuantity-r16 | 1~6 | | cri-SINR-r16 |
| Number of reported RS | 1~6 | | 2 |
| qcl-Info | 1~6 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 26 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.7.1.4.1-3: Test environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 4.6.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

### 4.6.7.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 4.6.7.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.1.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

   R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.1.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.1.5-4 for all test configurations or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.7.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC |

**Table 4.6.7.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

4.6.7.1.5 Test requirement

Table 4.6.7.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.7.1.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s / I_{ot}$ | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| | 3,6 | | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| | 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 0 | 3 |

Note 1: xxx?
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.1.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.1.5-4 for all test configurations.

**Table 4.6.7.1.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 41 |
| Highest reported value (CSI-RS#1) | 64 |

**Table 4.6.7.1.5-3:Void**

**Table 4.6.7.1.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS#0) | 0 |
| Highest DIFF SINR reported (CSI-RS#0) | 7 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

### 4.6.7.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based CMR and CSI-IM based IMR L1-SINR measurement in DRX within L1-SINR measurement requirements based in TS 38.133 [6] clause 9.8.4.2.

### 4.6.7.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and long DRX cycle and L1-SINR measurement.

### 4.6.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.2.

### 4.6.7.2.4 Test description

#### 4.6.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.2.4.1-2. Test environment parameters are given in Table 4.6.7.2.4.1-3.

**Table 4.6.7.2.4.1-1: EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.7.2.4.1-2: General test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference | 1,4 | | CR.1.1 FDD |

| | | | |
|---|---|---|---|
| Channel | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| CSI-IM configuration | 1,4 | | CSI-IM.1.1 FDD |
| | 2,5 | | CSI-IM.1.1 TDD |
| | 3,6 | | CSI-IM.2.1 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | periodic |
| reportQuantity-r16 | 1~6 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~6 | | 2 |
| L1-SINR reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.7.2.4.1-3: Test environment parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4TBD | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 4.6.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based CMR and CSI-IM based IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD based on the SSBs. DRX is configured as specified in Table 4.6.7.2.4.1-2.

#### 4.6.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.6.7.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.6.7.2.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.7.2.5-1. T2 starts.

7. The UE shall start sending L1-SINR reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 in Table 4.6.7.2.5-2 for all test configurations and the relative L1-SINR requirement for SSB#0 in Table 4.6.7.2.5-4 for all test configurations. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.7.2.4.3-1: Common Exception messages EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-4 with condition PERIODIC<br>Table H.3.7-1 with condition DRX.3 |

**Table 4.6.7.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.6.7.2.5 Test requirement

Table 4.6.7.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.7.2.5-1: SSB specific test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65+TT | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65+TT | | | |
| | 3,6 | | -91.65+TT | | | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0+TT | 0+TT | 0+TT | 0+TT |
| SS-RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -94.65+TT | -94.65+TT |
| | 3,6 | | -91.65+TT | -91.65+TT | -91.65+TT | -91.65+TT |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69+TT | -63.69+TT | -63.69+TT | -63.69+TT |
| | 3,6 | dBm/38.16 MHz | -57.59+TT | -57.59+TT | -57.59+TT | -57.59+TT |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 0+TT | 0+TT | 0+TT | 0+TT |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.2.5-4 for all test configurations.

**Table 4.6.7.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | TBD43 |
| Highest reported value (SSB#1) | - | TBD62 |

**Table 4.6.7.2.5-3: Void**

**Table 4.6.7.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF SINR reported (SSB#0) | - | TBD0 |
| Highest DIFF SINR reported (SSB#0) | - | TBD6 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

### 4.6.7.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based CMR and dedicated IMR L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

### 4.6.7.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and L1-SINR measurement and long DRX cycle.

### 4.6.7.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.3.

4.6.7.3.4 Test description

4.6.7.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.3.4.1-2. Test environment parameters are given in Table 4.6.7.3.4.1-3.

**Table 4.6.7.3.4.1-1: EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table 4.6.7.3.4.1-2: General test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 |
| CSI-RS configuration as CMR | 1,4 | | CSI-RS.1.3 FDD |
| | 2,5 | | CSI-RS.1.3 TDD |
| | 3,6 | | CSI-RS.2.3 TDD |
| CSI-RS configuration as IMR | 1,4 | | CSI-RS.1.2A FDD |
| | 2,5 | | CSI-RS.1.2A TDD |
| | 3,6 | | CSI-RS.2.2A TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| TRS Configuration | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | aperiodic |

| | | | |
|---|---|---|---|
| reportQuantity-r16 | 1~6 | | cri-SINR-r16 |
| Number of reported RS | 1~6 | | 2 |
| qcl-Info | 1~6 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 26 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 4.6.7.3.4.1-3: Test environment parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.7.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 4.6.7.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based CMR and dedicated IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. DRX is configured as specified in Table 4.6.7.3.4.1-2.

### 4.6.7.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 4.6.7.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS as CMR and the associated CSI-RS as IMR are transmitted with the offset of 4 slots and 6 slots after the DCI trigger, respectively.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

   R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.3.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.3.5-4 for all test configurations or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.6.7.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.6.7.3.4.3-1: Common Exception messages EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.6A-3 with conditions APERIODIC<br>Table H.3.7-1 with condition DRX.3 |

### 4.6.7.3.5 Test requirement

Table 4.6.7.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.6.7.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |

| | | | | |
|---|---|---|---|---|
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0.5 | 3 |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | 0.5 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.15 | -91.65 |
| | 3,6 | | -91.14 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.43 | -61.93 |
| | 3,6 | dBm/38.16 MHz | -57.33 | -55.84 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.3.5-2 for all configurations and the corresponding relative accuracy requirements in Table 4.6.7.3.5-4 for all test configurations.

**Table 4.6.7.3.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 44 |
| Highest reported value (CSI-RS#1) | 61 |

**Table 4.6.7.3.5-3: Void**

**Table 4.6.7.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 5 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 4.6.8 CSI-RS based intra-frequency measurement

### 4.6.8.0 Minimum conformance requirements

#### 4.6.8.0.1 Minimum conformance requirements for EN-DC event triggered reporting tests without gap under DRX

[TS 38.133, clause 9.10.2]

For each intra-frequency CSI-RS layer, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 32 CSI-RSs with different CSI-RS index and/or PCI on the intra-frequency layer, and
- the cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer of the associated SSB

Reported CSI-RSRP, CSI-RSRQ, and CSI- SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.2.3, 10.1.3.3, 10.1.7.2, 10.1.8.2, 10.1.12.2 and 10.1.13.2 in TS 38.133 [6].

The UE shall not send any event triggered measurement reports as long as no reporting criterion is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than the CSI-RS based measurement defined below. When L3 filtering is used an additional delay can be expected.

If a UE is configured with the higher layer parameters *CSI-RS-Resource-Mobility* and *associatedSSB*, the CSI-RS based measurement shall include PSS/SSS detection time of *associatedSSB*, the time period used to acquire the SFN information and CSI-RS based measurement period without gap.

- PSS/SSS detection time of *associatedSSB* is the intra-frequency $T_{PSS/SSS_sync_intra}$ in clause 9.2.5.1 in TS 38.133 [6].
- The time period used to acquire the SFN information is equal to 0 if the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, the time period used to acquire the SFN information is $T_{CSI\text{-}RS_SFN_intra}$ as shown in Table 4.6.8.0.1-2 for FR1. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.
- If the *associatedSSB*, which has been detectable at least for the time period $T_{identify_intra_with_index}$ defined in clause 9.2.5.1 in TS 38.133 [6], becomes undetectable for a period $\leq 5$ seconds and then the *associatedSSB* becomes detectable again with the same spatial reception parameter provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7], PSS/SSS detection time and time period used to acquire the SFN information are equal to 0.

The measurement period for CSI- RS based intra-frequency measurements without gaps is as shown in Table 4.6.8.0.1-1.

Additionally, for a given CSI-RS resource, if the associated SS/PBCH block is configured but not detected by the UE, or if CSI-RS is configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 4.6.8.0.1-1: Measurement period for intra-frequency CSI-RS based measurements without gaps (FR1)**

| DRX cycle | $T_{CSI\text{-}RS_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_{p_CSI\text{-}RS}$) x CSI-RS period) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_{p_CSI\text{-}RS}$) x max(CSI-RS |

| | |
|---|---|
| | period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil( 5 x $K_{p_CSI-RS}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: The requirements apply assuming CSI-RS configuration with {D=3 with PRBs ≥ 48}. D is frequency domain density for the 1-port CSI-RS for L3 mobility defined in clause 7.4.1 of TS 38.211 [7]. | |

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in clause 9.1.5 in TS 38.133 [6].

For a UE not supporting *concurrentMeasGap-r17* or for a UE is supporting *concurrentMeasGap-r17* but not configured with concurrent measurement gaps, and the UE does not support [*musim-GapPreference-r17]* or is supporting [*musim-GapPreference-r17]* but not configured with periodic MUSIM gaps,

- if the intra-frequency CSI-RS resource does not overlap with any measurement gaps, $K_{p_CSI-RS}$=1;
- if some occasions of the intra-frequency CSI-RS resource is overlapped with any measurement gaps, $K_{p_CSI-RS}$ = 1/(1- (CSI-RS resource period /MGRP)) , where CSI-RS resource period < MGRP, and the MGRP is the periodicity of the measurement gap.
- Otherwise, when UE supports concurrent measurement gaps or [*musim-GapPreference-r17]* or both concurrent measurement gaps and *[musim-GapPreference-r17]*, and concurrent measurement gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured, $K_{p_CSI-RS}$ is the scaling factor for a CSI-RS frequency layer to be measured outside gap which is defined as $K_{p_CSI-RS} = N_{total} / N_{available}$

  For a window W of duration max(CSI-RS period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG, periodic MUSIM gaps, and per-FR MG within the same FR as the CSI-RS frequency layer, and starting at the beginning of any gap occasions covering the CSI-RS resources:

  $N_{total}$ is the total number of CSI-RS resource occasions within the window, including those overlapped with other MG and MUSIM gap occasions within the window, and

  $N_{available}$ is the number of CSI-RS resource occasions that are not overlapped with any other non-dropped MG or non-dropped MUSIM gap occasions within the window W, after accounting for MG and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in clause 9.1.8.3, 9.1.10.4 and 9.1.10.5 in TS 38.133 [6], respectively.

  $K_{p_CSI-RS}$ = 1 when $N_{available}$ = 0

  Requirements in this clause do not apply when $N_{available}$ = 0 due to fully overlapping between CSI-RS occasions and MUSIM gap occasions within the window W.

  *Editor Note: FSS for the case when $N_{available}$ = 0 due to fully overlapping between CSI-RS occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

When UE supports [*MUSIM-GapConfig-17]* and the CSI-RS occasions of the target frequency layer is overlapping with the configured aperiodic MUSIM gap, longer cell identification period for the target frequency layer is expected.

**Table 4.6.8.0.1-2: Time period for SFN acquisition for intra-frequency CSI-RS based measurements without gaps(FR1)**

| DRX cycle | $T_{CSI-RS_SFN_intra}$ |
|---|---|
| No DRX | max(200ms, ceil(5 x $K_{p_CSI-RS}$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(2000ms, ceil (1.5 x 5 x $K_{p_CSI-RS}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(5 x $K_{p_CSI-RS}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.<br>NOTE 2: $K_{p_CSI-RS}$ is applicable for a UE supporting concurrent gaps and/or MUSIM gaps. | |

# 4.6.9 CSI-RS based inter-frequency measurement

## 4.6.9.0 Minimum conformance requirements

### 4.6.9.0.1 Minimum conformance requirements for EN-DC event triggered reporting tests for FR1 cell when non-DRX is used

[TS 38.133, clause 9.10.3]

For each inter-frequency CSI-RS layer, during each layer 1 measurement period, the UE shall be capable of performing CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements for at least:

- 14 CSI-RSs with different CSI-RS index and/or PCI, and
- The cells to be monitored based on CSI-RS are the same set or a subset of the cells monitored based on the layer of the associated SSB.

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.2, 10.1.5.2, 10.1.9.2, 10.1.10.2, 10.1.14.2 and 10.1.15.2 in TS 38.133 [6].

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within CSI-RS based measurement defined below. When L3 filtering is used an additional delay can be expected.

When measurement gaps are provided, if configured with the higher layer parameters *CSI-RS-Resource-Mobility* and *associatedSSB*, the UE shall be able to identify a new detectable CSI-RS based inter-frequency cell within $T_{CSI\text{-}RS_identify_inter}$,

$$T_{CSI\text{-}RS_identify_inter} = (T_{PSS/SSS_sync} + T_{CSI\text{-}RS_measurement_period_inter} + T_{CSI\text{-}RS_SFN_inter}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync}$ is the time period used in PSS/SSS detection which is determined according to $T_{PSS/SSS_sync_inter}$ in clause 9.3.4 in TS 38.133 [6],

TCSI-RS_SFN_inter is the time period used to acquire the SFN information of the cell being measured, which is shown in Table 4.6.9.0.1-2 for FR1,

$T_{CSI\text{-}RS_measurement_period_inter}$: equal to a measurement period of CSI-RS based measurement given in Table 4.6.9.0.1-1.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5 in TS 38.133 [6] for measurement conducted within measurement gaps.

When UE supports concurrent measurement gaps or [*musim-GapPreference-r17]* or both concurrent measurement gap and [*musim-GapPreference-r17]*, and concurrent measurement gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured, $K_{p_CSI\text{-}RS}$ is the scaling factor for a CSI-RS frequency layer to be measured within the associated measurement gap which is defined as $K_{p_CSI\text{-}RS} = N_{total} / N_{available}$. $K_{p_CSI\text{-}RS} = 1$ for UE not configured with concurrent measurement gaps and MUSIM gaps.

- For a window W of duration max(CSI-RS period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG, periodic MUSIM gaps, and per-FR MG within the same FR as the CSI-RS frequency layer, and starting at the beginning of any gap occasions covering the CSI-RS resources.:

- $N_{total}$ is the total number of associated gap occasions covering CSI-RS resources within the window, including those overlapped with other measurement gap and MUSIM gap instances within the window, and

- $N_{available}$ is the number of non-dropped associated gap occasions covering CSI-RS resources within the window W, after accounting for MG and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in clause 9.1.8.3 and clause 9.1.10.5 in TS 38.133 [6], respectively.

- Requirements do not apply if $N_{available} = 0$

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in clause 9.1.10.4 in TS 38.133 [6] is applied, longer cell identification period for the target inter-frequency is expected.

Additionally, for a given CSI-RS resource, if the associated SSB is configured but not detected by the UE, or if CSI-RS configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 4.6.9.0.1-1: Measurement period for CSI-RS based inter-frequency measurements with gaps (FR1)**

| Condition NOTE1,2 | $T_{CSI\text{-}RS_measurement_period_inter}$ |
|---|---|
| No DRX | $Max(200ms, ceil(8 \times K_{p_CSI\text{-}RS}) \times Max(MGRP, CSI\text{-}RS\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(200ms, Ceil(8 \times 1.5 \times K_{p_CSI\text{-}RS})) \times Max(MGRP, CSI\text{-}RS\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $Ceil(8 \times K_{p_CSI\text{-}RS}) \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6] | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 in TS 38.133 [6] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: If UE support concurrent gaps and multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the CSI-RS resources of the inter-frequency layer. | |
| NOTE 4: $K_{p_CSI\text{-}RS}$ is applicable for a UE supporting concurrent gaps and/or MUSIM gaps. | |

**Table 4.6.9.0.1-2: Time period for SFN acquisition for inter-frequency CSI-RS based measurements with gaps (FR1)**

| Condition NOTE1,2 | $T_{CSI\text{-}RS_SFN_inter}$ |
|---|---|
| No DRX | $Max(200ms, ceil(5 \times K_{p_CSI\text{-}RS}) \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(200ms, Ceil(5 \times 1.5 \times K_{p_CSI\text{-}RS}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $Ceil(5 \times K_{p_CSI\text{-}RS}) \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6] | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 in TS 38.133 [6] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: If UE support concurrent gaps and multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to *associatedSSB*. | |
| NOTE 4: $K_{p_CSI\text{-}RS}$ is applicable for a UE supporting concurrent gaps and/or MUSIM gaps. | |

# 4.7 Measurement performance requirements

## 4.7.1 SS-RSRP

### 4.7.1.0 Minimum conformance requirements

#### 4.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The intra-frequency SS-RSRP absolute accuracy requirements are defined for the SS-RSRP measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.1-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

**Table 4.7.1.0.1-1: SS-RSRP intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| | | | Io [Note 1] range | | | |
| Normal condition | Extreme condition | SSB Ês/Iot | NR operating band groups [Note 2] | Minimum Io | | Maximum Io |
| | | | | dBm / $SCS_{SSB}$ | | |
| dB | dB | dB | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±4.5 | ±9 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H, | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

**Table 4.7.1.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping**

| Reported value | Measured quantity value(L3 SS-RSRP) | Measured quantity value(L1 SS-RSRP and CSI-RSRP) | Unit |
|---|---|---|---|
| RSRP_0 | SS-RSRP<-156 | Not valid | dBm |
| RSRP_1 | -156≤ SS-RSRP<-155 | Not valid | dBm |
| RSRP_2 | -155≤ SS-RSRP<-154 | Not valid | dBm |
| RSRP_3 | -154≤ SS-RSRP<-153 | Not valid | dBm |
| RSRP_4 | -153≤ SS-RSRP<-152 | Not valid | dBm |
| RSRP_5 | -152≤ SS-RSRP<-151 | Not valid | dBm |
| RSRP_6 | -151≤ SS-RSRP<-150 | Not valid | dBm |
| RSRP_7 | -150≤ SS-RSRP<-149 | Not valid | dBm |

| Reported value | Measured quantity value(L3 SS-RSRP) | Measured quantity value(L1 SS-RSRP and CSI-RSRP) | Unit |
|---|---|---|---|
| RSRP_8 | -149≤ SS-RSRP<-148 | Not valid | dBm |
| RSRP_9 | -148≤ SS-RSRP<-147 | Not valid | dBm |
| RSRP_10 | -147≤ SS-RSRP<-146 | Not valid | dBm |
| RSRP_11 | -146≤ SS-RSRP<-145 | Not valid | dBm |
| RSRP_12 | -145≤ SS-RSRP<-144 | Not valid | dBm |
| RSRP_13 | -144≤ SS-RSRP<-143 | Not valid | dBm |
| RSRP_14 | -143≤ SS-RSRP<-142 | Not valid | dBm |
| RSRP_15 | -142≤ SS-RSRP<-141 | Not valid | dBm |
| RSRP_16 | -141≤ SS-RSRP<-140 | RSRP<-140 | dBm |
| RSRP_17 | -140≤ SS-RSRP<-139 | -140≤ RSRP<-139 | dBm |
| RSRP_18 | -139≤ SS-RSRP<-138 | -139≤ RSRP<-138 | dBm |
| … | … | | … |
| RSRP_111 | -46≤ SS-RSRP<-45 | -46≤ RSRP<-45 | dBm |
| RSRP_112 | -45≤ SS-RSRP<-44 | -45≤ RSRP<-44 | dBm |
| RSRP_113 | -44≤ SS-RSRP<-43 | -44≤ RSRP | dBm |
| RSRP_114 | -43≤ SS-RSRP<-42 | Not valid | dBm |
| RSRP_115 | -42≤ SS-RSRP<-41 | Not valid | dBm |
| RSRP_116 | -41≤ SS-RSRP<-40 | Not valid | dBm |
| RSRP_117 | -40≤ SS-RSRP<-39 | Not valid | dBm |
| RSRP_118 | -39≤ SS-RSRP<-38 | Not valid | dBm |
| RSRP_119 | -38≤ SS-RSRP<-37 | Not valid | dBm |
| RSRP_120 | -37≤ SS-RSRP<-36 | Not valid | dBm |
| RSRP_121 | -36≤ SS-RSRP<-35 | Not valid | dBm |
| RSRP_122 | -35≤ SS-RSRP<-34 | Not valid | dBm |
| RSRP_123 | -34≤ SS-RSRP<-33 | Not valid | dBm |
| RSRP_124 | -33≤ SS-RSRP<-32 | Not valid | dBm |
| RSRP_125 | -32≤ SS-RSRP<-31 | Not valid | dBm |
| RSRP_126 | -31≤ SS-RSRP | Not valid | dBm |
| RSRP_127[1] | Infinity | Infinity | dBm |
| NOTE: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.6.

### 4.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

The intra-frequency relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency in FR1.

The accuracy requirements in Table 4.7.1.0.2-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

**Table 4.7.1.0.2-1: SS-RSRP intra-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 2 | Io Note 1 range | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | Maximum Io |
| | | | | dBm / $SCS_{SSB}$ | | |
| dB | dB | dB | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| ±2 | ±3 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.<br>NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.2 and 10.1.6.

### 4.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP absolute accuracy requirements in this clause are defined for the SS-RSRP measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.3-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to clause B.2.3 for a corresponding Band for each relevant SSB.

**Table 4.7.1.0.3-1: SS-RSRP inter-frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 2 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 3 | **Minimum Io** | | | **Maximum Io** |
| | | | | **dBm / $SCS_{SSB}$** | | | |
| **dB** | **dB** | **dB** | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| ±4.5 | ±9 | ≥6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, | N/A | N/A | -70 | -50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | NR_FDD_FR1_H, | | | | |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: Void.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.1 and 10.1.6.

#### 4.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP relative accuracy requirements in this clause are defined for the SS-RSRP measured from one cell on a frequency in FR1compared to the SS-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.1.0.4-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB,
- $\left|RSRP1\right|_{dBm} - RSRP2\left|_{dBm}\right| \leq 27dB$
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 4.7.1.0.4-1: SS-RSRP inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| | | | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| dB | dB | dB | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±6 | ≥6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.2 and 10.1.6.

### 4.7.1.1 Intra-frequency measurements

### 4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy

#### 4.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

#### 4.7.1.1.1.4 Test description

##### 4.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.1.4.1-1.

**Table 4.7.1.1.1.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.1.1.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.1.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.1.4.1-2.

**Table 4.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.1.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell

3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.1.1.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 4.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.1.1.1.5-1 as appropriate and repeat steps 5-7.

#### 4.7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.1.1.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Condition SSB.1 FR1 and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.1.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRP Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |

| | | | |
|---|---|---|---|
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.1.1.1.5 Test requirement

Table 4.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-3 for test configurations 3 and 6.

**Table 4.7.1.1.1.5-1: EN-DC FR1 SS-RSRP measurement accuracy test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1,4 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.2.1 TDD | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control Channel RMC | Config 1,4 | | CCR.1.1 FD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1,4 | | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 |
| | Config 2,5 | | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB 2.FR1 | SSB.2 FR1 | SSB 2.FR1 | SSB.2 FR1 | SSB 2.FR1 | SSB.2 FR1 |
| Time offset with Cell 2 | Config 1,4 | ms | - | 3 | - | 3 | - | 3 |

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| | | Config 2,3,5,6 | μs | - | 3 | - | 3 | - | 3 |
| SMTC Configuration | | Config 1,4 | | SMTC.2 | | | | | |
| | | Config 2,3,5,6 | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| | | Config 3,6 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15KhZ | -107.5 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | N/A Note 6 | | -94 | | -115 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -107.4 | | -88 | | Same as Noc/15kHz | |
| | Config 3,6 | Depending on band group | | N/A Note 6 | | -91 | | -112 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | | dB | 2.23 | -5.57 | 2.23 | -5.57 | 0.37 | -5.56 |
| $\hat{E}_s / N_{oc}$ | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | -0.8 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -101.5 | -106.1 | -82 | -86.6 | -111 + $\Delta_{BG_offset}$ | -114.8 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | N/A Note 6 | N/A Note 6 | -85 | -89.6 | -109+ $\Delta_{BG_offset}$ | -112.8+ $\Delta_{BG_offset}$ |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -71.68 | | -52.18 | | -80.39+ $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | N/A Note 6 | | -51.91 | | -75.12 + $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.
NOTE 6: Subtest 1 is not used when testing with 30kHz SSB SCS.

**Table 4.7.1.1.1.5-2: SS-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 3) | 44 | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 36 |
| | | | Bands NR_FDD_FR1_B | 36 |
| | | | Bands NR_TDD_FR1_C | 37 |

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 38 |
| | | | Bands NR_FDD_FR1_G | 39 |
| | | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 3) | 56 | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | | Bands NR_FDD_FR1_B | 48 |
| | | | Bands NR_TDD_FR1_C | 49 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | | Bands NR_FDD_FR1_G | 51 |
| | | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 3) | 40 | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | | Bands NR_FDD_FR1_B | 32 |
| | | | Bands NR_TDD_FR1_C | 32 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 33 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | | Bands NR_FDD_FR1_G | 34 |
| | | | Bands NR_FDD_FR1_H | 35 |
| Highest reported value (Cell 3) | 61 | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | | Bands NR_FDD_FR1_B | 53 |
| | | | Bands NR_TDD_FR1_C | 53 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | | Bands NR_FDD_FR1_G | 55 |
| | | | Bands NR_FDD_FR1_H | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

**Table 4.7.1.1.1.5-3: SS-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 3) | N/A | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 38 |
| | | | Bands NR_FDD_FR1_B | 38 |
| | | | Bands NR_TDD_FR1_C | 39 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 39 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 40 |
| | | | Bands NR_FDD_FR1_G | 41 |
| | | | Bands NR_FDD_FR1_H | 41 |
| Highest reported value (Cell 3) | N/A | 76 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 50 |
| | | | Bands NR_FDD_FR1_B | 50 |
| | | | Bands NR_TDD_FR1_C | 51 |

| | | | | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 52 |
| | | | Bands NR_FDD_FR1_G | 53 |
| | | | Bands NR_FDD_FR1_H | 53 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 3) | N/A | 54 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | | Bands NR_FDD_FR1_B | 34 |
| | | | Bands NR_TDD_FR1_C | 34 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 35 |
| | | | Bands NR_FDD_FR1_G | 36 |
| | | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 3) | N/A | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 54 |
| | | | Bands NR_FDD_FR1_B | 55 |
| | | | Bands NR_TDD_FR1_C | 55 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 56 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 56 |
| | | | Bands NR_FDD_FR1_G | 57 |
| | | | Bands NR_FDD_FR1_H | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy

#### 4.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 4.7.1.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

#### 4.7.1.1.2.4 Test description

##### 4.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.2.4.1-1.

**Table 4.7.1.1.2.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.1.1.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |

| | |
|---|---|
| 4.7.1.1.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.1.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.1.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.1.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.2.4.1-2.

**Table 4.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.1.1.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

### 4.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.1.1.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 2 and Cell 3 in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 4.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.1.1.2.5-1 as appropriate and repeat steps 5-7.

### 4.7.1.1.2.4.3 Message contents

Message contents are same as in clause 4.7.1.1.1.4.3.

#### 4.7.1.1.2.5 Test requirement

Table 4.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.2.5-2.

**Table 4.7.1.1.2.5-1: Same as Table 4.7.1.1.1.5-1 with the following exceptions:**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15KhZ | -106 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | N/A | | -94 | | -114 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | Same as Noc/15kHz | | Same as Noc/15kHz | | Same as Noc/15kHz | |
| | Config 3,6 | Depending on band group | | N/A | | -91 | | -111 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | | dB | 1.88 | -4.97 | 1.88 | -4.97 | -0.01 | -4.76 |
| $\hat{E}_s / N_{oc}$ | | | dB | 6 | 2 | 6 | 2 | 3 | 0 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -100 | -104 | -82 | -86 | -111 + $\Delta_{BG_offset}$ | -114 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | N/A | N/A | -85 | -89 | -108 + $\Delta_{BG_offset}$ | -111 + $\Delta_{BG_offset}$ |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -70.05 | | -52.05 | | -80.20+ $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | N/A | | -51.77 | | -73.93 + $\Delta_{BG_offset}$ | |

**Table 4.7.1.1.2.5-2: SS-RSRP intra-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 3) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 3) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| NOTE: RSRP_x is the reported value of Cell 2. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.1.2 Inter-frequency measurements

### 4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy

#### 4.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

#### 4.7.1.2.1.4 Test description

##### 4.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.1.4.1-1.

**Table 4.7.1.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.1.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.1.4.1-2.

**Table 4.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.1.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.1.2.1.4.2 Test procedure

Same as in clause 4.7.1.1.1.4.2 but replacing Table 4.7.1.1.1.5-1 and 4.7.1.1.1.5-2 with 4.7.1.2.1.5-1 and 4.7.1.2.1.5-2, respectively.

#### 4.7.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.1.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.1.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRP Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.1.2.1.5 Test requirement

Table 4.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-3 for test configurations 3 and 6.

**Table 4.7.1.2.1.5-1: SS-RSRP inter-frequency test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | 1~6 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |

| Parameter | | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Gap pattern ID | | | | 0 | | 0 | |
| Duplex mode | | 1,4 | | FDD | | FDD | |
| | | 2,5 | | TDD | | TDD | |
| | | 3,6 | | TDD | | TDD | |
| TDD configuration | | 1,4 | | N/A | | N/A | |
| | | 2,5 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3,6 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | | 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3,6 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | | 2,5 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | | 3,6 | | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | 2,5 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | | 3,6 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1,4 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 2,5 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 3,6 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | | 1~6 | | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | | 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | | 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~6 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | | 1,4 | | SMTC.2 | | SMTC.2 | |
| | | 2,3,5,6 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | | 1,4 | ms | 3 | | 3 | |
| | | 2,3,5,6 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -94.65 | ($N_{oc}$ for Cell 3 +8dB) | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 3,6 | dBm/15kHz | -96 | -96 | ($N_{oc}$ for Cell 3 +8dB) | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | ($N_{oc}$ for Cell 3 +8dB) | -115+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3,6 | | -93 | -93 | ($N_{oc}$ for C 3 +8dB) | -112.00+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | 10 | 13 | -3 |
| SS-RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SCS | -84.65 | -84.65 | (RSRP for Cell 3 +24dB) | -118.00+ $\Delta_{BG_offset}$ |
| | Depending on | 3,6 | | -83 | -83 | (RSRP for Cell 3 | -115.00+ |

| Parameter | | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| | band group | | | | | +24dB) | $\Delta_{BG_offset}$ |
| $Io^{Note3}$ | Depending on band group | 1,2,4,5 | dBm/ 9.36MHz | 56.28 | 56.28 | (Io for Channel 3 +19.45dB) | -85.28+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3,6 | dBm/ 38.16MHz | -51.53 | -51.53 | (Io for Channel 3 +19.45dB) | -79.19+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | | 1~6 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~6 | - | AWGN | | AWGN | |
| Antenna configuration | | | | 1x2 | | 1x2 | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.
NOTE 6: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

**Table 4.7.1.2.1.5-2: SS-RSRP inter-frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 3) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 32 |
| | | Bands NR_FDD_FR1_B | 33 |
| | | Bands NR_TDD_FR1_C | 33 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 34 |
| | | Bands NR_FDD_FR1_G | 35 |
| | | Bands NR_FDD_FR1_H | 36 |
| Highest reported value (Cell 3) | 81 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 45 |
| | | Bands NR_FDD_FR1_B | 45 |
| | | Bands NR_TDD_FR1_C | 46 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 47 |
| | | Bands NR_FDD_FR1_G | 48 |
| | | Bands NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 3) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 28 |
| | | Bands NR_FDD_FR1_B | 28 |
| | | Bands NR_TDD_FR1_C | 29 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 29 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 30 |
| | | Bands NR_FDD_FR1_G | 31 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_H | 31 |
| Highest reported value (Cell 3) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 50 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 53 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 4.7.1.2.1.5-3: SS-RSRP inter-frequency absolute accuracy requirements for the reported values for test configurations 3 and 6**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 3) | 64 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | Bands NR_FDD_FR1_B | 36 |
| | | Bands NR_TDD_FR1_C | 36 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 37 |
| | | Bands NR_FDD_FR1_G | 38 |
| | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 3) | 83 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 49 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | Bands NR_FDD_FR1_G | 51 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 3) | 61 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 3) | 86 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 53 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy

#### 4.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.1.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

#### 4.7.1.2.2.4 Test description

##### 4.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.2.4.1-1.

**Table 4.7.1.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.1.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.1.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.1.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.1.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.2.4.1-2.

**Table 4.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.1.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.1.2.2.4.2 Test procedure

Same as in clause 4.7.1.1.2.4.2 but replacing Table 4.7.1.1.2.5-1 and 4.7.1.1.2.5-2 with 4.7.1.2.2.5-1 and 4.7.1.2.2.5-2, respectively.

#### 4.7.1.2.2.4.3 Message contents

Message contents are same as in clause 4.7.1.2.1.4.3.

### 4.7.1.2.2.5 Test requirement

Table 4.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.2.5-2.

**Table 4.7.1.2.2.5-1: same as Table 4.7.1.2.1.5-1**

**Table 4.7.1.2.2.5-2: SS-RSRP inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRP_x - 7 | SS-RSRP_x - 31 |
| Highest reported value (Cell 3) | SS-RSRP_x + 7 | SS-RSRP_x - 18 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRP_x - 9 | SS-RSRP_x - 33 |
| Highest reported value (Cell 3) | SS-RSRP_x + 9 | SS-RSRP_x - 17 |
| SS-RSRP_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.2 SS-RSRQ

### 4.7.2.0 Minimum conformance requirements

#### 4.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

The intra-frequency SS-RSRQ accuracy requirements are defined for the SS-RSRQ measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

**Table 4.7.2.0.1-1: SS-RSRQ intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal | Extreme | SSB | Io [Note 1] range |

| condition | condition | Ês/Iot | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±2.5 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.2.0.1-2: SS-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| SS-RSRQ_0 | SS-RSRQ<-43 | dB |
| SS-RSRQ_1 | -43≤ SS-RSRQ<-42.5 | dB |
| SS-RSRQ_2 | -42.5≤ SS-RSRQ<-42 | dB |
| SS-RSRQ_3 | -42≤ SS-RSRQ<-41.5 | dB |
| SS-RSRQ_4 | -41.5≤ SS-RSRQ<-41 | dB |
| .. | .. | … |
| SS-RSRQ_122 | 17.5≤ SS-RSRQ<18 | dB |
| SS-RSRQ_123 | 18≤ SS-RSRQ<18.5 | dB |
| SS-RSRQ_124 | 18.5≤ SS-RSRQ<19 | dB |
| SS-RSRQ_125 | 19≤ SS-RSRQ<19.5 | dB |
| SS-RSRQ_126 | 19.5≤ SS-RSRQ<20 | dB |
| SS-RSRQ_127 | 20 ≤ SS-RSRQ | dB |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.7.1.1 and 10.1.11.

### 4.7.2.0.2 Inter-frequency absolute SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ absolute accuracy requirements in this clause are defined for the SS-RSRQ measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.2-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

**Table 4.7.2.0.2-1: SS-RSRQ inter-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | |
| | | | NR operating band | Minimum Io | Maximum Io |

| | | | groups Note 3 | | | | |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±2.5 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.1 and 10.1.11.

#### 4.7.2.0.3 Inter-frequency relative SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ relative accuracy requirements in this clause are defined for the SS-RSRQ measured from one cell on a frequency in FR1compared to the SS-RSRQ measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB

**Table 4.7.2.0.3-1: SS-RSRQ inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 dB | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth. | | | | | | | |

NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.2 and 10.1.11.

## 4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy

### 4.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

### 4.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 4.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.1.

### 4.7.2.1.4 Test description

#### 4.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.1.4.1-1.

**Table 4.7.2.1.4.1-1: EN-DC FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.1.4.1-2.

**Table 4.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to | N/A | | |

| | | |
|---|---|---|
| connection diagram | | |

1. Message contents are defined in clause 4.7.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.3.

#### 4.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.2.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 4.7.2.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.2.1.5-1 as appropriate and repeat steps 5-7.

#### 4.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.2.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRQ measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-1 and 4.7.2.1-4 | Table H.3.1-3 with Condition SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-2 and 4.7.2.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.2.1-3 and 4.7.2.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRQ Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.7.2.1.5 Test requirement

Table 4.7.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.1.5-2.

**Table 4.7.2.1.5-1: SS-RSRQ intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP. 1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with | Config 2,3,5,6 | µs | - | 3 | - | 3 | - | 3 |

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Cell 2 | | Config 1,4 | ms | - | 3 | - | 3 | - | 3 |
| STMC configuration | | Config 2,3,5,6 | | SMTC.1 | | | | | |
| | | Config 1,4 | | SMTC.2 | | | | | |
| SSB configuration | | Config 1,2,4,5 | | SSB.1 FR1 | | | | | |
| | | Config 3,6 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| | | Config 3,6 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | -92.6 | | - | | -114+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | -89.6 | | - | | -111+ $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -83.5 | -83.5 | -103.9 | -103.9 | -118+$\Delta_{BG_offset}$ | -118+ $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -86.6 | -86.6 | - | - | -115+ $\Delta_{BG_offset}$ | -115+ $\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -51.57 | | -70 | | -83.50+ $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | -51.56 | | - | | -77.40+ $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.
NOTE 6: Subtest 2 is not used when testing with 30kHz SSB SCS.
NOTE 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.2.1.5-2: SS-RSRQ intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_52 | SS-RSRQ_46 | SS-RSRQ_44 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 3) | SS-RSRQ_62 | SS-RSRQ_60 | SS-RSRQ_59 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_49 | SS-RSRQ_45 | SS-RSRQ_43 |
| Highest reported value (Cell 3) | SS-RSRQ_65 | SS-RSRQ_61 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.2.2 Inter-frequency SS-RSRQ measurement accuracy

### 4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy

#### 4.7.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.2.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.1.

#### 4.7.2.2.1.4 Test description

##### 4.7.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.1.4.1-1.

**Table 4.7.2.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.2.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.1.4.1-2.

**Table 4.7.2.2.1.4.1-2: Initial conditions for SS-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |

| | | | |
|---|---|---|---|
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.2.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.2.2.1.4.2 Test procedure

Same as in clause 4.7.2.1.4.2 but replacing Table 4.7.2.1.5-1 and 4.7.2.1.5-2 with 4.7.2.2.1.5-1 and 4.7.2.2.1.5-2, respectively.

#### 4.7.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.2.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1.-1 and 4.7.2.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1-2 and 4.7.2.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.2.1.1-3 and 4.7.2.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.2.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRQ Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

4.7.2.2.1.5 Test requirement

Table 4.7.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.1.5-2

**Table 4.7.2.2.1.5-1: SS-RSRQ inter-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Gap pattern ID | Config 1-6 | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC configuration | Config 2,3,5,6 | | SMTC.1 | | | | | |
| | Config 1,4 | | SMTC.2 | | | | | |
| Time offset between Cell 2 and Cell 3 | Config 2,3,5,6 | µs | 3 | | | | | |
| | Config 1,4 | ms | 3 | | | | | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 in FR1 | | | | | |
| | Config 3,6 | | SSB.2 in FR1 | | | | | |
| PDSCH/PDCCH | Config 1,2,4,5 | kHz | 15 kHz | | | | | |

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| subcarrier spacing | | Config 3,6 | | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -81.68 | -81.68 | -106 | -106 | -116 + $\Delta_{BG_offset}$ | -116 + $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 3,6 | Depending on band group | dBm/15kHz | -87.80 | -87.80 | -113 | -113 | -116+ $\Delta_{BG_offset}$ | -116+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -81.68 | -81.68 | -106 | -106 | -116 + $\Delta_{BG_offset}$ | -116 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -84.8 | -84.8 | -110 | -110 | -113+ $\Delta_{BG_offset}$ | -113+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP Note 3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -83.43 | -83.43 | -107.75 | -107.75 | -113+ $\Delta_{BG_offset}$ | -117.75 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -86.54 | -86.54 | -111.75 | -111.75 | -110+ $\Delta_{BG_offset}$ | -114.75 + $\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | | dB | -14.76 | -14.76 | -14.76 | -14.76 | -12.56 | -14.76 |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/Ch BW | -51.51 | -51.51 | -75.83 | -75.83 | -83.28+ $\Delta_{BG_offset}$ | -85.83+ $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -51.52 | -51.52 | -76.73 | -76.73 | -77.19+ $\Delta_{BG_offset}$ | -79.73+ $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.2.2.1.5-2: SS-RSRQ intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_52 | SS-RSRQ_52 | SS-RSRQ_52 |
| Highest reported value (Cell 3) | SS-RSRQ_62 | SS-RSRQ_62 | SS-RSRQ_62 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_49 | SS-RSRQ_49 | SS-RSRQ_49 |
| Highest reported value (Cell 3) | SS-RSRQ_65 | SS-RSRQ_65 | SS-RSRQ_65 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy

#### 4.7.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands.

#### 4.7.2.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.2.

#### 4.7.2.2.2.4 Test description

##### 4.7.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.2.4.1-1.

**Table 4.7.2.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.2.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.2.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.2.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.2.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.2.4.1-2.

**Table 4.7.2.2.2.4.1-2: Initial conditions for SS-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Diagram | | Hz | |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.2.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.2.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.2.2.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the SS-RSRQ value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.2.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.2.2.2.5-1 as appropriate and repeat steps 5-7.

#### 4.7.2.2.2.4.3 Message contents

Message contents are same as in clause 4.7.2.2.1.4.3.

### 4.7.2.2.2.5 Test requirement

Table 4.7.2.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.2.5-2.

**Table 4.7.2.2.2.5-1: same as Table 4.7.2.2.2.1.5-1**

**Table 4.7.2.2.2.5-2: SS-RSRQ inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_x - 7 | SS-RSRQ_x - 7 | SS-RSRQ_x - 11 |
| Highest reported value (Cell 3) | SS-RSRQ_x + 7 | SS-RSRQ_x + 7 | SS-RSRQ_x + 2 |

| | | | |
|---|---|---|---|
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x - 13 |
| Highest reported value (Cell 3) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| NOTE: RSRQ_x is the reported value of Cell 2. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.3 SS-SINR

### 4.7.3.0 Minimum conformance requirements

#### 4.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to clause B.2.2 for a corresponding Band.

**Table 4.7.3.0.1-1: SS-SINR intra-frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 3 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3.0 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.3.0.2-1: SS-SINR inter-frequency absolute accuracy in FR1**

| **Reported value** | **Measured quantity value (L3 SS-SINR)** | **Measured quantity value (L1 SS-SINR and L1 CSI-SINR)** | **Unit** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| SINR_0 | SS-SINR<-23 | SINR<-23 | dB |
| SINR_1 | -23≤ SS-SINR<-22.5 | -23≤SINR<-22.5 | dB |
| SINR_2 | -22.5≤ SS-SINR<-22 | -22.5≤SINR<-22 | dB |
| SINR_3 | -22≤ SS-SINR<-21.5 | -22≤SINR<-21.5 | dB |
| SINR_4 | -21.5≤ SS-SINR<-21 | -21.5≤SINR<-21 | dB |
| .. | .. | .. | … |
| SINR_123 | 38≤ SS-SINR<38.5 | 38≤SINR<38.5 | dB |
| SINR_124 | 38.5≤ SS-SINR<39 | 38.5≤SINR<39 | dB |
| SINR_125 | 39≤ SS-SINR<39.5 | 39≤SINR<39.5 | dB |
| SINR_126 | 39.5≤ SS-SINR<40 | 39.5≤SINR<40 | dB |
| SINR_127 | 40≤ SS-SINR | 40≤SINR | dB |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.12.1.1 and 10.1.16.

### 4.7.3.0.2 Inter-frequency absolute SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on a different carrier frequency than that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

**Table 4.7.3.0.2-1: SS-SINR Inter-frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 3 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3.0 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.1 and 10.1.16.

### 4.7.3.0.3 Inter-frequency relative SS-SINR measurement accuracy requirements

The inter-frequency SS-SINR relative accuracy requirements in this clause are defined for the SS-SINR measured from one cell on a frequency in FR1compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.3.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 4.7.3.0.3-1: SS-SINR inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2,4 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | | |
| ±3.5 | ±4 | ≥-3 dB | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 dB | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: The requirements apply for SSB Ês/Iot ≤ [25] dB.
NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.2 and 10.1.16.

## 4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy

### 4.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

### 4.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

### 4.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.1.

### 4.7.3.1.4 Test description

#### 4.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.1.4.1-1.

**Table 4.7.3.1.4.1-1: EN-DC FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.3.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.1.4.1-2.

**Table 4.7.3.1.4.1-2: Initial conditions for SS-SINR intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

### 4.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 4.7.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.3.1.5-1 as appropriate and repeat steps 5-7.

#### 4.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.3.1.4.3-1: Common Exception messages for EN-DC FR1 SS-SINR measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-1 and 4.7.3.1-4 | Table H.3.1-3 with Condition and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-2 and 4.7.3.1-5 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.3.1-3 and 4.7.3.1-6 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-SINR Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.3.1.5 Test requirements

Table 4.7.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.1.5-2.

**Table 4.7.3.1.5-1: SS-SINR intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |
| | Config 3,6 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |

| Parameter | | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | |
| TRS configuration | | Config 1,4 | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | | Config 2,5 | | TRS.1.1 TDD | - | TRS.1.1 TDD | - |
| | | Config 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | | Config 3,6 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | | OP.1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 2 | | Config 2,3,5,6 | µs | - | 3 | - | 3 |
| | | Config 1,4 | ms | - | 3 | - | 3 |
| SMTC configuration | | Config 1,4 | | SMTC.2 | | | |
| | | Config 2,3,5,6 | | SMTC.1 | | | |
| SSB configuration | | Config 1,2,4,5 | | SSB.1 FR1 | | | |
| | | Config 3,6 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | |
| | | Config 3,6 | | 30 | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | | Depending on band group | dBm/15kHz | -93 | | -116+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -93.2 | | Same as Noc for 15kHz | |
| | Config 3,6 | Depending on band group | | -90.2 | | -113+ $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -3.5 | -3.5 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -88.46 | -90.34 | -119.5+ $\Delta_{BG_offset}$ | -119.5+ $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -85.65 | -87.53 | -116.5+ $\Delta_{BG_offset}$ | -116.5+ $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | | dB | 0 | -3.19 | -5.1 | -5.1 |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -57.5 | | -85.28+ $\Delta_{BG_offset}$ | |

| Parameter | | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | -51.59 | | -79.17+ $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | |
| NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |
| NOTE 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | |
| NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

**Table 4.7.3.1.5-2: SS-SINR intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 3) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 3) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.3.2 Inter-Frequency SS-SINR measurement accuracy

### 4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy

#### 4.7.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.3.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

#### 4.7.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.1.

#### 4.7.3.2.1.4 Test description

##### 4.7.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.1.4.1-1.

**Table 4.7.3.2.1.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.3.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.1.4.1-2.

**Table 4.7.3.2.1.4.1-2: Initial conditions for SS-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.3.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

### 4.7.3.2.1.4.2 Test procedure

Same as in clause 4.7.3.1.4.2 but replacing Table 4.7.3.1.5-1 and 4.7.3.1.5-2 with 4.7.3.2.1.5-1 and 4.7.3.2.1.5-2, respectively.

### 4.7.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.3.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-SINR absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1.-1 and 4.7.3.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1-2 and 4.7.3.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.3.1.1-3 and 4.7.3.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.3.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-SINR Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.7.3.2.1.5 Test requirements

Table 4.7.3.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.2.1.5-2.

**Table 4.7.3.2.1.5-1: SS-SINR inter-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | TRS.1.1 FDD | | TRS.1.1 FDD | |

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| | | Config 2, 5 | | TRS.1.1 TDD | - | TRS.1.1 TDD | - | TRS.1.1 TDD | - |
| | | Config 3, 6 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | |
| Time offset with Cell 2 | | Config 2,3,5,6 | µs | - | 3 | - | 3 | - | 3 |
| | | Config 1,4 | ms | - | 3 | - | 3 | - | 3 |
| STMC configuration | | Config 2,3,5,6 | | SMTC.1 | | | | | |
| | | Config 1,4 | | SMTC.2 | | | | | |
| SSB configuration | | Config 1,2,4,5 | | SSB.1 FR1 | | | | | |
| | | Config 3,6 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | | | |
| | | Config 3,6 | | 30 | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS (Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -88 | -88 | -108.5 | -108.5 | -119.5+ $\Delta_{BG_offset}$ | -119.5+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -88 | -88 | -108.5 | -108.5 | Same as Noc for 15kHz | Same as Noc for 15kHz |
| | Config 3,6 | Depending on band group | | -85 | -85 | -105.5 | -105.5 | -116.5+ $\Delta_{BG_offset}$ | 116.5+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -89.75 | -89.75 | -88.5 | -88.5 | -122.7+ $\Delta_{BG_offset}$ | -122.7+ $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -86.75 | -86.75 | -85.5 | -85.5 | -119.7+ $\Delta_{BG_offset}$ | -119.7+ $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -57.83 | -57.83 | -60.5 | -60.5 | -89.85+ $\Delta_{BG_offset}$ | -89.85+ $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | -51.73 | -51.73 | -54.41 | -54.41 | -83.75+ $\Delta_{BG_offset}$ | -83.75+ $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | |
| NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |
| NOTE 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | |
| NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

**Table 4.7.3.2.1.5-2: SS-SINR inter-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_35 | SS-SINR_79 | SS-SINR_32 |
| Highest reported value (Cell 3) | SS-SINR_51 | SS-SINR_94 | SS-SINR_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_33 | SS-SINR_77 | SS-SINR_31 |
| Highest reported value (Cell 3) | SS-SINR_53 | SS-SINR_96 | SS-SINR_50 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy

#### 4.7.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

#### 4.7.3.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

#### 4.7.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.2.

#### 4.7.3.2.2.4 Test description

##### 4.7.3.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.2.4.1-1.

**Table 4.7.3.2.2.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.3.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.3.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.3.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |

| | |
|---|---|
| 4.7.3.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.3.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.2.4.1-2.

**Table 4.7.3.2.2.4.1-2: Initial conditions for SS-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.3.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.3.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

### 4.7.3.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.3.2.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the SS-SINR value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.3.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.3.2.2.5-1 as appropriate and repeat steps 5-7.

### 4.7.3.2.2.4.3 Message contents

Message contents are same as in clause 4.7.3.2.1.4.3.

#### 4.7.3.2.2.5 Test requirements

Table 4.7.3.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.3.2.2.5-2.

**Table 4.7.3.2.2.5-1: same as Table 4.7.3.2.1.5-1**

**Table 4.7.3.2.2.5-2: SS-SINR inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 3) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 3) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| SS-SINR_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.4 L1-RSRP

### 4.7.4.0 Minimum conformance requirements

#### 4.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

**Table 4.7.4.0.1-1: SSB based L1-RSRP absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io [Note 1] range** | | | | |
| | | | **NR operating band groups [Note 2]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±5.0 | ±9.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR_FDD_FR1_A,<br>NR_TDD_FR1_A,<br>NR_SDL_FR1_A,<br>NR_FDD_FR1_B,<br>NR_TDD_FR1_C,<br>NR_FDD_FR1_D,<br>NR_TDD_FR1_D,<br>NR_FDD_FR1_E,<br>NR_TDD_FR1_E,<br>NR_FDD_FR1_F,<br>NR_FDD_FR1_G,<br>NR_FDD_FR1_H, | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.4.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping**

| Reported value | Measured quantity value (L3 SS-RSRP and CSI-RSRP) | Measured quantity value (L1 SS-RSRP and CSI-RSRP) | Unit |
|---|---|---|---|
| RSRP_0 | RSRP<-156 | Not valid | dBm |
| RSRP_1 | -156≤RSRP<-155 | Not valid | dBm |
| RSRP_2 | -155≤RSRP<-154 | Not valid | dBm |
| RSRP_3 | -154≤RSRP<-153 | Not valid | dBm |
| RSRP_4 | -153≤RSRP<-152 | Not valid | dBm |
| RSRP_5 | -152≤RSRP<-151 | Not valid | dBm |
| RSRP_6 | -151≤RSRP<-150 | Not valid | dBm |
| RSRP_7 | -150≤RSRP<-149 | Not valid | dBm |
| RSRP_8 | -149≤RSRP<-148 | Not valid | dBm |
| RSRP_9 | -148≤RSRP<-147 | Not valid | dBm |
| RSRP_10 | -147≤RSRP<-146 | Not valid | dBm |
| RSRP_11 | -146≤RSRP<-145 | Not valid | dBm |
| RSRP_12 | -145≤RSRP<-144 | Not valid | dBm |
| RSRP_13 | -144≤RSRP<-143 | Not valid | dBm |
| RSRP_14 | -143≤RSRP<-142 | Not valid | dBm |
| RSRP_15 | -142≤RSRP<-141 | Not valid | dBm |
| RSRP_16 | -141≤RSRP<-140 | RSRP<-140 | dBm |
| RSRP_17 | -140≤RSRP<-139 | -140≤RSRP<-139 | dBm |
| RSRP_18 | -139≤RSRP<-138 | -139≤ RSRP<-138 | dBm |
| … | … | | … |
| RSRP_111 | -46≤RSRP<-45 | -46≤ RSRP<-45 | dBm |
| RSRP_112 | -45≤RSRP<-44 | -45≤ RSRP<-44 | dBm |
| RSRP_113 | -44≤RSRP<-43 | -44≤ RSRP | dBm |
| RSRP_114 | -43≤RSRP<-42 | Not valid | dBm |
| RSRP_115 | -42≤RSRP<-41 | Not valid | dBm |
| RSRP_116 | -41≤RSRP<-40 | Not valid | dBm |
| RSRP_117 | -40≤RSRP<-39 | Not valid | dBm |
| RSRP_118 | -39≤RSRP<-38 | Not valid | dBm |

| | | | |
|---|---|---|---|
| RSRP_119 | -38≤RSRP<-37 | Not valid | dBm |
| RSRP_120 | -37≤RSRP<-36 | Not valid | dBm |
| RSRP_121 | -36≤RSRP<-35 | Not valid | dBm |
| RSRP_122 | -35≤RSRP<-34 | Not valid | dBm |
| RSRP_123 | -34≤ RSRP<-33 | Not valid | dBm |
| RSRP_124 | -33≤RSRP<-32 | Not valid | dBm |
| RSRP_125 | -32≤RSRP<-31 | Not valid | dBm |
| RSRP_126 | -31≤RSRP | Not valid | dBm |
| RSRP_127 (Note) | Infinity | Infinity | dBm |
| NOTE: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.1 and 10.1.6.

4.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 4.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

**Table 4.7.4.0.2-1: SSB based L1-RSRP relative accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 2 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.<br>NOTE 3: Void<br>NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.2 and 10.1.6.

#### 4.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.3-1.

**Table 4.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io [Note 1] range** | | | | | |
| | | | **NR operating band groups [Note 2]** | **Minimum Io** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{CSI-RS}$** | | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | | **$SCS_{CSI-RS}$ = 15 kHz** | **$SCS_{CSI-RS}$ = 30 kHz** | **$SCS_{CSI-RS}$ = 60 kHz** | | |
| ±5.0 | ±9.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4. | | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.1 and 10.1.6.

#### 4.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 4.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.4-1.

**Table 4.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** Note 2 | **Io** Note 1 **range** | | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{CSI-RS}$** | | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{CSI-RS}$ = 15 kHz** | **$SCS_{CSI-RS}$ = 30 kHz** | **$SCS_{CSI-RS}$ = 60 kHz** | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.2 and 10.1.6.

### 4.7.4.1 SSB based L1-RSRP measurements

#### 4.7.4.1.1 EN-DC FR1 SSB-based L1-RSRP absolute measurement accuracy

##### 4.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.4.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

#### 4.7.4.1.1.4 Test description

##### 4.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.1.4.1-1.

**Table 4.7.4.1.1.4.1-1: EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.4.1.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.1.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.1.4.1-2.

**Table 4.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.4.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.4.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.1.4.1-2.
2. Set the parameters according to T1 in Table 4.7.4.1.1.5-1.
3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 4.7.4.1.1.5-2 or Table 4.7.4.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.4.1.1.5-1 as appropriate and repeat steps 3-5.

#### 4.7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.4.1.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODICTable H.3.6-10<br>Table H.3.4-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table H.3.5-8 |

**Table 4.7.4.1.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.4.1.1.5 Test requirement

Table 4.7.4.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-3 for test configurations 3 and 6.

**Table 4.7.4.1.1.5-1: L1-RSRP test parameters**

| Parameter | | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|---|
| SSB GSCN | | 1~6 | | freq1 | freq1 |
| Duplex mode | | 1,4 | | FDD | FDD |
| | | 2,5 | | TDD | TDD |
| | | 3,6 | | TDD | TDD |
| TDD Configuration | | 1,4 | | N/A | N/A |
| | | 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | | 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | | 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | | 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 2,5 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 3,6 | | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~6 | | OP.1 | OP.1 |
| TRS configuration | | 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~6 | | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~6 | | periodic | periodic |
| reportQuantity | | 1~6 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1~6 | | 2 | 2 |
| L1-RSRP reporting period | | 1~6 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1~6 | dB | 0 | 0 |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -96.00 | 117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3,6 | | -83.00 | -116.2 + |

| Parameter | | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|---|
| | | | | | $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 | | AWGN | AWGN |
| Antenna configuration | | 1~6 | | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_F | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 2) | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 44 |
| | | Bands NR_FDD_FR1_B | 45 |
| | | Bands NR_TDD_FR1_C | 45 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 46 |
| | | Bands NR_FDD_FR1_F | 47 |
| | | Bands NR_FDD_FR1_G | 47 |
| | | Bands NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | Bands NR_FDD_FR1_B | 27 |
| | | Bands NR_TDD_FR1_C | 27 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 28 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 28 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_F | 29 |
| | | Bands NR_FDD_FR1_G | 29 |
| | | Bands NR_FDD_FR1_H | 30 |
| Highest reported value (Cell 2) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 49 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 50 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_F | 51 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 52 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 4.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | e63 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 34 |
| | | Bands NR_FDD_FR1_B | 34 |
| | | Bands NR_TDD_FR1_C | 35 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 36 |
| | | Bands NR_FDD_FR1_F | 36 |
| | | Bands NR_FDD_FR1_G | 37 |
| | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 2) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 47 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 48 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 49 |
| | | Bands NR_FDD_FR1_F | 50 |
| | | Bands NR_FDD_FR1_G | 50 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 29 |
| | | Bands NR_FDD_FR1_B | 30 |
| | | Bands NR_TDD_FR1_C | 30 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 31 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 31 |
| | | Bands NR_FDD_FR1_F | 32 |
| | | Bands NR_FDD_FR1_G | 32 |
| | | Bands NR_FDD_FR1_H | 33 |
| Highest reported value (Cell 2) | 87 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 52 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, | 53 |

| | | | |
|---|---|---|---|
| | | NR_TDD_FR1_D | |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_F | 54 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 55 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.4.1.2 EN-DC FR1 SSB-based L1-RSRP relative measurement accuracy

#### 4.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 4.7.4.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

#### 4.7.4.1.2.4 Test description

##### 4.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.2.4.1-1.

**Table 4.7.4.1.2.4.1-1: EN-DC FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.4.1.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.1.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.1.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.1.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.2.4.1-2.

**Table 4.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |

| | | | |
|---|---|---|---|
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.4.1.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.4.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.2.4.1-2.
2. Set the parameters according to T1 in Table 4.7.4.1.2.5-1.
3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 4.7.4.1.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.4.1.2.5-1 as appropriate and repeat steps 3-5.

#### 4.7.4.1.2.4.3 Message contents

Message contents are same as in clause 4.7.4.1.1.4.3.

### 4.7.4.1.2.5 Test requirement

Table 4.7.4.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.4.1.2.5-2.

**Table 4.7.4.1.2.5-1: Same as Table 4.7.4.1.1.5-1**

**Table 4.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported | 2 | 2 |

| | | |
|---|---|---|
| value | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.4.2 CSI-RS based L1-RSRP measurements

### 4.7.4.2.1 EN-DC FR1 CSI-RS-based L1-RSRP absolute measurement accuracy

#### 4.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.4.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 4.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

#### 4.7.4.2.1.4 Test description

##### 4.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.1.4.1-1.

**Table 4.7.4.2.1.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.4.2.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.2.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.1.4.1-2.

**Table 4.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to | N/A | | |

| Parameter | Value | Comment |
|---|---|---|
| connection diagram | | |

1. Message contents are defined in clause 4.7.4.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.2.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.1.4.1-2.
2. Set the parameters according to T1 in Table 4.7.4.2.1.5-1.
3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of CSI-RS #0 or CSI-RS #1 in the periodic L1-RSRP reports. If the value for the strongest CSI-RS is within the limits in Table 4.7.4.2.1.5-2 or Table 4.7.4.2.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

#### 4.7.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.4.2.1.4.3-1: Common Exception messages EN-DC CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table H.3.4-1<br>Table H.3.5-8<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.4.2.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the | |

| | | | |
|---|---|---|---|
| | | SSB. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

4.7.4.2.1.5 Test requirement

Table 4.7.4.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-3 for test configurations 3 and 6.

**Table 4.7.4.2.1.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 | freq1 |
| Duplex mode | 1,4 | | FDD | FDD |
| | 2,5 | | TDD | TDD |
| | 3,6 | | TDD | TDD |
| TDD Configuration | 1,4 | | N/A | N/A |
| | 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 | SSB.3 FR1 |
| | 3,6 | | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | 1~6 | | OP.1 | OP.1 |
| TRS configuration | 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 | SMTC.1 |
| CSI-RS | 1,4 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | 2,5 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | 3,6 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | 1~6 | | periodic | periodic |
| reportQuantity | 1~6 | | cri-RSRP | cri-RSRP |
| Number of reported RS | 1~6 | | 2 | 2 |
| L1-RSRP reporting period | 1~6 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |

| Parameter | | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -96.00 | 117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2,4,5 | dBm/CSI-RS SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | -2.2 |
| CSI-RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/CSI-RS SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3,6 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 | | AWGN | AWGN |
| Antenna configuration | | 1~6 | | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.4.2.1.5-2: Same as Table 4.7.4.1.1.5-2**

**Table 4.7.4.2.1.5-3: Same as Table 4.7.4.1.1.5-3**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.4.2.2 EN-DC FR1 CSI-RS-based L1-RSRP relative measurement accuracy

### 4.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

### 4.7.4.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 4.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

#### 4.7.4.2.2.4 Test description

##### 4.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.2.4.1-1.

**Table 4.7.4.2.2.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.4.2.2-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.2-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.2-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.4.2.2-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.4.2.2-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.4.2.2-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.2.4.1-2.

**Table 4.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.4.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.4.2.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.2.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.2.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-RSRP reports. The DIFF-RSRP value of CSI-RS#0 or CSI-RS#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 4.7.4.2.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.4.2.2.5-1 as appropriate and repeat steps 3-5.

#### 4.7.4.2.2.4.3 Message contents

Message contents are same as in clause 4.7.4.2.1.4.3.

#### 4.7.4.2.2.5 Test requirement

Table 4.7.4.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.2.5-2.

**Table 4.7.4.2.2.5-1: Same as Table 4.7.4.2.1.5-1**

**Table 4.7.4.2.2.5-2: Same as Table 4.7.4.1.2.5-2**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.5 SFTD

### 4.7.5.0 Minimum conformance requirements

#### 4.7.5.0.1 SFTD accuracy requirement

The SFN and frame timing difference (SFTD) is measured between PCell and NR PSCell under EN-DC, or between PCell and NR cell for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 4.7.5.0.1-3 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to Annex B.3.5 of TS 36.133 [23] for a corresponding Band.
- Io range defined in Table 4.7.5.0.1-1.

**Table 4.7.5.0.1-1: PCell Io range conditions for SFTD measurement accuracy**

| Parameter | Io Note 1 range | | |
|---|---|---|---|
| | E-UTRA operating band groups Note 4, 5 | Minimum Io | Maximum Io |
| | | dBm/15kHz Note 2, 3 | $dBm/BW_{Channel}$ |
| Conditions | FDD_A, TDD_A | -121 | -50 |
| | FDD_C, TDD_C | -120 | -50 |

| | | | |
|---|---|---|---|
| | FDD_D | -119.5 | -50 |
| | FDD_E, TDD_E | -119 | -50 |
| | FDD_F | -118.5 | -50 |
| | FDD_G | -118 | -50 |
| | FDD_H | -117.5 | -50 |
| | FDD_N | -114.5 | -50 |

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by $\Delta$>0, when applicable, as described in clause B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
NOTE 5: Only E-UTRA bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Io range defined in Table 4.7.5.0.1-2.

**Table 4.7.5.0.1-2: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy in FR1**

| **Parameter** | **Io Note 1 range** | | | |
|---|---|---|---|---|
| | **NR operating band groups Note 4, 5** | **Minimum Io** Note 2, 3 | | **Maximum Io** |
| | | **dBm/$SCS_{SSB}$** | | **dBm/$BW_{Channel}$** |
| | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | |
| **Conditions** | NR_FDD_FR1_A, NR_TDD_FR1_A | -121 | -118 | -50 |
| | NR_FDD_FR1_B | -120.5 | -117.5 | -50 |
| | NR_TDD_FR1_C | -120 | -117 | -50 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -50 |
| | NR_FDD_FR1_G | -118 | -115 | -50 |
| | NR_FDD_FR1_H | -117.5 | -114.5 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA - NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3.5 of TS 36.133 [23].
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

**Table 4.7.5.0.1-3: SFTD measurement accuracy**

| **Accuracy** | **Conditions** | |
|---|---|---|
| | **Ês/Iot** | **Frequency range** |
| **Ts Note 1** | **dB** | |
| 40 | ≥ -3 dB | FR1 |
| 40 | | FR2 |

NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

## 4.7.5.1 EN-DC FR1 SFTD measurement accuracy

#### 4.7.5.1.1 Test purpose

The purpose of this test is to verify that SFTD measurement accuracy is within the specified limits for all bands.

#### 4.7.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. Applicability requires support of SFTD measurements between an E-UTRA PCell and an NR PSCell.

#### 4.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.5.1.

#### 4.7.5.1.4 Test description

##### 4.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.5.1.4.1-1.

**Table 4.7.5.1.4.1-1: Test configurations**

| Test Case ID | Description |
|---|---|
| 4.7.5.1-1 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.5.1-2 | LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.5.1-3 | LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| 4.7.5.1-4 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 4.7.5.1-5 | LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 4.7.5.1-6 | LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.5.1.4.1-2.

**Table 4.7.5.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.5.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3. The SFTD between PCell and PSCell shall be set to one of the conditions in Table 4.7.5.1.5-2. For negative Frame boundary offset, it can be achieved delaying PSCell in regards to PCell OR advancing PCell in regards to

PSCell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to PSCell OR advancing PSCell in regards to PCell.

#### 4.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.5.1.5-1 and Table 4.7.5.1.5-2 as appropriate. (Condition = 3)
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.
6. The SS shall check the reported SFN offset and frame boundary offset between the E-UTRA PCell and the NR PSCell. The number of failed iterations is increased by one if

   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult* is outside the range given in Table 4.7.5.1.5-3, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. Switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.
8. Repeat steps 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 4.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.5.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-4 with Condition INTER_RAT, GAPLESS and SFTD<br>Table H.3.4-7 with Condition Inter-RAT and SFTD |
| Specific message contents exceptions for Test Configuration 4.7.5.1.-1, 4.7.5.1-2, 4.7.5.1-4 and 4.7.5.1-54 | Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.5.1-3 and 4.7.5.1-6 | Table H.3.4-6 with Condition S SB.2 FR1 and SMTC.1 |

**Table 4.7.5.1.4.3-2: ReportConfigInterRAT-SFTD**

| Derivation Path: TS 36.508 [25], Table 4.6.6-8B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportQuantityCellNR-r15 ::= SEQUENCE { | | | |
| ss-rsrp | true | | |
| } | | | |
| reportSFTD-Meas-r15 | pSCell | | |
| } | | | |

#### 4.7.5.1.5 Test requirement

Table 4.7.5.1.5-1 defines the primary level settings including test tolerances.

**Table 4.7.5.1.5-1: Test parameters for SFTD accuracy**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.1 FR1 |
| | 2,5 | | SSB.1 FR1 |
| | 3,6 | | SSB.2 FR1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DL BWP configuration | 1~6 | | DLBWP.1.1 |
| UL BWP configuration | 1~6 | | ULBWP.1.1 |
| CSI-RS for tracking | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -104 |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -104 |
| | 3,6 | | -101 |
| $\hat{E}_s / I_{ot}$ | 1~6 | dB | -2.7 |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | -2.7 |
| SS-RSRP Note3 | 1,2,4,5 | dBm/SCS | -106.7 |
| | 3,6 | | -103.7 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -74.18 |
| | 3,6 | dBm/38.16 MHz | -68.08 |
| Propagation condition | 1~6 | | AWGN |

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| Antenna configuration | 1~6 | | 1x2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | |

The SFTD reported by the UE consists of two elements, the SFN offset and the frame boundary offset between PCell and PSCell. Table 4.7.5.1.5-2 defines the timing offsets for the SFTD accuracy test. The SFN offset in reported SFTD shall match the values in Table 4.7.5.1.5-2 and the frame boundary offset in reported SFTD shall be within the range given in Table 4.7.5.1.5-3.

**Table 4.7.5.1.5-2: Timing offsets for SFTD accuracy test**

| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|---|---|---|
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

**Table 4.7.5.1.5-3: EN-DC FR1 SFTD measurement accuracy requirements for the value of frameBoundaryOffsetResult in reported SFTD**

| Normal and Extreme Conditions | frameBoundaryOffsetResult | | | | |
|---|---|---|---|---|---|
| | Condition 1 | Condition 2 | Condition 3 | Condition 4 | Condition 5 |
| Lowest reported value | -24408 | -12116 | 192 | 12500 | 24792 |
| Highest reported value | -24392 | -12100 | 208 | 12516 | 24808 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.6 CLI measurements

### 4.7.6.0 Minimum conformance requirements

#### 4.7.6.0.1 Minimum conformance requirements for SRS-RSRP accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.1-1 for FR1, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to 38.133 [6] Annex B.2.7 for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where:

- $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1
- $N_{TA_offset}$ is defined in TS 38.133 [6] Table 7.1.2-2
- $T_C$ is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping, or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

**Table 4.7.6.0.1-1: SRS-RSRP absolute accuracy in FR1**

| Accuracy | | | | | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal condition | | | Extreme condition | | | SRS Ês/Iot | Io [Note 1] range | | | | | |
| | | | | | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| dB | | | | | | dB | | dBm / $SCS_{SRS}$ | | | dBm/BW Channel | dBm/BW Channel |
| $SCS_{SRS}$ (kHz) | | | $SCS_{SRS}$ (kHz) | | | | | | | | | |
| 15 | 30 | 60 | 15 | 30 | 60 | | | $SCS_{SRS}$ = 15 kHz | $SCS_{SRS}$ = 30 kHz | $SCS_{SRS}$ = 60 kHz | | |
| ±3 | ±3.5 | ±5 | ±7.5 | ±8 | ±9.5 | ≥1 | NR_TDD_FR1_A, | -120 | -117 | -114 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_C | -119 | -116 | -113 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_E | -118 | -115 | -112 | N/A | -70 |
| ±6.5 | ±7 | ±8.5 | ±9.5 | ±10 | ±11.5 | ≥1 | NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.1

#### 4.7.6.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.6.0.1.2-1: SRS-RSRP measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| SRS-RSRP_0 | SRS-RSRP<-140 | dBm |
| SRS-RSRP_1 | -140≤ SRS-RSRP<-139 | dBm |
| SRS-RSRP_2 | -139≤ SRS-RSRP<-138 | dBm |
| SRS-RSRP_3 | -138≤ SRS-RSRP<-137 | dBm |
| SRS-RSRP_4 | -137≤ SRS-RSRP<-136 | dBm |
| .. | .. | … |
| SRS-RSRP_95 | -46≤ SRS-RSRP<-45 | dBm |
| SRS-RSRP_96 | -45≤ SRS-RSRP<-44 | dBm |
| SRS-RSRP_97 | -44≤ SRS-RSRP | dBm |
| SRS-RSRP_98 | Infinity | |
| NOTE: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure. | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.2.

### 4.7.6.0.2 Minimum conformance requirements for CLI-RSSI measurement accuracy with FR1 serving cell

The CLI-RSSI measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.2-1 for FR1, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

**Table 4.7.6.0.2-1: CLI-RSSI absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **Io [Note 1] range** | | | | | |
| | | **NR operating band groups [Note 2]** | **Minimum Io** | | | | **Maximum Io** |
| **dB** | **dB** | | **dBm / $SCS_{SRS}$** | | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | **$SCS_{SRS}$ = 15 kHz** | **$SCS_{SRS}$ = 30 kHz** | **$SCS_{SRS}$ = 60 kHz** | | |
| ±3.5 | ±6.5 | NR_TDD_FR1_A, | -120 | -117 | -114 | N/A | -70 |
| | | NR_TDD_FR1_C | -119 | -116 | -113 | N/A | -70 |
| | | NR_TDD_FR1_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | NR_TDD_FR1_E | -118 | -115 | -112 | N/A | -70 |
| ±5.5 | ±8.5 | Note 3 | Note 3 | Note 3 | Note 3 | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.<br>NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.2.1

#### 4.7.6.0.2.1 CLI-RSSI report mapping

The reporting range of CLI-RSSI is defined from -100 dBm to -25 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.2.1-1. The range in the signalling may be larger than the guaranteed accuracy range. UE shall scale the measured CLI-RSSI to report a nominal RSSI equivalent to 6RB measurement with 15kHz SCS.

**Table 4.7.6.0.2.1-1: CLI-RSSI measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CLI-RSSI_00 | CLI-RSSI < -100 | dBm |
| CLI-RSSI_01 | -100 ≤ CLI-RSSI < -99 | dBm |
| CLI-RSSI_02 | -99 ≤ CLI-RSSI < -98 | dBm |
| … | … | … |
| CLI-RSSI_74 | -27 ≤ CLI-RSSI < -26 | dBm |
| CLI-RSSI_75 | -26 ≤ CLI-RSSI < -25 | dBm |
| CLI-RSSI_76 | -25 ≤ CLI-RSSI | dBm |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.22.2.2.

## 4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

### 4.7.6.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the SRS-RSRP measurement requirements in clause 4.7.6.0.

### 4.7.6.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting NR EN-DC and CLI-based SRS-RSRP measurements.

### 4.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.1.

### 4.7.6.1.4 Test description

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1) and NR FR1 PSCell (Cell 2). The test parameters for Cell 1 are defined in Annex A.6. The test parameters for the Cell 2 are given in Table 4.7.6.1.5-1 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table 4.7.6.1.5-2. The SRS resource configuration is given in Table 4.7.6.1.5-3.

#### 4.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.1.4.1-1.

**Table 4.7.6.1.4.1-1: Supported test configurations for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Config | Description |
|---|---|
| 4.7.6.1-1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4.7.6.1-4 | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.6.1.4.1-2.

**Table 4.7.6.1.4.1-2: Initial conditions for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |

1. Message contents are defined in clause 4.7.6.1.4.3.
2. Cell 1 is the E-UTRAN PCell, with power levels and settings set according to Annex A.6. Cell 2 is the NR serving cell (PSCell). The power levels and settings for Cell 2 are set according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.
3. The test parameters are given in Table 4.7.6.1.4.1-3

### 4.7.6.1.4.2 Test procedure

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 4.7.6.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to the corresponding Test in Table 4.7.6.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message, embedded in an *RRCConnectionReconfiguration* message, configuring a CLI measurement object with periodic reporting, as specified in clause 4.7.6.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* message, embedded in an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages, embedded in *ULInformationTransferMRDC* messages.
6. After 10s wait from Step 5, the SS shall check the SRS-RSRP reported values in the periodic *MeasurementReport*. The reported SRS-RSRP value of the neighbor virtual UE is compared to the expected SRS-RSRP as specified in Table 4.7.6.1.5-4 and Table 4.7.6.1.5-5 for Test 1 and Test 2, correspondingly. If the reported value is outside the limits specified in such tables, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each Test in Table 4.7.6.1.5-1 as appropriate and repeat steps 2-7.

### 4.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 4.7.6.1.4.3-1: Common Exception messages for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 4.7.6.1.4.3-2: *MeasObjectToAddModList* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectCLI-r16 | MeasObjectCLI-r16 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.7.6.1.4.3-3: *MeasObjectCLI-r16* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectCLI-r16 ::= SEQUENCE { | | | |
| cli-ResourceConfig-r16 SEQUENCE { | | | |
| srs-ResourceConfig-r16 CHOICE { | | | |
| setup SEQUENCE { | | | |
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry | | |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1,3 |
| | SRSConf.2 | entry 1 | Config 2,4 |
| srs-SCS-r16 | kHz15 | | Config 1,3 |
| | kHz30 | | Config 2,4 |
| refServCellIndex-r16 | 0 | PSCell | |
| refBWP-r16 | 0 | BWP-0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.7.6.1.4.3-4: *ReportConfigNR* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| cli-Periodical-r16 SEQUENCE { | | | |
| reportInterval-r16 | ms240 | | |
| reportAmount-r16 | infinity | | |
| reportQuantityCLI-r16 | srs-rsrp | | |
| maxReportCLI-r16 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.7.6.1.4.3-5: *MeasResultCLI-r16* for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 and TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultCLI-r16 ::= SEQUENCE { | | | |
| measResultsListSRS-r16 CHOICE { | | | |
| srs-ResourceId-r16 | SRS-ResourceId | | |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) | |
| } | | | |
| } | | | |

4.7.6.1.5 Test requirement

Table 4.7.6.1.5-1 and Table 4.7.6.1.5-2 define the primary level settings including test tolerances for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell. Table 4.7.6.1.5-3 defines the SRS resource configurations. Table 4.7.6.1.5-4 and Table 4.7.6.1.5-5 define the absolute accuracy requirements for Tests 1, 2 and 3 for configurations (1 and 3) and (2 and 4), correspondingly.

**Table 4.7.6.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Parameter | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | freq1 | freq1 |
| Duplex mode | 1~4 | | TDD | TDD | TDD |
| TDD configuration | 1,3 | | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
| | 2,4 | | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1,3 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,4 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,3 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| | 2,4 | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,3 | | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| | 2,4 | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,3 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| | 2,4 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | 1,3 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | 2,4 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~4 | | OP.1 | OP.1 | OP.1 |
| TRS configuration | 1,3 | | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD |
| | 2,4 | | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | 1~4 | μs | 17.67 | 17.67 | 17.67 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | NR_TDD_FR1_A Note3 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A Note3 | 2,4 | | Not applicable Note4 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A Note3 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A Note3 | 2,4 | | Not applicable Note4 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |
| NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| NOTE 3: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | |
| NOTE 4: Test 1 is not used when testing with 30kHz SSB SCS. | | | | | | |

**Table 4.7.6.1.5-2: Neighbor UE specific test parameters for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |
| $\hat{E}_s / I_{ot}$ on SRS | NR_TDD_FR1_A NOTE 5 | 1,3 | dB | 1.5 | 1.5 | 1.75 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | 1.5 | 2.25 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| SRS RSRP Note3 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/SRS SCS | -104.5 | -86.5 | -112.25 |
| | NR_TDD_FR1_C | | | | | -111.5 |
| | NR_TDD_FR1_D | | | | | -111 |
| | NR_TDD_FR1_E | | | | | -110.5 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -86.49 | -108.74 |
| | NR_TDD_FR1_C | | | | | -108.49 |
| | NR_TDD_FR1_D | | | | | -107.99 |
| | NR_TDD_FR1_E | | | | | -107.49 |
| Io Note3 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/9.36 MHz | -74.42 | -56.42 | -82.28 |
| | NR_TDD_FR1_C | | | | | -81.42 |
| | NR_TDD_FR1_D | | | | | -80.92 |
| | NR_TDD_FR1_E | | | | | -80.42 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | dBm/38.16 MHz | Not applicable Note 6 | -54.80 | -77.49 |
| | NR_TDD_FR1_C | | | | | -76.80 |
| | NR_TDD_FR1_D | | | | | -76.30 |
| | NR_TDD_FR1_E | | | | | -75.80 |
| $\hat{E}_s / N_{oc}$ on SRS | NR_TDD_FR1_A NOTE 5 | 1,3 | dB | 1.5 | 1.5 | 1.75 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | 1.5 | 2.25 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| Propagation condition | | 1,2,3,4 | | AWGN | AWGN | AWGN |
| Antenna configuration | | 1,2,3,4 | | 1x2 | 1x2 | 1x2 |
| SRS configuration | | 1,3 | | SRSConf.1 | SRSConf.1 | SRSConf.1 |
| | | 2,4 | | SRSConf.2 | SRSConf.2 | SRSConf.2 |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.
NOTE 6: Test 1 is not used when testing with 30kHz SSB SCS.
NOTE 7: For Test 3, values are specified based on NR_TDD_FR1_X but they apply also to the FDD band group counterpart, NR_FDD_FR1_X. Informatively, test parameters are defined based on band group A and then add $\Delta_{BG_offset}$, which is the band group dependent component defined in clause 3A.4, Table 3A.4.1-2.

**Table 4.7.6.1.5-3: SRS configuration for EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| SRS-Resource | SRS-ResourceId | 0 | 0 |
| | nrofSRS-Ports | Port1 | Port1 |

| | | | |
|---|---|---|---|
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n1 | n1 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 12 | 12 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl20, 9 | sl40, 19 |
| | sequenceId | 0 | 0 |

**Table 4.7.6.1.5-4: Absolute accuracy requirements for the reported values for test configurations 1 and 3 of EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest SRS-RSRP reported value | 30 | 45 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 23 |
| | | | Bands NR_TDD_FR1_C | 23 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 24 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 24 |
| Highest SRS-RSRP reported value | 41 | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | | Bands NR_TDD_FR1_C | 34 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 35 |
| NOTE 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

**Table 4.7.6.1.5-5: Absolute accuracy requirements for the reported values for test configurations 2 and 4 of EN-DC SRS-RSRP measurement accuracy with FR1 serving cell**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest SRS-RSRP reported value | N/A Note 2 | 44 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | | Bands NR_TDD_FR1_C | 26 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 26 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 27 |
| Highest SRS-RSRP reported value | N/A Note 2 | 63 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 37 |
| | | | Bands NR_TDD_FR1_C | 37 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 38 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 38 |
| NOTE 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.<br>NOTE 2: Test 1 is not used when testing with 30kHz SSB SCS. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.6.2 EN-DC CLI-RSSI measurement accuracy with FR1 serving cell

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated

#### 4.7.6.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement accuracy in TS 38.133 [6] clause 10.1.22.2.1.

#### 4.7.6.2.2 Test applicability

FFS.

#### 4.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.2.

#### 4.7.6.2.4 Test description

##### 4.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.2.4.1-1. Test environment parameters are given in Table 4.7.6.2.4.1-2.

**Table 4.7.6.2.4.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 4.7.6.2.4.1-2: Test environment parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 4.7.6.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before.

#### 4.7.6.2.4.2 Test procedure

FFS

#### 4.7.6.2.4.3 Message contents

FFS

### 4.7.6.2.5 Test requirement

Table 4.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 4.7.6.2.5-1: NR Cell specific test parameters for CLI-RSSI accuracy**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD configuration | 1,3 | | TDDConf.1.1 |
| | 2,4 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,3 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,4 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,3 | | SR.1.1 TDD |
| | 2,4 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,3 | | CR.1.1 TDD |
| | 2,4 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,3 | | CCR.1.1 TDD |
| | 2,4 | | CCR.2.1 TDD |
| SSB configuration | 1,3 | | SSB.1 FR1 |
| | 2,4 | | SSB.2 FR1 |
| OCNG Patterns Note6 | 1~4 | | OP.1 |
| TRS configuration | 1,3 | | TRS.1.1 TDD |
| | 2,4 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1~4 | µs | 17.67 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ on CLI-RSSI measurement resource Note2 | 1,3 | dBm/15kHz | -106 |
| | 2,4 | | -106 |
| $N_{oc}$ on CLI-RSSI measurement resource Note2 | 1,3 | dBm/ BWP SCS | -106 |
| | 2,4 | | -103 |
| $\hat{E}_s / I_{ot}$ on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| RSRP on CLI-RSSI measurement resource Note3 | 1~4 | dBm/ BWP SCS | -Infinity |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/9.36 MHz | -78.05+TT |
| | 2,4 | dBm/38.16 MHz | -71.96+TT |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/1.08 MHz | -87.43+TT |
| | 2,4 | | -87.44+TT |
| $\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| Propagation condition | 1~4 | | AWGN |
| Antenna configuration | 1~4 | | 1x2 |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.
NOTE 6: OCNG is not transmitted in the CLI-RSSI measurement resources.

**Table 4.7.6.2.5-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy**

| | Field | Config | SRSConf.1 |
|---|---|---|---|
| CLI-RSSI measurement resource | rssi-ResourceId | 1~4 | 0 |
| | rssi-SCS | 1,3 | 15kHz |
| | | 2,4 | 30kHz |
| | startPRB | 1~4 | 0 |
| | nrofPRBs | 1,3 | 52 |
| | | 2,4 | 106 |
| | startPosition | 1~4 | 3 |
| | nrofSymbols | 1~4 | 11 |
| | rssi-PeriodicityAndOffset | 1,3 | sl20, 9 |
| | | 2,4 | sl40, 19 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 4.7.7 L1-SINR measurement for beam reporting

## 4.7.7.0 Minimum conformance requirements

### 4.7.7.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

The UE shall be capable of performing L1-SINR measurements with the CSI-RS configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 4.7.7.0.1-1 for FR1 and in Table 4.7.7.0.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS} < MGRP$) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 4.7.7.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI-RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI-RS}))$ |

| | |
|---|---|
| DRX cycle > 320ms | ceil(M*P)*$T_{DRX}$ |
| NOTE 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

**Table 4.7.7.0.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P*N)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P*N)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320ms | ceil(M*P*N)*$T_{DRX}$ |
| NOTE 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The accuracy requirements in Table 4.7.7.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 4.7.7.0.1-3.

**Table 4.7.7.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/BW Channel | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±5.5 | ±6.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth. | | | | | | | | |
| NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.27.1.

#### 4.7.7.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 4.7.7.0.2-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of $P_{CMR}$ shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1 of TS 38.133 [6], in which the occasions and period of the SSB for CMR shall be used instead.

- the value of $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

**Table 4.7.7.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| NOTE 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

**Table 4.7.7.0.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(1.5*M*P*N)*T_{DRX}$ |
| NOTE 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. | |

| | |
|---|---|
| | $T_{Report}$ is configured periodicity for reporting. |
| NOTE 2: | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. |

The accuracy requirements in Table 4.7.7.0.2-3 and Table 4.7.7.0.2-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Table 4.7.7.0.2-3 and Table 4.7.7.0.2-4.

**Table 4.7.7.0.2-3: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB-CMR Ês/Iot | NZP-IMR Ês/Iot | Io Note 1 range | | | |
| | | | | NR operating band groups Note 2 | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

**Table 4.7.7.0.2-4: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB-CMR Ês/Iot | Io Note 1 range | | | |
| | | | NR operating band groups Note 2 | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| | | | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ±4.5 | ±5.5 | ≥-3 | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.27.2.

#### 4.7.7.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 4.7.7.0.3-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of $P_{CMR}$ and $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 4.7.7.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| NOTE 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.<br>NOTE 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

**Table 4.7.7.0.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P*N)*T_{DRX}$ |
| NOTE 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

NOTE 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.

The accuracy requirements in Table 4.7.7.0.3-3 and Table 4.7.7.0.3-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Table 4.7.7.0.3-3 and Table 4.7.7.0.3-4.

**Table 4.7.7.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot | NZP-IMR Ês/Iot | Io Note 1 range | | | | |
| | | | | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | | |

**Table 4.7.7.0.3-4: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot | Io Note 1 range | | | | | |
| | | | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 | $SCS_{CSI-RS}$ = 30 | $SCS_{CSI-RS}$ = 60 | | |

| | | | | kHz | kHz | kHz | | |
|---|---|---|---|---|---|---|---|---|
| ±4.5 | ±5.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.27.3.

## 4.7.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement

### 4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy

#### 4.7.7.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 4.7.7.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

#### 4.7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

#### 4.7.7.1.1.4 Test description

##### 4.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.1.4.1-2.

**Table 4.7.7.1.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 4.7.7.1.1.4.1-2: Test environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.7.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

### 4.7.7.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.7.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.1.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.1.1.5-2 or Table 4.7.7.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.1.1.5-1 as appropriate and repeat steps 3-5.

### 4.7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.7.1.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.7.1.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

4.7.7.1.1.5 Test requirement

Table 4.7.7.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-3 for test configurations 3 and 6.

**Table 4.7.7.1.1.5-1: FR1 CSI-RS based L1-SINR test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 | freq1 |
| Duplex mode | 1,4 | | FDD | FDD |
| | 2,5 | | TDD | TDD |
| | 3,6 | | TDD | TDD |
| TDD Configuration | 1,4 | | N/A | N/A |
| | 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.1 FR1 | SSB.1 FR1 |
| | 2,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~6 | | OP.1 | OP.1 |
| TRS configuration | 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |

| | | | | | |
|---|---|---|---|---|---|
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~6 | | SMTC.1 | SMTC.1 |
| CSI-RS | | 1,4 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | | 2,5 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | | 3,6 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~6 | | periodic | periodic |
| reportQuantity-r16 | | 1~6 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~6 | | 2 | 2 |
| L1-RSRP reporting period | | 1~6 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -96.00 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3,6 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~6 | dB | 10 | -2.2 |
| Propagation condition | | 1~6 | | AWGN | AWGN |
| Antenna configuration | | 1~6 | | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.7.1.1.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 52 | All Bands | 28 |
| Highest reported value (Cell 2) | 81 | All Bands | 57 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 51 | All Bands | 27 |
| Highest reported value (Cell 2) | 82 | All bands | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 4.7.7.1.1.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 52 | All Bands | 28 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | 81 | All Bands | 57 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 51 | All Bands | 27 |
| Highest reported value (Cell 2) | 82 | All Bands | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

[IS: this new clause creates a duplication!!!!!!]

### 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy

#### 4.7.7.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

#### 4.7.7.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

#### 4.7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

#### 4.7.7.1.2.4 Test description

##### 4.7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.2.4.1-2.

**Table 4.7.7.1.2.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 4.7.7.1.2.4.1-2: Test environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.7.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

### 4.7.7.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.7.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.1.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

#### 4.7.7.1.2.4.3 Message contents

Same message contents as described in clause 4.7.7.1.1.4.3

#### 4.7.7.1.2.5 Test requirement

Table 4.7.7.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.1.2.5-2.

**Table 4.7.7.1.2.5-1**

Same as Table 4.7.7.1.1.5-1

**Table 4.7.7.1.2.5-2: L1-SINR relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR_x - 9 | L1-SINR_x - 9 |
| Highest reported value (CSI-RS#1) | L1-SINR_x + 9 | L1-SINR_x + 9 |
| Extreme Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR_x - 10 | L1-SINR_x - 10 |
| Highest reported value (CSI-RS#1) | L1-SINR_x + 10 | L1-SINR_x + 10 |
| L1-SINR_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

#### 4.7.7.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 4.7.7.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

#### 4.7.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.2.

#### 4.7.7.2.4 Test description

##### 4.7.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.2.4.1-1.

**Table 4.7.7.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.2.4.1-2.

**Table 4.7.7.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-SINR measurements. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR. The connection setup is done according to the settings in Annex C.1.1.

##### 4.7.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.5-1.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-SINR reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 4.7.7.2.5-2 or Table 4.7.7.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.2.5-1 as appropriate and repeat steps 3-5.

#### 4.7.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.7.2.4.3-1: Common Exception messages EN-DC SSB based L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-4 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.7.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 4.7.7.2.5 Test requirement

Table 4.7.7.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.2.5-3 for test configurations 3 and 6.

**Table 4.7.7.2.5-1: FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 | freq1 |
| Duplex mode | 1,4 | | FDD | FDD |
| | 2,5 | | TDD | TDD |
| | 3,6 | | TDD | TDD |
| TDD Configuration | 1,4 | | N/A | N/A |
| | 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |

| | | | | | |
|---|---|---|---|---|---|
| | | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | | 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | | 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 2,5 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 3,6 | | SSB.4 FR1 | SSB.4 FR1 |
| CSI-IM configuration | | 1,4 | | CSI-IM 1.1 FDD | CSI-IM 1.1 FDD |
| | | 2,5 | | CSI-IM 1.1 TDD | CSI-IM 1.1 TDD |
| | | 3,6 | | CSI-IM 2.1 TDD | CSI-IM 2.1 TDD |
| OCNG Patterns | | 1~6 | | OP.1 | OP.1 |
| TRS configuration | | 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~6 | | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~6 | | periodic | periodic |
| reportQuantity-r16 | | 1~6 | | ssb-Index-SINR-r16 | ssb-Index-SINR-r16 |
| Number of reported RS | | 1~6 | | 2 | 2 |
| L1-SINR reporting period | | 1~6 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -96.00 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | 1~6 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3,6 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 10 | -2.2 |
| Propagation condition | 1~6 | | AWGN | AWGN |
| antenna configuration | 1~6 | | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.7.2.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |

NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.

**Table 4.7.7.2.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement

### 4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy

#### 4.7.7.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 4.7.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support of L1-SINR measurements between an E-UTRA PCell and an NR PSCell.

#### 4.7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

#### 4.7.7.3.1.4 Test description

##### 4.7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.1.4.1-1.

**Table 4.7.7.3.1.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based both CMR based IMR**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.1.4.1-2.

**Table 4.7.7.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.7.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

##### 4.7.7.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.3.1.5-2 or Table 4.7.7.3.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.1.5-1 as appropriate and repeat steps 3-5.

#### 4.7.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.7.3.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.7.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 4.7.7.3.1.5 Test requirement

Table 4.7.7.3.5-1 defines the primary level settings not including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-3 for test configurations 3 and 6.

**Table 4.7.7.3.1.5-1: FR1 L1-SINR measurement test with CSI-RS based both CMR and IMR**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 | freq1 |

| | | | | | |
|---|---|---|---|---|---|
| Duplex mode | | 1,4 | | FDD | FDD |
| | | 2,5 | | TDD | TDD |
| | | 3,6 | | TDD | TDD |
| TDD Configuration | | 1,4 | | N/A | N/A |
| | | 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | | 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD | SR.1.1 FDD |
| | | 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | | 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2,5 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3,6 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 | | SSB.1 FR1 | SSB.1 FR1 |
| | | 2,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | | 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~6 | | OP.1 | OP.1 |
| TRS configuration | | 1,4 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 |
| SMTC configuration | | 1~6 | | SMTC.1 | SMTC.1 |
| CSI-RS configuration as CMR | | 1,4 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | | 2,5 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | | 3,6 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| CSI-RS configuration as IMR | | 1,4 | | CSI-RS 1.3A FDD | CSI-RS 1.3A FDD |
| | | 2,5 | | CSI-RS 1.3A TDD | CSI-RS 1.3A TDD |
| | | 3,6 | | CSI-RS 2.3A TDD | CSI-RS 2.3A TDD |
| reportConfigType | | 1~6 | | periodic | periodic |
| reportQuantity-r16 | | 1~6 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~6 | | 2 | 2 |
| L1-RSRP reporting period | | 1~6 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $\hat{E}_s / I_{ot}$ | | 1~6 | dB | 10 | 0.8 |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -96.00 | -117+ $\Delta_{BG_offset}$ |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note2 | | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3,6 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | 0.8 |
| SSB RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3,6 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3,6 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~6 | dB | 10 | 0.8 |
| Propagation condition | | 1~6 | | AWGN | AWGN |
| Antenna configuration | | 1~6 | | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.7.3.1.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 4.7.7.3.1.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 54 | All Bands | 30 |
| Highest reported value (Cell 2) | 79 | All Bands | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 53 | All Bands | 29 |
| Highest reported value (Cell 2) | 80 | All Bands | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy

#### 4.7.7.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

#### 4.7.7.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

#### 4.7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

#### 4.7.7.3.2.4 Test description

##### 4.7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.2.4.1-2.

**Table 4.7.7.3.2.4.1-1: EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 4.7.7.3.2.4.1-2: Test environment parameters for EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.7.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.7.3.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

#### 4.7.7.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.7.7.3.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.2.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.3.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.2.5-1 as appropriate and repeat steps 3-5.

#### 4.7.7.3.2.4.3 Message contents

Same message contents as described in clause 4.7.7.3.1.4.3

### 4.7.7.3.2.5 Test requirement

Table 4.7.7.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.3.2.5-2.

**Table 4.7.7.3.2.5-1**

Same as Table 4.7.7.3.1.5-1

**Table 4.7.7.3.2.5-2: L1-SINR relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR_x - 9 | L1-SINR_x - 9 |
| Highest reported value (CSI-RS#1) | L1-SINR_x + 9 | L1-SINR_x + 9 |
| Extreme Conditions | | |
| Lowest reported value (CSI-RS#1) | L1-SINR_x - 10 | L1-SINR_x - 10 |
| Highest reported value (CSI-RS#1) | L1-SINR_x + 10 | L1-SINR_x + 10 |
| L1-SINR_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.8 CSI-RSRP

## 4.7.8.0 Minimum conformance requirements

### 4.7.8.0.1 Intra-frequency absolute CSI-RSRP measurement accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same centre frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 4.7.8.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.8.0.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

**Table 4.7.8.0.1-1: CSI-RSRP intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io [Note 1] range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| dB | dB | dB | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±4.5 | ±9 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H, NR_FDD_FR1_N | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The reporting range of SS-RSRP and CSI-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.8.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.8.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping**

| Reported value | Measured quantity value (L3 SS-RSRP) and CSI-RSRP | Measured quantity value (L1 SS-RSRP and CSI-RSRP) | Unit |
|---|---|---|---|
| RSRP_0 | SS-RSRP<-156 | Not valid | dBm |
| RSRP_1 | -156≤ SS-RSRP<-155 | Not valid | dBm |
| RSRP_2 | -155≤ SS-RSRP<-154 | Not valid | dBm |
| RSRP_3 | -154≤ SS-RSRP<-153 | Not valid | dBm |
| RSRP_4 | -153≤ SS-RSRP<-152 | Not valid | dBm |
| RSRP_5 | -152≤ SS-RSRP<-151 | Not valid | dBm |
| RSRP_6 | -151≤ SS-RSRP<-150 | Not valid | dBm |
| RSRP_7 | -150≤ SS-RSRP<-149 | Not valid | dBm |
| RSRP_8 | -149≤ SS-RSRP<-148 | Not valid | dBm |
| RSRP_9 | -148≤ SS-RSRP<-147 | Not valid | dBm |
| RSRP_10 | -147≤ SS-RSRP<-146 | Not valid | dBm |
| RSRP_11 | -146≤ SS-RSRP<-145 | Not valid | dBm |
| RSRP_12 | -145≤ SS-RSRP<-144 | Not valid | dBm |
| RSRP_13 | -144≤ SS-RSRP<-143 | Not valid | dBm |
| RSRP_14 | -143≤ SS-RSRP<-142 | Not valid | dBm |
| RSRP_15 | -142≤ SS-RSRP<-141 | Not valid | dBm |
| RSRP_16 | -141≤ SS-RSRP<-140 | RSRP<-140 | dBm |
| RSRP_17 | -140≤ SS-RSRP<-139 | -140≤RSRP<-139 | dBm |
| RSRP_18 | -139≤ SS-RSRP<-138 | -139≤ RSRP<-138 | dBm |
| … | … | | … |
| RSRP_111 | -46≤ SS-RSRP<-45 | -46≤ RSRP<-45 | dBm |
| RSRP_112 | -45≤ SS-RSRP<-44 | -45≤ RSRP<-44 | dBm |
| RSRP_113 | -44≤ SS-RSRP<-43 | -44≤ RSRP | dBm |
| RSRP_114 | -43≤ SS-RSRP<-42 | Not valid | dBm |
| RSRP_115 | -42≤ SS-RSRP<-41 | Not valid | dBm |
| RSRP_116 | -41≤ SS-RSRP<-40 | Not valid | dBm |
| RSRP_117 | -40≤ SS-RSRP<-39 | Not valid | dBm |
| RSRP_118 | -39≤ SS-RSRP<-38 | Not valid | dBm |
| RSRP_119 | -38≤ SS-RSRP<-37 | Not valid | dBm |
| RSRP_120 | -37≤ SS-RSRP<-36 | Not valid | dBm |
| RSRP_121 | -36≤ SS-RSRP<-35 | Not valid | dBm |
| RSRP_122 | -35≤ SS-RSRP<-34 | Not valid | dBm |
| RSRP_123 | -34≤ SS-RSRP<-33 | Not valid | dBm |
| RSRP_124 | -33≤ SS-RSRP<-32 | Not valid | dBm |
| RSRP_125 | -32≤ SS-RSRP<-31 | Not valid | dBm |
| RSRP_126 | -31≤ SS-RSRP | Not valid | dBm |

| | | | |
|---|---|---|---|
| RSRP_127 (Note) | Infinity | Infinity | dBm |
| NOTE: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.3.1 and 10.1.6.

### 4.7.8.0.2 Intra-frequency relative CSI-RSRP measurement accuracy requirements

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 4.7.8.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.8.0.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

**Table 4.7.8.0.2-1: CSI-RSRP intra-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | NR operating band groups Note 4 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| dB | dB | dB | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±2 | ±3 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting and L3 reporting is defined from 0 dB to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 4.7.8.0.2-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.8.0.2-2: Differential SS-RSRP and CSI-RSRP measurement (for L1 reporting and L3 reporting) report mapping**

| Reported value | Measured quantity value (difference in measured RSRP from strongest RSRP) | Unit |
|---|---|---|
| DIFFRSRP_0 | 0≥ΔRSRP>-2 | dB |
| DIFFRSRP_1 | -2≥ΔRSRP>-4 | dB |
| DIFFRSRP_2 | -4≥ΔRSRP>-6 | dB |
| DIFFRSRP_3 | -6≥ΔRSRP>-8 | dB |
| DIFFRSRP_4 | -8≥ΔRSRP>-10 | dB |
| DIFFRSRP_5 | -10≥ΔRSRP>-12 | dB |
| DIFFRSRP_6 | -12≥ΔRSRP>-14 | dB |
| DIFFRSRP_7 | -14≥ΔRSRP>-16 | dB |
| DIFFRSRP_8 | -16≥ΔRSRP>-18 | dB |
| DIFFRSRP_9 | -18≥ΔRSRP>-20 | dB |
| DIFFRSRP_10 | -20≥ΔRSRP>-22 | dB |
| DIFFRSRP_11 | -22≥ΔRSRP>-24 | dB |
| DIFFRSRP_12 | -24≥ΔRSRP>-26 | dB |
| DIFFRSRP_13 | -26≥ΔRSRP>-28 | dB |
| DIFFRSRP_14 | -28≥ΔRSRP>-30 | dB |
| DIFFRSRP_15 | -30≥ΔRSRP | dB |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.3.2 and 10.1.6.

### 4.7.8.0.3 Inter-frequency absolute CSI-RSRP measurement accuracy requirements

The requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 4.7.8.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.8.0.3-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 4.7.8.0.3-1: CSI-RSRP Inter-frequency Absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal | Extreme | CSI- | Io [Note 1] range |

| condition | condition | RS Ês/Iot | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | NR operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±4.5 | ±9 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H, NR_FDD_FR1_N | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1. | | | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.8.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.3.1 and 10.1.6.

### 4.7.8.0.4 Inter-frequency relative CSI-RSRP measurement accuracy requirements

The relative accuracy of CSI-RSRP in inter-frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR1compared to the CSI-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.8.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.8.0.4-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

  - Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27$ dB

- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 4.7.8.0.4-1: CSI-RSRP inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range | | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±4.5 | ±6 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| | | | NR_FDD_FR1_N | -113.5 | -111.5 | -108.5 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting and L3 reporting is defined from 0 dB to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 4.7.8.0.2-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.3.2 and 10.1.6.

## 4.7.8.1 Intra-frequency CSI-RSRP measurement accuracy

### 4.7.8.1.1 EN-DC FR1 CSI-RSRP absolute measurement accuracy

#### 4.7.8.1.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 4.7.8.1.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurement.

#### 4.7.8.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.8.1.

#### 4.7.8.1.1.4 Test description

##### 4.7.8.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.8.1.1.4.1-1.

**Table 4.7.8.1.1.4.1-1: CSI-RSRP intra-frequency CSI-RSRP supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations for each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.8.1.1.4.1-2.

**Table 4.7.8.1.1.4.1-2: Test environment parameters for EN-DC CSI-RSRP intra-frequency measurement accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.8.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.8.1.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

##### 4.7.8.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.8.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-RS reported values in the periodic MeasurementReport. The CSI-RS value of Cell 3 reported by the UE is compared to the expected CSI-RS. If the value is outside the limits in Table 4.7.8.1.5-2 and Table 4.7.8.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.8.1.5-1 as appropriate and repeat steps 5-7.

#### 4.7.8.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.8.1.1.4.3-1: Common Exception messages EN-DC FR1 CSI-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition CSI-RS MOBILITY<br>Table H.3.1-7 with Condition CSI-RS MOBILITY<br>Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.6-2 with conditions PERIODIC and CSI-RSRP |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Condition SSB.1 FR1 and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.8.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 CSI-RSRP Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.8.1.1.5 Test requirement

Table 4.7.8.1.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRP measurement report for each of the tests in Table 4.7.8.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.8.1.1.5-2 for test configuration 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.8.1.1.5-3 for test configuration 3 and 6.

**Table 4.7.8.1.1.5-1: CSI-RSRP intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| | Config 2,5 | | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
| | Config 3,6 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control Channel RMC | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1,4 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 2,5 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1,4 | | SMTC.2 | | | | | |
| | Config 2,3,5,6 | | SMTC.1 | | | | | |

| OCNG Patterns | | | | OP.1 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | | kHz | 15 kHz | | | | | |
| | Config 3,6 | | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15KhZ | -107.5 | | -88 | | -114$\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | Not applicable Note 5 | | -94 | | -114$\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -107.5 | | -88 | | Same as Noc/15kHz | |
| | Config 3,6 | Depending on band group | | Not applicable Note 5 | | -91 | | -111 $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ for SSB | | | dB | 1.89 | -5.57 | 1.89 | -5.57 | -0.09 | -5.56 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | | | dB | 1.89 | -5.57 | 1.89 | -5.57 | -0.09 | -5.56 |
| $\hat{E}_s/N_{oc}$ for SSB | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | -0.8 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | -0.8 |
| CSI-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -101.5 | -106.1 | -82 | -86.6 | -111.00 $\Delta_{BG_offset}$ | -114.00 $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | - Not applicable Note 5 | Not applicable Note 5 | -85 | -89.6 | -108.00 $\Delta_{BG_offset}$ | -111.00 $\Delta_{BG_offset}$ |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -71.68 | | -52.18 | | -82.39+$\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | Not applicable Note 5 | | -51.91 | | -76.12+$\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.8.1.1.5-2: CSI-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 3) | 44 | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 36 |

**Table**

| | | | | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_B | 37 |
| | | | Bands NR_TDD_FR1_C | 37 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 38 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 38 |
| | | | Bands NR_FDD_FR1_F | 39 |
| | | | Bands NR_FDD_FR1_G | 39 |
| | | | Bands NR_FDD_FR1_H | 40 |
| Highest reported value (Cell 3) | 56 | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | | Bands NR_FDD_FR1_B | 49 |
| | | | Bands NR_TDD_FR1_C | 50 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 50 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | | Bands NR_FDD_FR1_F | 51 |
| | | | Bands NR_FDD_FR1_G | 52 |
| | | | Bands NR_FDD_FR1_H | 52 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 3) | 40 | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 32 |
| | | | Bands NR_FDD_FR1_B | 32 |
| | | | Bands NR_TDD_FR1_C | 33 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 33 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 34 |
| | | | Bands NR_FDD_FR1_F | 34 |
| | | | Bands NR_FDD_FR1_G | 35 |
| | | | Bands NR_FDD_FR1_H | 35 |
| Highest reported value (Cell 3) | 61 | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 53 |
| | | | Bands NR_FDD_FR1_B | 54 |
| | | | Bands NR_TDD_FR1_C | 54 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 55 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 55 |
| | | | Bands NR_FDD_FR1_F | 56 |
| | | | Bands NR_FDD_FR1_G | 56 |
| | | | Bands NR_FDD_FR1_H | 57 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

### 4.7.8.1.1.5-3: CSI-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 3 and 6

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
|---|---|---|---|---|
| Lowest reported value (Cell 3) | Not applicable | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 39 |
| | | | Bands NR_FDD_FR1_B | 40 |
| | | | Bands NR_TDD_FR1_C | 40 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 41 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 41 |
| | | | Bands NR_FDD_FR1_F | 40 |
| | | | Bands NR_FDD_FR1_G | 41 |
| | | | Bands NR_FDD_FR1_H | 41 |
| Highest reported value (Cell 3) | Not | 76 | Bands NR_FDD_FR1_A, | 52 |

For the test to pass, the ratio of

| | | | | |
|---|---|---|---|---|
| | applicable | | NR_TDD_FR1_A | |
| | | | Bands NR_FDD_FR1_B | 52 |
| | | | Bands NR_TDD_FR1_C | 53 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 53 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | | Bands NR_FDD_FR1_F | 53 |
| | | | Bands NR_FDD_FR1_G | 53 |
| | | | Bands NR_FDD_FR1_H | 54 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 3) | Not applicable | 54 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | | Bands NR_FDD_FR1_B | 35 |
| | | | Bands NR_TDD_FR1_C | 36 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 36 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 37 |
| | | | Bands NR_FDD_FR1_F | 37 |
| | | | Bands NR_FDD_FR1_G | 36 |
| | | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 3) | Not applicable | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 56 |
| | | | Bands NR_FDD_FR1_B | 57 |
| | | | Bands NR_TDD_FR1_C | 57 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 58 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 58 |
| | | | Bands NR_FDD_FR1_F | 58 |
| | | | Bands NR_FDD_FR1_G | 58 |
| | | | Bands NR_FDD_FR1_H | 58 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | | |

successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 4.7.8.1.2 EN-DC FR1 CSI-RSRP relative measurement accuracy

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability needs to be updated

#### 4.7.8.1.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 4.7.8.1.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurement.

#### 4.7.8.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.8.1.

#### 4.7.8.1.2.4 Test description

##### 4.7.8.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.8.1.2.4.1-1.

**Table 4.7.8.1.2.4.1-1: CSI-RSRP intra-frequency CSI-RSRP supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations for each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.8.1.2.4.1-2.

**Table 4.7.8.1.2.4.1-2: Test environment parameters for EN-DC CSI-RSRP intra-frequency measurement accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.8.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.8.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.8.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.8.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRP reported values of Cell 2 and Cell 3 in the periodic MeasurementReport. The CSI-RSRP value of Cell 3 reported by the UE is compared to the reported CSI-RSRP of Cell 2. If the resulting value is outside the limits in Table 4.7.8.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.8.1.2.5-1 as appropriate and repeat steps 5-7.

#### 4.7.8.1.2.4.3 Message contents

Message contents are same as in clause 4.7.8.1.1.4.3.

### 4.7.8.1.2.5 Test requirement

Table 4.7.8.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRP measurement report for each of the tests in Table 4.7.8.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.8.1.2.5-2.

**Table 4.7.8.1.2.5-1:**

Same as Table 4.7.8.1.1.5-1 with the following exceptions: TBD

**Table 4.7.8.1.2.5-2: CSI-RSRP intra-frequency relative accuracy requirements for the reported values**

**TBD**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.8.2 Inter-frequency measurement accuracy

### 4.7.8.2.1 EN-DC FR1 CSI-RSRP absolute measurement accuracy

#### 4.7.8.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits for all bands.

#### 4.7.8.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards.

#### 4.7.8.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.8.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.8.2.

#### 4.7.8.2.1.4 Test description

##### 4.7.8.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.8.2.1.4.1-1.

**Table 4.7.8.2.1.4.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

| Config | Description |
|---|---|

| | |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations on each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.8.2.1.4.1-2.

**Table 4.7.8.2.1.4.1-2: Test environment parameters for EN-DC CSI-RSRP inter-frequency measurement accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.8.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.8.2.1.4.3.
2. In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 is the target cell for CSI-RSRP measurement. The connection setup is done according to the settings in clause C.1.1.

### 4.7.8.2.1.4.2 Test procedure

Same as in clause 4.7.8.1.1.4.2 but replacing Table 4.7.8.1.1.5-1, 4.7.8.1.1.5-2 and 4.7.8.1.1.5-3 with 4.7.8.2.1.5-1, 4.7.8.2.1.5-2 and 4.7.8.2.1.5-3, respectively.

### 4.7.8.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4.7.8.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 CSI-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 4.7.8.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 CSI-RSRP Accuracy**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.7.8.2.1.5 Test requirement

Table 4.7.8.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRP measurement report for each of the tests in Table 4.7.8.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.8.2.1.5-2 for test configuration 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.8.2.1.5-3 for test configuration 3 and 6.

**Table 4.7.8.2.1.5-1: CSI-RSRP inter-frequency test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | 1~6 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | 1,4 | | FDD | | FDD | |
| | 2,5 | | TDD | | TDD | |
| | 3,6 | | TDD | | TDD | |
| TDD configuration | 1,4 | | N/A | | N/A | |
| | 2,5 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3,6 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3,6 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2,5 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | 3,6 | | CR.2.1 FDD | - | CR.2.1 FDD | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | 2,5 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | | 3,6 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1,4 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 2,5 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 3,6 | | SSB.2 FR1 | | SSB.2 FR1 | |
| CSI-RS configuration for RRM | | 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | | 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | | 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | |
| OCNG Patterns | | 1~6 | | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | | 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | | 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~6 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| Time offset with Cell 2 | | 1,2,4,5 | µs | - | 4.7 | - | 4.7 |
| | | 3,6 | µs | - | 2.35 | - | 2.35 |
| SMTC configuration | | 1,4 | | SMTC.2 | | SMTC.2 | |
| | | 2,3,5,6 | | SMTC.1 | | SMTC.1 | |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ for Cell 3 +8dB) | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 3,6 | dBm/15 kHz | -96 | | -96 | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 1,2,4,5 | dBm/SSB SCS | -94.65 | | ( $N_{oc}$ for Cell 3 +8dB) | -115+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3,6 | | -93 | | ( $N_{oc}$ for C 3 +8dB) | -112.00+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ for SSB | | 1~6 | dB | 10 | 10 | 13 | -3 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | | 1~6 | dB | 10 | 10 | 13 | -3 |
| CSI-RSRP Note3 | Depending on band group | 1,2,4,5 | dBm/SCS | -84.65 | | (RSRP for Cell 3 +25dB) | -118.00+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3,6 | | -83 | | (RSRP for Cell 3 +25dB) | -115.00+ $\Delta_{BG_offset}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $Io^{Note3}$ | Depending on band group | 1,2,4,5 | dBm/ 9.36MHz | -56.28 | | (Io for Channel 3 +19.75dB) | -85.28+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3,6 | dBm/ 38.16MHz | -51.53 | | (Io for Channel 3 +19.75dB) | -79.19+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ for SSB | | 1~6 | dB | 10 | 10 | 13 | -3 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | | 1~6 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~6 | - | AWGN | | AWGN | |
| Antenna configuration | | | | 1x2 | | 1x2 | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4.7.8.2.1.5-2: CSI-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 3) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 32 |
| | | Bands NR_FDD_FR1_B | 33 |
| | | Bands NR_TDD_FR1_C | 33 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 34 |
| | | Bands NR_FDD_FR1_F | 35 |
| | | Bands NR_FDD_FR1_G | 35 |
| | | Bands NR_FDD_FR1_H | 36 |
| Highest reported value (Cell 3) | 81 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 45 |
| | | Bands NR_FDD_FR1_B | 45 |
| | | Bands NR_TDD_FR1_C | 46 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 47 |
| | | Bands NR_FDD_FR1_F | 47 |
| | | Bands NR_FDD_FR1_G | 48 |
| | | Bands NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 3) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 28 |
| | | Bands NR_FDD_FR1_B | 28 |
| | | Bands NR_TDD_FR1_C | 29 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 29 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 30 |
| | | Bands NR_FDD_FR1_F | 30 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_G | 31 |
| | | Bands NR_FDD_FR1_H | 31 |
| Highest reported value (Cell 3) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 50 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_F | 52 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 53 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 4.7.8.2.1.5-3: CSI-RSRP intra-frequency absolute accuracy requirements for the reported values for test configurations 3 and 6**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 3) | 64 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | Bands NR_FDD_FR1_B | 36 |
| | | Bands NR_TDD_FR1_C | 36 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 37 |
| | | Bands NR_FDD_FR1_F | 38 |
| | | Bands NR_FDD_FR1_G | 38 |
| | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 3) | 83 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 49 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | Bands NR_FDD_FR1_F | 50 |
| | | Bands NR_FDD_FR1_G | 51 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 3) | 61 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_F | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 3) | 86 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 53 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_F | 55 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 4.7.8.2.2 EN-DC FR1 CSI-RSRP relative measurement accuracy

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability needs to be updated

##### 4.7.8.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP relative measurement accuracy is within the specified limits for all bands.

##### 4.7.8.2.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurement.

##### 4.7.8.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.8.1.

##### 4.7.8.2.2.4 Test description

###### 4.7.8.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.8.2.2.4.1-1.

**Table 4.7.8.2.2.4.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations on each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.8.2.2.4.1-2.

**Table 4.7.8.2.2.4.1-2: Test environment parameters for EN-DC CSI-RSRP inter-frequency measurement accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.8.2.2.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.8.2.2.4.3.
2. In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 is the target cell for CSI-RSRP measurement. The connection setup is done according to the settings in clause C.1.1.

#### 4.7.8.2.2.4.2 Test procedure

Same as in clause 4.7.8.1.2.4.2 but replacing Table 4.7.8.1.2.5-1 and 4.7.8.1.2.5-2 with 4.7.8.2.2.5-1 and 4.7.8.2.2.5-2, respectively.

#### 4.7.8.2.2.4.3 Message contents

Message contents are same as in clause 4.7.8.2.1.4.3.

### 4.7.8.2.2.5 Test requirement

Table 4.7.8.2.2.5-1 defines the primary level settings for all tests.

Each CSI-RSRP measurement report for each of the tests in Table 4.7.8.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.8.2.2.5-2.

**Table 4.7.8.2.2.5-1: same as Table 4.7.8.2.1.5-1**

TBD

**Table 4.7.8.2.2.5-2: CSI-RSRP inter-frequency relative accuracy requirements for the reported values**

TBD

## 4.7.9 CSI-RSRQ

### 4.7.9.0 Minimum conformance requirements

#### 4.7.9.0.1 Intra-frequency CSI-RSRQ accuracy requirements

[TS 38.133, clause 10.1.7.2 and clause 10.1.11]

##### 4.7.9.0.1.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in TS 38.133 [6] in FR1.

The accuracy requirements in Table 4.7.9.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 in TS 38.133 [6] for a corresponding Band for associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.9.0.1.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

**Table 4.7.9.0.1.1-1: CSI-RSRQ intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 3] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±2.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.9.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.9.0.1.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |

| | | |
|---|---|---|
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 4.7.9.0.2 Inter-frequency CSI-RSRQ accuracy requirements

[TS 38.133, clause 10.1.9.2 and clause 10.1.11]

#### 4.7.9.0.2.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the inter-frequency measurement defined in 9.10.3.1 in TS 38.133 [6] in FR1.

The accuracy requirements in Table 4.7.9.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.9.0.2.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 4.7.9.0.2.1-1: CSI-RSRQ inter-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 3] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±2.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.9.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.9.0.2.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 4.7.9.0.2.2 Relative CSI-RSRQ accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR1.

The accuracy requirements in Table 4.7.9.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for the associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.9.0.2.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 4.7.9.0.2.2-1: CSI-RSRQ inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS | Io [Note 1] range |

| | | Ês/Iot Note 2 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | NR operating band groups Note 4 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].

## 4.7.9.1 EN-DC iintra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 4.7.9.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.7.2 in TS 38.133 [6].

### 4.7.9.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurements.

### 4.7.9.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.7.9.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.4.7.9.1.

### 4.7.9.1.4 Test description

#### 4.7.9.1.4.1 Initial conditions

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table 4.7.9.1.4.1-1.

**Table 4.7.9.1.4.1-1: CSI-RSRQ intra-frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.9.1.4.1-2.

**Table 4.7.9.1.4.1-2: Initial conditions for CSI-RSRQ intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.9.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.9.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup, which is specified in clause A.3.7.2.1 in TS 38.133 [6]. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-RSRQ measurements. The connection setup is done according to the settings in clause C.1.3.

### 4.7.9.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.9.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 3 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 4.7.9.0.1.1-1, Table 4.7.9.0.1.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.9.1.5-1 as appropriate and repeat steps 5-7.

#### 4.7.9.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.7.9.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and RSRQ<br>Table H.3.4-1a<br>Table H.3.4-2 |

**Table 4.7.9.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |

#### 4.7.9.1.5 Test requirements

The absolute accuracy of CSI-RSRQ intra-frequency measurement is tested by using the parameters in Table 4.7.9.1.5-1. The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 4.7.9.0.1.

**Table 4.7.9.1.5-1: CSI-RSRQ intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Control Channel RMC | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP. 1 | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1,4 | | SMTC.2 | | | | | |
| | Config 2,3,5,6 | | SMTC.1 | | | | | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | | | | | |
| | Config 3,6 | | SSB.2 FR1 | | | | | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2, 5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3, 6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| | Config 3,6 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/15kHz | -85 | | -101 | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | | -91 | | - | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/SCS | -85 | | -101 | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | | -88 | | - | | -111 | |
| | | NR_FDD_FR1_B | | | | | | -110.5 | |
| | | NR_TDD_FR1_C | | | | | | -110 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109 | |
| | | NR_FDD_FR1_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| CSI-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/SCS | -82 | -82 | -103.9 | -103.9 | -118 | -118 |
| | | NR_FDD_FR1_B | | | | | | -117.5 | -117.5 |
| | | NR_TDD_FR1_C | | | | | | -117 | -117 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -116.5 | -116.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -116 | -116 |
| | | NR_FDD_FR1_F | | | | | | -115.5 | -115.5 |
| | | NR_FDD_FR1_G | | | | | | -115 | -115 |
| | | NR_FDD_FR1_H | | | | | | -114.5 | -114.5 |
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | | -85 | -85 | - | - | -115 | -115 |
| | | NR_FDD_FR1_B | | | | | | -114.5 | -114.5 |
| | | NR_TDD_FR1_C | | | | | | -114 | -114 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 | -113.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 | -113 |
| | | NR_FDD_FR1_F | | | | | | -112.5 | -112.5 |
| | | NR_FDD_FR1_G | | | | | | -112 | -112 |
| | | NR_FDD_FR1_H | | | | | | -111.5 | -111.5 |
| CSI-RSRQ Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
| | | NR_FDD_FR1_B | | | | | | | |
| | | NR_TDD_FR1_C | | | | | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | | |
| | | NR_FDD_FR1_F | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| Io Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/ 9.36MHz | -50 | | -70 | | -83.5 | |
| | | NR_FDD_FR1_B | | | | | | -83 | |
| | | NR_TDD_FR1_C | | | | | | -82.5 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -82 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -81.5 | |
| | | NR_FDD_FR1_F | | | | | | -81 | |
| | | NR_FDD_FR1_G | | | | | | -80.5 | |
| | | NR_FDD_FR1_H | | | | | | -80 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/ 38.16M Hz | -50 | | - | | -77.4 | |
| | | NR_FDD_FR1_B | | | | | | -76.9 | |
| | | NR_TDD_FR1_C | | | | | | -76.4 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -75.9 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -75.4 | |
| | | NR_FDD_FR1_F | | | | | | -74.9 | |
| | | NR_FDD_FR1_G | | | | | | -74.4 | |
| | | NR_FDD_FR1_H | | | | | | -73.9 | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: CSI-RSRQ, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 6: Subtest 2 is not used when testing with 30kHz SSB and CSI-RS SCS.
NOTE 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.9.2 EN-DC iinter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 4.7.9.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9. 2 in TS 38.133 [6] for inter-frequency measurement.

### 4.7.9.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurements.

### 4.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.7.9.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.4.7.9.2.

### 4.7.9.2.4 Test description

#### 4.7.9.2.4.1 Initial conditions

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 4.7.9.2.4.1-1.

**Table 4.7.9.2.4.1-1: CSI-RSRQ inter-frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.9.2.4.1-2.

**Table 4.7.9.2.4.1-2: Initial conditions for CSI-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.9.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.9.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup, which is specified in clause A.3.7.2.1 in TS 38.133 [6]. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-RSRQ measurements. The connection setup is done according to the settings in clause C.1.3.

### 4.7.9.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.9.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 3 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 4.7.9.0.2.1-1, Table 4.7.9.0.2.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.9.2.5-1 as appropriate and repeat steps 5-7.

### 4.7.9.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.7.9.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and RSRQ<br>Table H.3.4-1a with condition GAP_NEEDED<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 |

**Table 4.7.9.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.7.9.2.5 Test requirements

Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table 4.7.9.2.5-1. The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 4.7.9.0.2.

**Table 4.7.9.2.5-1: CSI-RSRQ Inter-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2,5 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1,4 | | SMTC.2 | | | | | |
| | Config 2,3,5,6 | | SMTC.1 | | | | | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | | | | | |
| | Config 3,6 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | | | | | |
| | Config 3,6 | | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | dBm/15 kHz | -80.18 | -80.18 | -106 | -106 | -116 | -116 |
| | | NR_FDD_FR1_B | | | | | | -115.5 | -115.5 |
| | | NR_TDD_FR1_C | | | | | | -115 | -115 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -114 | -114 |
| | | NR_FDD_FR1_G | | | | | | -113 | -113 |
| | | NR_FDD_FR1_H | | | | | | -112.5 | -112.5 |
| | Config 3,6 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | dBm/15 kHz | -86.27 | -86.27 | -113 | -113 | -116 | -116 |
| | | NR_FDD_FR1_B | | | | | | -115.5 | -115.5 |
| | | NR_TDD_FR1_C | | | | | | -115 | -115 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -114 | -114 |
| | | NR_FDD_FR1_G | | | | | | -113 | -113 |
| | | NR_FDD_FR1_H | | | | | | -112.5 | -112.5 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | dBm/SCS | -80.18 | -80.18 | -106 | -106 | -116 | -116 |
| | | NR_FDD_FR1_B | | | | | | -115.5 | -115.5 |
| | | NR_TDD_FR1_C | | | | | | -115 | -115 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -114 | -114 |
| | | NR_FDD_FR1_G | | | | | | -113 | -113 |
| | | NR_FDD_FR1_H | | | | | | -112.5 | -112.5 |
| | Config 3,6 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | | -83.27 | -83.27 | -110 | -110 | -113 | -113 |
| | | NR_FDD_FR1_B | | | | | | -112.5 | -112.5 |
| | | NR_TDD_FR1_C | | | | | | -112 | -112 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -111.5 | -111.5 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -111 | -111 |
| | | NR_FDD_FR1_G | | | | | | -110 | -110 |
| | | NR_FDD_FR1_H | | | | | | -109.5 | -109.5 |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| CSI-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | dBm/SCS | -81.93 | -81.93 | -107.75 | -107.75 | -113 | -117.75 |
| | | NR_FDD_FR1_B | | | | | | -112.5 | -117.25 |
| | | NR_TDD_FR1_C | | | | | | -112 | -116.75 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -111.5 | -116.25 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -111 | -115.75 |
| | | NR_FDD_FR1_G | | | | | | -110 | -114.75 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_H | | | | | | -109.5 | -114.25 |
| | Config 3,6 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | | -85.02 | -85.02 | -111.75 | -111.75 | -110 | -114.75 |
| | | NR_FDD_FR1_B | | | | | | -109.5 | -114.25 |
| | | NR_TDD_FR1_C | | | | | | -109 | -113.75 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -108.5 | -113.25 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -108 | -112.75 |
| | | NR_FDD_FR1_G | | | | | | -107 | -111.75 |
| | | NR_FDD_FR1_H | | | | | | -106.5 | -111.25 |
| CSI-RSRQ Note3 | | NR_FDD_FR1_A<br>NR_TDD_FR1_A | dB | -14.77 | -14.77 | -40.59 | -40.59 | -12.56 | -14.76 |
| | | NR_FDD_FR1_B | | | | | | | |
| | | NR_TDD_FR1_C | | | | | | | |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | | |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| Io Note3 | Config 1,2,4,5 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | dBm/ 9.36MHz | -50 | -50 | -75.83 | -75.83 | -83.28 | -85.83 |
| | | NR_FDD_FR1_B | | | | | | -82.78 | -85.33 |
| | | NR_TDD_FR1_C | | | | | | -82.28 | -84.83 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -81.78 | -84.33 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -81.28 | -83.83 |
| | | NR_FDD_FR1_G | | | | | | -80.28 | -82.83 |
| | | NR_FDD_FR1_H | | | | | | -79.78 | -82.33 |
| | Config 3,6 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | dBm/ 38.16MHz | -50 | -50 | -76.73 | -76.73 | -77.19 | -79.73 |
| | | NR_FDD_FR1_B | | | | | | -76.69 | -79.23 |
| | | NR_TDD_FR1_C | | | | | | -76.19 | -78.73 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -75.69 | -78.23 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -75.19 | -77.73 |
| | | NR_FDD_FR1_G | | | | | | -74.19 | -76.73 |
| | | NR_FDD_FR1_H | | | | | | -73.69 | -76.53 |
| Propagation condition | | | | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: CSI-RSRQ, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 4.7.10 CSI-SINR

## 4.7.10.0 Minimum conformance requirements

### 4.7.10.0.1 Intra-frequency CSI-SINR accuracy requirements in FR1

[TS 38.133, clause 10.1.12.2 and clause 10.1.16]

#### 4.7.10.0.1.1 Absolute CSI-SINR accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 4.7.10.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for intra-frequency measurement is serving cell timing.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.10.0.1.1-1.

**Table 4.7.10.0.1.1-1: CSI-SINR intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io [Note 1] range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | NR operating band groups | Minimum Io | | | | Maximum Io |
| | | | | dBm / SCS | | | dBm/BW Channel | dBm/BW Channel |
| | | | | SCS (kHz) | | | | |
| dB | dB | dB | | 15 | 30 | 60 | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference

| measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP. |
|---|

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.10.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.10.0.1.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

## 4.7.10.0.2 Inter-frequency CSI-SINR accuracy requirements in FR1

[TS 38.133, clause 10.1.14.2 and clause 10.1.16]

### 4.7.10.0.2.1 Absolute accuracy of CSI-SINR in FR1

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 4.7.10.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.10.0.2.1-1.

**Table 4.7.10.0.2.1-1: CSI-SINR Inter-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | |
| | | | NR operating band groups | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm / SCS SCS (kHz) | dBm/BW Channel | dBm/BW Channel |

| | | | | 15 | 30 | 60 | | |
|---|---|---|---|---|---|---|---|---|
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.10.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.10.0.2.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

### 4.7.10.0.2.2 Relative accuracy of CSI-SINR in FR1

The relative accuracy of CSI-SINR in inter-frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR1 compared to the CSI-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.10.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.10.0.2.2-1.

**Table 4.7.10.0.2.2-1: CSI-SINR Inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 3 | NR operating band groups | Minimum Io | | | | Maximum Io |
| | | | | dBm / SCS | | | dBm/BW Channel | dBm/BW Channel |
| | | | | SCS (kHz) | | | | |
| dB | dB | dB | | 15 | 30 | 60 | | |
| ±3.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±4 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 5: The requirements apply for CSI-RS Ês/Iot ≤ XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

## 4.7.10.1 EN-DC iintra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 4.7.10.1.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12 in TS 38.133 [6].

### 4.7.10.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC, which support CSI-RS based SINR measurements.

#### 4.7.10.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.7.10.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.4.7.10.1.

#### 4.7.10.1.4 Test description

##### 4.7.10.1.4.1 Initial conditions

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table 4.7.10.1.4.1-1.

**Table 4.7.10.1.4.1-1: CSI-SINR intra-frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.10.1.4.1-2.

**Table 4.7.10.1.4.1-2: Initial conditions for CSI-SINR intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.10.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.10.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup, which is specified in clause A.3.7.2.1 in TS 38.133 [6]. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-SINR measurements. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3. The connection setup is done according to the settings in clause C.1.3.

##### 4.7.10.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.10.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 3 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 4.7.10.0.1.1-1, Table 4.7.10.0.1.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.10.1.5-1 as appropriate and repeat steps 5-7.

### 4.7.10.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.7.10.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and SINR<br>Table H.3.4-1a<br>Table H.3.4-2 |

**Table 4.7.10.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 4.7.10.1.5 Test requirements

The absolute accuracy of CSI-SINR intra-frequency measurement is tested by using the parameters in Table 4.7.10.1.5-1. The CSI-SINR measurement accuracy shall fulfil the requirements in clause 4.7.10.0.1.

**Table 4.7.10.1.5-1: CSI-SINR intra-frequency test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1,4 | | FDD | | | |
| | Config 2,3,5,6 | | TDD | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | |
| | Config 2,5 | | TDDConf.1.1 | | | |
| | Config 3,6 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2, 5 | | TRS.1.1 TDD | | | |
| | Config 3, 6 | | TRS.1.2 TDD | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3,6 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2,5 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | 2.35 | 2.35 | 2.35 | 2.35 |
| | Config 3.6 | µs | 1.17 | 1.17 | 1.17 | 1.17 |
| SMTC configuration | Config 1,4 | | SMTC.2 | | | |
| | Config 2,3,5,6 | | SMTC.1 | | | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | | | |
| | Config 3,6 | | SSB.2 FR1 | | | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | | | |
| | Config 3,6 | | 30 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm /15kHz | -93 | | -116 | |
| | NR_FDD_FR1_B | | | | -115.5 | |
| | NR_TDD_FR1_C | | | | -115 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -114.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -114 | |
| | NR_FDD_FR1_F | | | | -113.5 | |
| | NR_FDD_FR1_G | | | | -113 | |
| | NR_FDD_FR1_H | | | | -112.5 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm /SCS | -93 | | Same as Noc for 15kHz | |
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -90 | | -113 | |
| | | NR_FDD_FR1_B | | | | -112.5 | |
| | | NR_TDD_FR1_C | | | | -112 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -111.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -111 | |
| | | NR_FDD_FR1_F | | | | -110.5 | |
| | | NR_FDD_FR1_G | | | | -110 | |
| | | NR_FDD_FR1_H | | | | -109.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| CSI-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A | dBm /SCS | -88.46 | -90.34 | -120 | -120 |
| | | NR_FDD_FR1_B | | | | -119.5 | -119.5 |
| | | NR_TDD_FR1_C | | | | -119 | -119 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -118.5 | -118.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -118 | -118 |
| | | NR_FDD_FR1_F | | | | -117.5 | -117.5 |
| | | NR_FDD_FR1_G | | | | -117 | -117 |
| | | NR_FDD_FR1_H | | | | -116.5 | -116.5 |
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -85.46 | -87.34 | -117 | -117 |
| | | NR_FDD_FR1_B | | | | -116.5 | -116.5 |
| | | NR_TDD_FR1_C | | | | -116 | -116 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -115.5 | -115.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -115 | -115 |
| | | NR_FDD_FR1_F | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_G | | | | -114 | -114 |
| | | NR_FDD_FR1_H | | | | -113.5 | -113.5 |
| CSI-SINR Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dB | 0 | -3.19 | -5.46 | -5.46 |
| | | NR_FDD_FR1_B | | | | | |
| | | NR_TDD_FR1_C | | | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | |
| | | NR_FDD_FR1_F | | | | | |
| | | NR_FDD_FR1_G | | | | | |
| | | NR_FDD_FR1_H | | | | | |
| Io Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm / 9.36 MHz | -57.5 | | -85.51 | |
| | | NR_FDD_FR1_B | | | | -85.01 | |
| | | NR_TDD_FR1_C | | | | -84.51 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -84.01 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -83.51 | |
| | | NR_FDD_FR1_F | | | | -83.01 | |
| | | NR_FDD_FR1_G | | | | -82.51 | |
| | | NR_FDD_FR1_H | | | | -82.01 | |

| | | | | | |
|---|---|---|---|---|---|
| | Config 3,6 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm / 38.16MHz | -51.41 | -79.41 |
| | | NR_FDD_FR1_B | | | -78.91 |
| | | NR_TDD_FR1_C | | | -78.41 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -77.91 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -77.41 |
| | | NR_FDD_FR1_F | | | -76.91 |
| | | NR_FDD_FR1_G | | | -76.41 |
| | | NR_FDD_FR1_H | | | -75.91 |
| Propagation condition | | | - | AWGN | |
| Antenna configuration | | | - | 1x2 | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.10.2 EN-DC iinter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 4.7.10.2.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.2 in TS 38.133 [6] for inter-frequency measurement.

### 4.7.10.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR EN-DC, which supports CSI-RS based SINR measurements.

### 4.7.10.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.7.10.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.4.7.10.2.

### 4.7.10.2.4 Test description

#### 4.7.10.2.4.1 Initial conditions

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 4.7.10.2.4.1-1.

**Table 4.7.10.2.4.1-1: CSI-SINR Inter-frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4.7.10.2.4.1-2.

**Table 4.7.10.2.4.1-2: Initial conditions for CSI-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.10.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4.7.10.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup, which is specified in clause A.3.7.2.1 in TS 38.133 [6]. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for CSI-SINR measurements. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3. The connection setup is done according to the settings in clause C.1.3.

### 4.7.10.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.10.2.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 3 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 4.7.10.0.2.1-1 and 4.7.10.0.2.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.10.2.5-1 as appropriate and repeat steps 5-7.

#### 4.7.10.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.7.10.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and SINR<br>Table H.3.4-1a with condition GAP_NEEDED<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 |

**Table 4.7.10.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 4.7.10.2.5 Test requirements

Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table 4.7.10.2.5-1. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3.

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 4.7.10.0.2.

**Table 4.7.10.2.5-1: CSI-SINR inter-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| **SSB ARFCN** | | | **freq1** | **freq2** | **freq1** | **freq2** | **freq1** | **freq2** |
| Duplex mode | Config 1,4 | | FDD | | | | | |
| | Config 2,3,5,6 | | TDD | | | | | |
| TDD configuration | Config 1,4 | | Not Applicable | | | | | |
| | Config 2,5 | | TDDConf.1.1 | | | | | |
| | Config 3,6 | | TDDConf.2.1 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | | | |
| TRS configuration | Config 1, 4 | | | TRS.1.1 FDD | | | | | | | |
| | Config 2, 5 | | | TRS.1.1 TDD | | | | | | | |
| | Config 3, 6 | | | TRS.1.2 TDD | | | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - | | |
| | Config 2,5 | | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | | | |
| | Config 3,6 | | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | Config 1,4 | | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - | | |
| | Config 2,5 | | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | | |
| | Config 3,6 | | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | | | |
| Dedicated CORESET Reference Channel | Config 1,4 | | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - | | |
| | Config 2,5 | | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | | |
| | Config 3,6 | | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | | | |
| OCNG Patterns | | | | OP.1 | | | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | | µs | - | 2.35 | - | 2.35 | - | 2.35 | | |
| | Config 3,6 | | µs | - | 1.17 | - | 1.17 | - | 1.17 | | |
| SMTC configuration | Config 1,4 | | | SMTC.2 | | | | | | | |
| | Config 2,3,5,6 | | | SMTC.1 | | | | | | | |
| SSB configuration | Config 1,2,4,5 | | | SSB.1 FR1 | | | | | | | |
| | Config 3,6 | | | SSB.2 FR1 | | | | | | | |
| CSI-RS configuration for RRM | Config 1,4 | | | CSI-RS.RRM.FR1.1 FDD | | | | | | | |
| | Config 2,5 | | | CSI-RS.RRM.FR1.1 TDD | | | | | | | |
| | Config 3,6 | | | CSI-RS.RRM.FR1.2 TDD | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | | kHz | 15 | | | | | | | |
| | Config 3,6 | | | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -88 | | -108.5 | | -119.5 | | | |
| | | NR_FDD_FR1_B | | | | | | -119 | | | |
| | | NR_TDD_FR1_C | | | | | | -118.5 | | | |
| | | NR_FDD_FR1_D | | | | | | -118 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_TDD_FR1_D | | | | |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | -117.5 |
| | | NR_FDD_FR1_F | | | | -117 |
| | | NR_FDD_FR1_G | | | | -116.5 |
| | | NR_FDD_FR1_H | | | | -116 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -88 | -108.5 | Same as Noc for 15kHz |
| | Config 3,6 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | | -85 | -105.5 | -116.5 |
| | | NR_FDD_FR1_B | | | | -116 |
| | | NR_TDD_FR1_C | | | | -115.5 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | -115 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | -114.5 |
| | | NR_FDD_FR1_F | | | | -114 |
| | | NR_FDD_FR1_G | | | | -114.5 |
| | | NR_FDD_FR1_H | | | | -113 |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | 20 | -4.0 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | 20 | -4.0 |
| CSI-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -89.75 | -88.5 | -123.5 |
| | | NR_FDD_FR1_B | | | | -123 |
| | | NR_TDD_FR1_C | | | | -122.5 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | -122 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | -121.5 |
| | | NR_FDD_FR1_F | | | | -121 |
| | | NR_FDD_FR1_G | | | | -120.5 |
| | | NR_FDD_FR1_H | | | | -120 |
| | Config 3,6 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | | -86.75 | -85.5 | -120.5 |
| | | NR_FDD_FR1_B | | | | -120 |
| | | NR_TDD_FR1_C | | | | -119.5 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | -119 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | -118.5 |
| | | NR_FDD_FR1_F | | | | -118 |
| | | NR_FDD_FR1_G | | | | -117.5 |
| | | NR_FDD_FR1_H | | | | -117 |
| CSI-SINR Note3 | | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB | -1.75 | 20 | -4.0 |
| | | NR_FDD_FR1_B | | | | |
| | | NR_TDD_FR1_C | | | | |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | |
| | | NR_FDD_FR1_F | | | | |
| | | NR_FDD_FR1_G | | | | |
| | | NR_FDD_FR1_H | | | | |
| Io Note3 | Config 1,2,4,5 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/9.36MHz | -57.83 | -60.5 | -90.09 |
| | | NR_FDD_FR1_B | | | | -89.59 |
| | | NR_TDD_FR1_C | | | | -89.09 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | -88.59 |
| | | NR_FDD_FR1_E | | | | -88.09 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_TDD_FR1_E | | | | |
| | | NR_FDD_FR1_F | | | | -87.59 |
| | | NR_FDD_FR1_G | | | | -87.09 |
| | | NR_FDD_FR1_H | | | | -86.59 |
| | Config 3,6 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/ 38.16MHz | -51.73 | -54.41 | -84 |
| | | NR_FDD_FR1_B | | | | -83.5 |
| | | NR_TDD_FR1_C | | | | -83 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | -82.5 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | -82 |
| | | NR_FDD_FR1_F | | | | -81.5 |
| | | NR_FDD_FR1_G | | | | -81 |
| | | NR_FDD_FR1_H | | | | -80.5 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 4.7.11 TDCP amplitude measurement accuracy

### 4.7.11.0 Minimum conformance requirements

#### 4.7.11.0.1 TDCP amplitude measurement accuracy requirements in FR1

[38.133 clause 10.1.42]

The reporting range of TDCP amplitude is defined from 0 to 1. The reporting range of TDCP phase is 0 to 2π. The mapping of measured quantity is defined in Table 4.7.11.0.1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 4.7.11.0.1: TDCP amplitude measurement report mapping**

| Reported value | Measured quantity value |
|---|---|
| TDCP_0 | $1 - \frac{1}{128\sqrt{2}} < \text{TDCP} \leq 1$ |
| TDCP_1 | $1 - \frac{1}{128} < \text{TDCP} \leq 1 - \frac{1}{128\sqrt{2}}$ |
| TDCP_2 | $1 - \frac{1}{64\sqrt{2}} < \text{TDCP} \leq 1 - \frac{1}{128}$ |
| TDCP_3 | $1 - \frac{1}{64} < \text{TDCP} \leq 1 - \frac{1}{64\sqrt{2}}$ |
| TDCP_4 | $1 - \frac{1}{32\sqrt{2}} < \text{TDCP} \leq 1 - \frac{1}{64}$ |
| TDCP_5 | $1 - \frac{1}{32} < \text{TDCP} \leq 1 - \frac{1}{32\sqrt{2}}$ |
| TDCP_6 | $1 - \frac{1}{16\sqrt{2}} < \text{TDCP} \leq 1 - \frac{1}{32}$ |
| TDCP_7 | $1 - \frac{1}{16} < \text{TDCP} \leq 1 - \frac{1}{16\sqrt{2}}$ |
| TDCP_8 | $1 - \frac{1}{8\sqrt{2}} < \text{TDCP} \leq 1 - \frac{1}{16}$ |

| | |
|---|---|
| TDCP_9 | $1-\frac{1}{8} < TDCP \leq 1-\frac{1}{8\sqrt{2}}$ |
| TDCP_10 | $1-\frac{1}{4\sqrt{2}} < TDCP \leq 1-\frac{1}{8}$ |
| TDCP_11 | $1-\frac{1}{4} < TDCP \leq 1-\frac{1}{4\sqrt{2}}$ |
| TDCP_12 | $1-\frac{1}{2\sqrt{2}} < TDCP \leq 1-\frac{1}{4}$ |
| TDCP_13 | $1-\frac{1}{2} < TDCP \leq 1-\frac{1}{2\sqrt{2}}$ |
| TDCP_14 | $1-\frac{1}{\sqrt{2}} < TDCP \leq 1-\frac{1}{2}$ |
| TDCP_15 | $0 \leq TDCP \leq 1-\frac{1}{\sqrt{2}}$ |

## 4.7.11.1 TDCP amplitude measurement accuracy in EN-DC

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing
- test case applicability is missing

### 4.7.11.1.1 Test purpose

The purpose of this test is to verify that the TRS based TDCP amplitude measurement accuracy is within the specified limits in the test requirements clause Clause 10.1.42 of TS 38.133. The configurations for the test are specified in Table 4.7.11.1.1-1.

### 4.7.11.1.2 Test applicability

This test applies to all types of NR UE Rel-18 and forward supporting NR EN-DC, which supports T based SINR measurements.

### 4.7.11.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.7.11.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.4.7.11.2.

### 4.7.11.1.4 Test description

#### 4.7.11.1.4.1 Initial conditions

The test consists of two tests, Test 1 and Test 2. Each test further consists of two subtests Test 1A, 1B and Test 2A, 2B.

Test 1A: 10 Hz doppler + 15kHz SCS FDD + 20dB SNR

Test 1B: 300 Hz doppler + 15kHz SCS FDD + 10 dB SNR

Test 2A: 10 Hz doppler + 30kHz SCS TDD + 20 dB SNR

Test 2B: 300 Hz doppler + 30kHz SCS TDD + 10 dB SNR

Relevant parameters for each test are provided in the Table 4.7.11.1.2-1. UE needs to pass Test 1A, 1B, 2A, 2B.

**Table 4.7.11.1.4-1: Applicable NR configurations for FR1 TRS based TDCP test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 4.7.11.1.4.1-2.

**Table 4.7.11.1.4.1-2: Initial conditions for CSI-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.10.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

### 4.7.11.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.11.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the TDCP reported index in the periodic MeasurementReport. The TDCP reported index of Cell 2 reported by the UE is compared to the expected TDCP reported index. If the value is outside the limits (determined by Table 4.7.11.0.1-1) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.11.1.5-1 as appropriate and repeat steps 5-7.

### 4.7.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 4.7.11.1.4.3-1: CSI-ReportConfig**

| Derivation Path: TS 38.508[14] Table 7.3.1-12F | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots5 | 0 | | SCS15kHz_FDD |

| | | | |
|---|---|---|---|
| slots5 | 2 | | SCS15kHz_ TDD |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| reportQuantity-r18 | TDCP-r18 | | |
| } | | | |

### 4.7.11.1.5 Test requirements

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in clause A.3.7.2 of TS 38.133 [6]. The test parameters for the Cell 2 are given in Table 4.7.11.1.5-1. Amplitude of TDCP is tested by using the parameters in Table 4.7.11.1.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured with 1 TRS set with the TRS resources in the set are configured in adjacent slot. UE is configured to perform L1-RSRP measurement based on the SSB resources 0 and 1.

**Table 4.7.11.1.5-1: FR1 TRS based TDCP test parameters**

| Parameter | Config | Unit | Test 1 (FDD) | | Test 2 (TDD) | |
|---|---|---|---|---|---|---|
| | | | 1A | 1B | 2A | 2B |
| SSB GSCN | 1~4 | | freq1 | | freq1 | |
| Duplex mode | 1,3 | | FDD | | N/A | |
| | 2,4 | | N/A | | TDD | |
| TDD Configuration | 1,3 | | N/A | | N/A | |
| | 2,4 | | N/A | | TDDConf.1.1 | |
| $BW_{channel}$ | 1,3 | MHz | 10: $N_{RB,c}$ = 52 | | N/A | |
| | 2,4 | | N/A | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1,3 | | SR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | 1,3 | | CR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | 1,3 | | CCR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | CCR.2.1 TDD | |
| SSB configuration | 1,3 | | SSB.3 FR1 | | N/A | |
| | 2,4 | | N/A | | SSB.4 FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| TRS configuration | 1,3 | | TRS.1.5 FDD | | N/A | |
| | 2,4 | | N/A | | TRS.1.5 TDD | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | | SMTC.1 | |
| reportConfigType | 1~4 | | periodic | | periodic | |
| reportQuantity | 1~4 | | ssb-Index-RSRP | | ssb-Index-RSRP | |
| Number of reported RS | 1~4 | | 2 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ | dBm/15kHz | 1 | -98 | | -98 | |
| | | 2 | | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | -98 | |
| | | 2 | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | TBD | | TBD | |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 20 | 10 | 20 | 10 |
| SSB_RP | 1,4 | | -78 | -88 | -78 | -88 |
| Propagation condition | 1~4 | | TDL-A 30ns 10 Hz | TDL-A 30ns 300 Hz | TDL-A 30ns 10Hz | TDL-A 30ns 300 Hz |
| Antenna configuration | 1~4 | | 1x2 | | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |

For Test 1A, the reported TDCP index shall be smaller than or equal to 6 for the 80% of the times over repeated tests.

For Test 1B: the reported TDCP index shall be smaller than or equal to 5 for the 80% of the times over repeated tests.

For Test 2A: the reported TDCP index shall be larger than 8 for the 80% of the times over repeated tests.

For Test 2B: the reported TDCP index shall be larger than 6 for the 80% of the times over repeated tests.

# 4A NE-DC with all NR cells in FR1

## 4A.0 General

This clause contains test scenarios for NR and E-UTRA dual connectivity with NR as PCell and E-UTRA and PSCell. This configuration is also known as NE-DC. All NR cells are in Frequency Range 1.

## 4A.1 Signalling characteristics

### 4A.1.1 E-UTRAN PSCell addition

#### 4A.1.1.0 Minimum conformance requirements

##### 4A.1.1.0.1 E-UTRA PSCell addition delay requirement

This clause defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

Upon receiving E-UTRAN PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe $n + T_{config_EUTRAN-PSCell}$:

Where:

$T_{config_EUTRAN-PSCell} = T_{RRC_delay} + T_{activation_time} + 50ms + T_{E-UTRAN-PSCell_DU}$

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

$T_{activation_time}$ is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then $T_{activation_time}$ is 20ms. If the E-UTRAN PSCell is unknown, then $T_{activation_time}$ is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

$T_{E-UTRAN-PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell. $T_{E-UTRAN-PSCell_DU}$ is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the E-UTRAN PSCell configuration command:
  - the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and
  - the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23],
- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay $T_{config_EUTRAN-PSCell}$ according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14] [xxx: need further check].

#### 4A.1.1.0.2 E-UTRA PSCell release delay requirement

The requirements in this clause shall apply for a UE which is configured with PCell and E-UTRAN PSCell and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [13] no later than in subframe $n+T_{RRC_delay}$:

Where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14] [xxx: need further check].

### 4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are FFS

#### 4A.1.1.1.1 Test purpose

The purpose of this test is to verify that the LTE PSCell addition/release delay and interruption under NE-DC are within the specified requirements for the case when the PSCell is known by the UE at the time of addition.

#### 4A.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards.

#### 4A.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.1.

#### 4A.1.1.1.4 Test description

##### 4A.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.1.1.1.4.1-1.

**Table 4A.1.1.1.4.1-1: Test configurations for NE-DC PSCell addition and Release test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4A.1.1.1.4.1-2.

**Table 4A.1.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4A.1.1.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.1.1.4.1-3.

**Table 4A.1.1.1.4.1-3: General Test Parameters for PSCell Addition and Release**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP (Config 1,2,4,5) | dBm | -97 Note 1 | Actual RSRP threshold for event B1. |

| | | | | |
|---|---|---|---|---|
| | Threshold RSRP (Config 3,6) | dBm | -97 Note 2 | Actual RSRP threshold for event B1. |
| | Time to Trigger | S | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | | | 0 | Gaps are configured before T2 and released before T3. |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 0.5 | During this time the UE adds the PSCell. |
| T4 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T5 | | s | 0.5 | During this time the UE releases the PSCell. |
| NOTE 1: Value includes the TT based on the TT analysis results. Original value -96 dBm. TT: -1dB.<br>NOTE 2: Value includes the TT based on the TT analysis results. Original value -93 dBm. TT: -4dB. | | | | |

#### 4A.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall set the parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T1 starts
3. The SS shall transmit an RRCReconfiguration message with event B1 configured.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. When T1 expires, the SS shall set T2 parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T2 starts.
6. The UE shall transmit a MeasurementReport message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.
7. The SS shall transmit an RRCReconfiguration message to release measurement gap.
8. The UE shall transmit an RRCReconfigurationComplete message.
9. The SS then shall transmit RRCReconfiguration message with condition NE-DC according to TS 38.508-1 [14] Table 4.6.1-13 to add E-UTRA cell (PSCell). T3 starts when the UE receives the RRC message.
10. The UE shall transmit an RRCReconfigurationComplete message.
11. The UE shall send a PRACH to PSCell during T3. The UE shall send PRACH no later than 120ms from the start of T3, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.
12. T4 starts.
13. During T4 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.
14. The SS shall transmit RRCReconfiguration message with condition NE-DC_PSCell_Rel according to TS 38.508-1 [14] Table 4.6.1-13 to release E-UTRA cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T5 starts when the UE receives the RRC message.
15. The UE shall transmit an RRCReconfigurationComplete message.
16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T5, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

17. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for the next iteration of the test procedure loop.

18. If the UE is not switched off, the SS shall transmit an RRCRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC_CONNECTED with generic parameter Connectivity NR with , Connected without release On. If paging succeeds, go to step 20, otherwise switches off the UE.

19. Switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

20. Repeat step 2-19 until a test verdict has been achieved.

#### 4A.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4A.1.1.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

#### 4A.1.1.1.5 Test Requirements

Table 4A.1.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1. Table 4A.1.1.1.5-2 defines primary level settings including test tolerances for E-UTRA Cell 2.

**Table 4A.1.1.1.5-1: NR Cell Specific Parameters for PSCell Addition and Release**

| Parameter | Unit | Config | Test |
|---|---|---|---|
| NR RF Channel Number | | 1,2,3,4,5,6 | 1 |
| E-UTRA RF Channel Number | | 1,2,3,4,5,6 | 2 |
| TDD configuration | | 1,4 | Not Applicable |
| | | 2,5 | TDDConf.1.1 |
| | | 3,6 | TDDConf.2.1 |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD |
| | | 2,5 | SR.1.1 TDD |
| | | 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD |
| | | 2,5 | CR.1.1 TDD |
| | | 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD |
| | | 2,5 | CCR.1.1 TDD |
| | | 3,6 | CCR.2.1 TDD |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 |
| | | 3,6 | SSB.2 FR1 |
| SMTC configuration | | 1,2,4,5 | SMTC.1 |
| | | 3,6 | SMTC.1 |
| TRS Configuration | | 1,4 | TRS.1.1 FDD |
| | | 2,5 | TRS.1.1 TDD |

| | | | |
|---|---|---|---|
| | | 3,6 | TRS.1.2 TDD |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD |
| | | 2,5 | CSI-RS.1.1 TDD |
| | | 3,6 | CSI-RS.2.1 TDD |
| reportConfigType | | 1,2,3,4,5,6 | periodic |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 |
| | | 3,6 | 10 |
| CSI reporting offset | slot | 1,2,4,5 | 2 |
| | | 3,6 | 4 |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -88 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -88 |
| | | 3,6 | -85 |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | 0 |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | 0 |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -88 |
| | | 3,6 | -85 |
| Io Note3 | dBm/9.36MHz | 1,2,4,5 | -57 |
| | dBm/38.1MHz | 3,6 | -51 |
| Propagation condition | | 1,2,3,4,5,6 | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 4A.1.1.1.5-2: E-UTRAN cell specific test parameters for PSCell Addition and Release tests**

| Parameter | Unit | E-UTRAN Cell | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| Duplex mode | | FDD or TDD | | | | |
| TDD special subframe configuration Note1 | | 6 | | | | |
| TDD uplink-downlink configuration Note1 | | 1 | | | | |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | | | |

| | | | |
|---|---|---|---|
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA[Note3] | dB | | |
| OCNG_RB[Note3] | dB | | |
| $N_{oc}$[Note4] | dBm/15 kHz | N/A | -104 |
| $\hat{E}_s/N_{oc}$ | dB | -infinite | 17 |
| $\hat{E}_s/I_{ot}$ | dB | -infinite | 17 |
| RSRP [Note5] | dBm/15 kHz | -infinite | -87 |
| SCH_RP [Note5] | dBm/15 kHz | -infinite | -87 |
| Io [Note5] | dBm/Ch BW | N/A | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition | | AWGN | |
| Antenna Configuration | | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in Table 4.2-1 in TS 36.211.
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit the PRACH to PSCell at latest 120 ms[Note1] into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4.

The UE shall stop sending CSI reports for PSCell in at latest 20ms into T5.

Interruption on PCell during PSCell addition and release shall not exceed the values specified for NE-DC in clause 8.2.3.2.3 of TS 38.133 [6].

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

## 4A.1.2 Active BWP switch delay

### 4A.1.2.0 Minimum conformance requirements

FFS

### 4A.1.2.1 NE-DC FR1 DCI-based and timer-based DL active BWP switch in non-DRX in synchronous NE-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Test procedure is FFS

- Test applicability in TS 38.522 is FFS

- Test requirements contain values in [.]

- Message contents are FFS

#### 4A.1.2.1.1 Test purpose

The purpose of this test is to verify that the active BWP switch delay under NE-DC is within the specified requirements for the case.

#### 4A.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of DCI and timer based active BWP switching delay type1 or type2 (*bwp-SwitchingDelay)* and BWP adaptation of at least 2BWPs (*bwp-SameNumerology)*.

#### 4A.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.2.

#### 4A.1.2.1.4 Test description

##### 4A.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.12.4.1-1.

**Table 4A.1.2.1.4.1-1: Test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4A.1.2.1.4.1-2.

**Table 4A.1.2.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4A.1.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.2.1.4.1-3.

**Table 4A.1.2.1.4.1-3: General test parameters for DL BWP switch in synchronous NE-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| E-UTRA RF Channel Number | | 2 | One E-UTRA radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous NE-DC |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 4A.1.2.1.4.2 Test procedure

1. FFS.

### 4A.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4A.1.2.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

### 4A.1.2.1.5 Test requirements

Table 4A.1.2.1.5-1 defines the primary level settings including test tolerances for NR Cell 1.

**Table 4A.1.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous NE-DC**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1,4 | | FDD |
| | Config 2,3,5,6 | | TDD |
| TDD configuration | Config 1,4 | | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-1 Configuration | Config 1,4 | | DLBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active DL BWP-2 Configuration | Config 1,4 | | DLBWP.1.3 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.2 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-1 Configuration | Config 1,4 | | ULBWP.1.1 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| Active UL BWP-2 Configuration | Config 1,4 | | ULBWP.1.3 Note 4 |
| | Config 2,5 | | |
| | Config 3,6 | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD |
| | Config 2,5 | | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD |
| | Config 2,5 | | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 | | CCR.1.1 FDD |
| | Config 2,5 | | CCR.1.1 TDD |
| | Config 3,6 | | CCR.2.3 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2,4,5 | dBm/SCS | [-104] |
| | Config 3,6 | | [-101] |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
| | Config 3,6 | | [-90] |

| | | | |
|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | Config 1,2,4,5 | dBm/9.36MHz | [-59] |
| | Config 3,6 | dBm/38.16MHz | [-61.9] |
| Propagation Condition | | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213. | | | |

During T1, the UE shall start to send the ACK for PCell in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PCell in the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7] [xxx: need further check].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PSCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PSCell interruption of during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 clause 7.36.2.6.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

# 4A.2 Measurement performance requirements

## 4A.2.1 SFTD accuracy

### 4A.2.1.0 Minimum conformance requirements

#### 4A.1.1.0.1 NE-DC SFTD accuracy requirement

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 4A.2.1.1.3-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Io range defined in Table 4A.2.1.1.3-1.

**Table 4A.2.1.1.3-1: PCell Io range conditions in FR1**

| Parameter | Io Note 1 range | | | |
|---|---|---|---|---|
| | NR operating band groups Note 4, 5 | Minimum Io Note 2, 3 | | Maximum Io |
| | | dBm/$SCS_{SSB}$ | | dBm/$BW_{Channel}$ |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A | -121 | -118 | -50 |
| | NR_FDD_FR1_B | -120.5 | -117.5 | -50 |
| | NR_TDD_FR1_C | -120 | -117 | -50 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -50 |
| | NR_FDD_FR1_G | -118 | -115 | -50 |
| | NR_FDD_FR1_H | -117.5 | -114.5 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA – NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA – NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [2] for reference sensitivity are fulfilled.
- Io range defined in Table 4A.2.1.1.3-2.

**Table 4A.2.1.1.3-2: PCell Io range conditions in FR2**

| Parameter | Io Note 1 range | | |
|---|---|---|---|
| | Minimum Io Note 2, 3 | | Maximum Io |
| | dBm/$SCS_{SSB}$ | | dBm/$BW_{Channel}$ |
| | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | Same value as SSB_RP in Table B.2.4.1-2 of TS 38.133 [6], according to UE Power class, operating band and angle of arrival | Same value as SSB_RP in Table B.2.4.1-2 of TS 38.133[6], according to UE Power class, operating band and angle of arrival | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the Reference point.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [2]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to Annex B.3.5 in TS 36.101 [27] for a corresponding Band.
- Io range defined in Table 4A.2.1.1.3-3.

**Table 4A.2.1.1.3-3: E-UTRA PSCell Io range conditions**

| Parameter | Io Note 1 range | | |
|---|---|---|---|
| | E-UTRA operating band groups Note 3 | Minimum Io | Maximum Io |
| Conditions | | dBm/15kHz Note 2 | dBm/$BW_{Channel}$ |
| | FDD_A, TDD_A | -121 | -50 |

| | | | |
|---|---|---|---|
| | FDD_C, TDD_C | -120 | -50 |
| | FDD_D | -119.5 | -50 |
| | FDD_E, TDD_E | -119 | -50 |
| | FDD_F | -118.5 | -50 |
| | FDD_G | -118 | -50 |
| | FDD_H | -117.5 | -50 |
| | FDD_N | -114.5 | -50 |

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by Δ>0, when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [23].
NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [23].

**Table 4A.2.1.1.3-4: SFTD measurement accuracy**

| Accuracy | Conditions | |
|---|---|---|
| | **Ês/Iot** Note 2 | **Frequency range** |
| **Ts** Note 1 | **dB** | |
| 40*64*Tc | ≥-3 dB | FR1 |
| 40*64*Tc | | FR2 |

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

## 4A.2.1.1 NE-DC FR1 SFTD accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Message contents are FFS

### 4A.2.1.1.1 Test purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits.

### 4A.2.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of SFTD measurements between an NR PCell and an E-UTRA PSCell (*sftd-MeasPSCell-NEDC)*.

### 4A.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.2.1.

### 4A.2.1.1.4 Test description

#### 4A.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.2.1.1.4.1-1.

**Table 4A.2.1.1.4.1-1: Supported test configurations for SFTD accuracy**

| Configuration | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |

| | |
|---|---|
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 4A.2.1.1.4.1-2.

**Table 4A.2.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | FFS | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4A.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 4A.1.1.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

### 4A.2.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4A.2.1.1.5-1 and Table 4A.2.1.1.5-1 as appropriate. (Condition = 3)
3. The SS shall transmit an RRReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.
6. The SS shall check the reported SFN offset and frame boundary offset between the NR PCell and the E-UTRA PSCell. The number of failed iterations is increased by one if
   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult* is outside the range given in Table 4A.2.1.1.5-3, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. Switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
8. Repeat steps 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 4A.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 4A.2.1.1.4.3-1: Common exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | FFS |
| Default RRC messages and information elements contents exceptions | FFS |

### 4A.2.1.1.5 Test requirements

Table 4A.2.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1.

**Table 4A.2.1.1.5-1: Test parameters for SFTD accuracy (Cell 1)**

| Parameter | | Config | Unit | Test 1 |
|---|---|---|---|---|
| SSB GSCN | | 1~6 | | freq1 |
| Duplex mode | | 1,4 | | FDD |
| | | 2,5 | | TDD |
| | | 3,6 | | TDD |
| TDD Configuration | | 1,4 | | N/A |
| | | 2,5 | | TDDConf.1.1 |
| | | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD |
| | | 2,5 | | SR.1.1 TDD |
| | | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD |
| | | 2,5 | | CR.1.1 TDD |
| | | 3,6 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD |
| | | 2,5 | | CCR.1.1 TDD |
| | | 3,6 | | CCR.2.1 TDD |
| SSB configuration | | 1,4 | | SSB.1 FR1 |
| | | 2,5 | | SSB.1 FR1 |
| | | 3,6 | | SSB.2 FR1 |
| SMTC configuration | | 1~6 | | SMTC.1 |
| DL BWP configuration | | 1~6 | | DLBWP.1.1 |
| UL BWP configuration | | 1~6 | | ULBWP.1.1 |
| OCNG Patterns | | 1~6 | | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~6 | dBm/15kHz | -104 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, | | | |

| | | | | |
|---|---|---|---|---|
| | NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -104 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 3,6 | | -101 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| $\hat{E}_s / I_{ot}$ | | 1~6 | dB | 2.7 |
| $\hat{E}_s / N_{oc}$ | | 1~6 | dB | 2.7 |
| SS-RSRP Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/SCS | -107 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 3,6 | | -104 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| Io Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -74.18 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |

| | | | | |
|---|---|---|---|---|
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 3,6 | dBm/38.16 MHz | -65.08 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_F | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| Propagation condition | | 1~6 | | AWGN |
| Antenna configuration | | 1~6 | | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 4A.2.1.1.5-2: Timing offsets for SFTD accuracy test**

| Configuration | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|---|---|---|
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and E-UTRAN target cell. The reported SFTD accuracy shall fulfil the requirement in clause 10.1.21.1 of TS 38.133 [6].

# 5 EN-DC with at least one NR cell in FR2

## 5.0 General

This clause contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR as PSCell. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

## 5.1 Void

## 5.2 Void

## 5.3 RRC_CONNECTED state mobility

### 5.3.1 Void

### 5.3.2 RRC connection mobility control

#### 5.3.2.1 Void

#### 5.3.2.2 Random access

##### 5.3.2.2.1 EN-DC FR2 contention based random access

Editor's note: This test case is incomplete for Test 2, 3 and 7. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- This test case has testability issues due to low uplink level for absolute uplink power and unapplicable requirement for relative uplink power, and therefore testing of Test 2, 3 and 7 is not recommended.

###### 5.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

###### 5.3.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC with FR2.

#### 5.3.2.2.1.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element, and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

#### 5.3.2.2.1.4 Test description

##### 5.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.1.4.1-1.

**Table 5.3.2.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.3.2.2.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |

| | |
|---|---|
| 5.3.2.2.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.1.4.1-2.

**Table 5.3.2.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.3.2.2.1.4.1-1. | | |
| Propagation conditions | No interference | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.3.2.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.1.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.3.2.2.1.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.3.2.2.1.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.
4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.
5. Test 2: Correct behaviour when receiving Random Access Response

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 5.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 5.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3 including C-RNTI MAC control element.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving a successful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

9.4. The System Simulator shall send a PDCCH addressed to the C-RNTI.

9.5. The UE shall send PUSCH according to the received PDCCH addressed to the C-RNTI.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble after the Contention Resolution Timer and backoff timer expire and it shall not exceed the values specified in 5.3.2.2.1.5.

#### 5.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 5.3.2.2.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 5.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

**Table 5.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |

| | | | |
|---|---|---|---|
| oneFourth | n48 | | FR2 |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| | | | |
| } | | | |

**Table 5.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | FR2 |
| msg1-FDM | one | | FR2 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -100 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 5.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | 20 +$\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

### 5.3.2.2.1.5 Test requirement

Table 5.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 5.3.2.2.1.5-3, 5.3.2.2.1.5-4 and 5.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 5.3.2.2.1.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR2 | As defined in clause A.3.2 |
| CSI-RS for tracking | Config 1,2 | | TRS.2.1 TDD | |
| Duplex Mode for Cell 2 | Config 1,2 | | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | As defined in clause A.1.5 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | As defined in clause A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1,2 | | SR.3.1 TDD | As defined in clause A.1.1 |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | As defined in clause A.1.2 |

| | | | | |
|---|---|---|---|---|
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | As defined in clause A.1.3 |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | |
| *ss-PBCH-BlockPower* | | dBm/SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| PRACH Configuration | | | PRACH.1 FR2 | As defined in clause A.As defined in clause A.7.2, with exceptions as defined below |
| *rsrp-ThresholdSSB* | | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | As defined in TS 38.331 [13] |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{_REP}$ – RSRP_76), where $RSRP_{_REP}$ is the SS-RSRP Reported value in TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 5.3.2.2.1.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (NOTE 3) | |

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving a successful UE Contention Resolution

- The UE shall send PUSCH according to the PDCCH addressed to the C-RNTI.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

**Table 5.3.2.2.1.5-3 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 5.3.2.2.1.5-4 Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | PRACH (dB) |
|---|---|---|
| Measured power of both PRACHs being compared > ($P_{max}^{Note1}$ – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ ($P_{max}^{Note1}$ – 6dB) | | ± (6+FFS) |
| NOTE 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 5.3.2.2.1.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

#### 5.3.2.2.2 EN-DC FR2 non-contention based random access

Editor's note: This test case is incomplete for Test 3 and 4. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- This test case has testability issues due to low uplink level for absolute uplink power and unapplicable requirement for relative uplink power, and therefore testing of Test 3 and 4 is not recommended.

##### 5.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

##### 5.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC with FR2. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RS-CFRA-ForHO.

##### 5.3.2.2.2.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

#### 5.3.2.2.2.4 Test description

##### 5.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.2.4.1-1.

**Table 5.3.2.2.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.3.2.2.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| 5.3.2.2.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.2.4.1-2.

**Table 5.3.2.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.3.2.2.2.4.1-1. | | |
| Propagation conditions | No interference | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.3.2.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the

settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.2.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.3.2.2.2.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Ensure the UE will choose SSB with index 0 for this procedure.

2. Set the parameters according to Table 5.3.2.2.2.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to Table 5.3.2.2.2.4.3-2.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 5.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3

   6.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 5.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

   7.1. Repeat steps 1-3.

   7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 5.3.2.2.2.5.

#### 5.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 5.3.2.2.2.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 5.3.2.2.2.4.3-1: RACH-ConfigCommon for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| | | | |
| } | | | |

**Table 5.3.2.2.2.4.3-2: RACH-ConfigDedicated for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |

| | | | |
|---|---|---|---|
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF CFRA-SSB-Resource { | 2 entries | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | | |
| ssb[2] | 1 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 40 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.3.2.2.2.4.3-3: RACH-ConfigGeneric for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | FR2 |
| msg1-FDM | one | | FR2 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -100 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 5.3.2.2.2.4.3-4: *ServingCellConfigCommon* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | 20 +$\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

**Table 5.3.2.2.2.4.3-5: CellGroupConfig for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |

| | | | |
|---|---|---|---|
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicated CHOICE { | | | |
| uplink | RACH-ConfigDedicated for Non-Contention Based Random Access | Table 5.3.2.2.2.4.3-2 | |
| } | | | |
| SpCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |

**Table 5.3.2.2.2.4.3-6: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

### 5.3.2.2.2.5 Test requirement

Table 5.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 5.3.2.2.2.5-3, 5.3.2.2.2.5-4 and 5.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 5.3.2.2.2.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR2 | SSB.1 FR2 | As defined in clause A.3.2 |
| CSI-RS Configuration | Config 1,2 | | N/A | CSI-RS.3.1 TDD | As defined in clause A.1.4 |
| Duplex Mode for Cell 2 | Config 1,2 | | TDD | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | TDDConf.3.1 | As defined in clause A.1.5 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 24 | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | OP.3 | As defined in clause A.2.1. |
| PDSCH Reference Channel Note 2 | Config 1,2 | | SR3.1 TDD | SR3.1 TDD | As defined in clause A.1.1. |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | CR.3.1 TDD | As defined in clause A.1.2 |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | CCR.3.1 TDD | As defined in clause A.1.3 |
| NR RF Channel Number | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | | |

| | | | | |
|---|---|---|---|---|
| ss-PBCH-BlockPower | dBm/SCS | +20 +$\Delta_{UL}$ | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$ | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| PRACH Configuration | | PRACH.2 FR2 | PRACH.3 FR2 | As defined in clause A.7.2, with exceptions as defined below. |
| rsrp-ThresholdSSB | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| preambleReceivedTargetPower | dBm | -100 | -100 | As defined in TS 38.331 [13] |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 5.3.2.2.2.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| AoA setup | | | Setup 1 | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (NOTE 3) | No external noise (NOTE 3) | |

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.2.5-5.

**Table 5.3.2.2.2.5-3 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 5.3.2.2.2.5-4 Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | PRACH (dB) |
|---|---|---|
| Measured power of both PRACHs being compared > ($P_{max}$ Note1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ ($P_{max}$ Note1 – 6dB) | | ± (6+FFS) |
| NOTE 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 5.3.2.2.2.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(KHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 5.3.2.2.3 EN-DC FR2 2-step contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- TT analysis and test requirements are missing.

- Test procedure is FFS

#### 5.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 5.3.2.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with FR2 and twoStepRACH-r16.

#### 5.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.5.3.2.2.3.

#### 5.3.2.2.3.4 Test description

##### 5.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.3.4.1-1.

**Table 5.3.2.2.3.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 5.3.2.2.3-1 | 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| 5.3.2.2.3-2 | 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.3.4.1-2.

**Table 5.3.2.2.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.3.2.2.3.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.3.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.3.2.2.3.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.3.2.2.3.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

   FFS

#### 5.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 5.3.2.2.3.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |
| Common exceptions to the contents of TS 38.508-1 [14] | FFS |

### 5.3.2.2.3.5 Test requirement

Table 5.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. The test requirements are FFS.

**Table 5.3.2.2.3.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR2 | As defined in clause A.3.2 |
| Duplex Mode for Cell 2 | Config 1,2 | | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | As defined in clause A.1.5 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | As defined in clause A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1,2 | | SR.3.1 TDD | As defined in clause A.1.1 |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | As defined in clause A.1.2 |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | As defined in clause A.1.3 |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH_DMRS to SSS | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | dB | | |
| *ss-PBCH-BlockPower* | dBm/SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| MsgA Configuration | | FR2 MsgA configuration 1 | As defined in FFS, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | dBm | RSRP_69 +ΔDL | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| msgA-PreambleReceivedTargetPower | dBm | -100 | As defined in TS 38.331 [13] |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 5.3.2.2.3.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (NOTE 3) | |

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

### 5.3.2.2.4 EN-DC FR2 2-step non-contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- TT analysis and test requirements are missing.

- Test procedure is FFS

#### 5.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 5.3.2.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with FR2 and twoStepRACH-r16.

#### 5.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.5.3.2.2.4.

#### 5.3.2.2.4.4 Test description

##### 5.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.4.4.1-1.

**Table 5.3.2.2.4.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 5.3.2.2.4-1 | 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| 5.3.2.2.4-2 | 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.4.4.1-2.

**Table 5.3.2.2.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.3.2.2.4.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.4.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.3.2.2.4.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.3.2.2.4.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

   FFS

#### 5.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 5.3.2.2.4.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |
| Common exceptions to the contents of TS 38.508-1 [14] | FFS |

#### 5.3.2.2.4.5 Test requirement

Table 5.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. The test requirements are FFS.

**Table 5.3.2.2.4.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR2 | As defined in clause A.3.2 |
| Duplex Mode for Cell 2 | Config 1,2 | | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | As defined in clause A.1.5 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | As defined in clause A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1,2 | | SR.3.1 TDD | As defined in clause A.1.1 |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | As defined in clause A.1.2 |

| | | | | |
|---|---|---|---|---|
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | As defined in clause A.1.3 |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | |
| *ss-PBCH-BlockPower* | | dBm/SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| MsgA Configuration | | | FR2 MsgA configuration 2 | As defined in FFS, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | | dBm | RSRP_69 +ΔDL | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| msgA-PreambleReceivedTargetPower | | dBm | -100 | As defined in TS 38.331 [13] |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{_REP}$ – RSRP_76), where $RSRP_{_REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 5.3.2.2.4.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (NOTE 3) | |

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

#### 5.3.2.3 Void

# 5.4 Timing

## 5.4.1 UE transmit timing

### 5.4.1.0 Minimum Conformance Requirements

#### 5.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 5.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_c$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_c$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 5.4.1.0.1-2.

**Table 5.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (KHz) | SCS of uplink signals (KHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | 12*64*$T_c$ |
| | | 30 | 10*64*$T_c$ |
| | | 60 | 10*64*$T_c$ |
| | 30 | 15 | 8*64*$T_c$ |
| | | 30 | 8*64*$T_c$ |
| | | 60 | 7*64*$T_c$ |
| 2 | 120 | 60 | 3.5*64*$T_c$ |
| | | 120 | 3.5*64*$T_c$ |
| | 240 | 60 | 3*64*$T_c$ |
| | | 120 | 3*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 5.4.1.0.1-2: The Value of $N_{\mathrm{TA\ offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\mathrm{TA\ offset}}$ (Unit: $T_C$) |
|---|---|
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| NOTE: The UE identifies $N_{\mathrm{TA\ offset}}$ based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\mathrm{TA\ offset}}$is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in [3] and the value 39936 of $N_{\mathrm{TA\ offset}}$ can also be provided for a FDD serving cell.<br>NOTE 2: Void | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{TA} + N_{TA\,offset}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.

2) The minimum aggregate adjustment rate shall be $T_p$ per second.

3) The maximum aggregate adjustment rate shall be $T_q$ per 200ms.

where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 5.4.1.0.1-3.

**Table 5.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (KHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 1 | 15 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| | 30 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| | 60 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| 2 | 60 | $2.5*64*T_c$ | $2.5*64*T_c$ |
| | 120 | $2.5*64*T_c$ | $2.5*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

## 5.4.1.1 EN-DC FR2 UE transmit timing accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2

### 5.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR2.

### 5.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.1.1

#### 5.4.1.1.4 Test Description

##### 5.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 5.4.1.1.4.1-1.

**Table 5.4.1.1.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR2 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 5.4.1.1.4.1-2

**Table 5.4.1.1.4.1-2: Initial conditions for EN-DC FR2 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5 4.1.1.4.3.
2. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. Downlink signals for NR cell are initially set up according to clause C.1.2 and C.1.3.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 5.4.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR FR2 cell (PSCell). The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
2. Set up E-UTRA PCell according to parameters given in Table A.6.1.1-1 and setup NR PSCell according to parameters given in Table 5.4.1.1.4.1-1.
3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 5.4.1.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the UE in the Rx beam peak direction found with a 3D EIS scan as performed in Annex I.1 - I.3. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.
6. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.
   a. The $N_{TA}$ offset value (in $T_c$ units) is 13792 for FR2
   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 5.4.1.1.5-4.
7. The test system shall adjust the timing of the DL path by values given in Table 5.4.1.1.4.2-1

**Table 5.4.1.1.4.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (KHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 240 | +8*64Tc | +4*64Tc |

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 5.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 5.4.1.0.1 and Table 5.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 5.4.1.1.4.2-1.
9. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

### 5.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.4.1.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 5.4.1.1.4.3-1: *SRS-Config* : Additional test requirement for UE transmit timing accuracy for EN-DC FR2 UE**

| Derivation Path: TS 38.331 [6], clause 6.3.2 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 17 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl2560 | 4 | | Test 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.4.1.1.4.3-2: *DRX-Config* : Additional test requirement for UE transmit timing accuracy Test 2 for EN-DC FR2**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | NOT PRESENT | |
| } | | | |

### 5.4.1.1.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 5.4.1.1.5-4.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_c$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_c$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 5.4.1.1.5-5.

**Table 5.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | Test2 | Band Group |
|---|---|---|---|---|---|
| SSB ARFCN | | 1,2 | Freq1 | Freq1 | |
| Duplex Mode | | 1,2 | TDD | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 1,2 | 100: NRB,c = 66 | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | | |
| TRS Configuration | | 1,2 | TRS.2.1 TDD | | |
| PDSCH/PDCCH TCI State | | 1,2 | TCI.State.2 | | |
| DRx Cycle | ms | 1,2 | N/A | DRX.8[Note5] | |
| PDSCH Reference measurement channel | | 1,2 | SR.3.3 TDD | | |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD | | |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.7 TDD | | |
| OCNG Patterns | | 1,2 | OP.1 | | |
| SSB Configuration | | 1,2 | SSB.4 FR2 | | |
| SMTC Configuration | | 1,2 | SMTC.1 | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| Propagation condition | | 1,2 | AWGN | | |
| SRS Config | | 1,2 | Config1[Note6] | Config2[Note6] | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: Void
NOTE 4: Void
NOTE 5: DRx related parameters are given in Table A.3.3.5-1 or Table A.5-1
NOTE 6: SRS configs are given in Table A. 5.4.1.1.5-2

**Table 5.4.1.1.5-2: SRS Configuration for Timing Accuracy Test**

| | Field | Config1 | Config 2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | |
| | resourceType | Periodic | Periodic | |
| | Usage | Codebook | Codebook | |

| | | | | |
|---|---|---|---|---|
| SRS-Resource | SRS-ResourceId | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | |
| | freqDomainShift | 0 | 0 | |
| | freqHopping c-SRS | 17 | 17 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1,0 | sl2560,4 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | Any 10 bit number |

**Table 5.4.1.1.5-3: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in A.9.1 | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -100 | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -96 | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | |
| Io Note2 | dBm/95.04 MHz Note4 | -68.5 | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 5.4.1.1.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals ( kHz) | SCS of uplink signals ( kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 60 | N/A |
| | | 120 | N/A |
| | 240 | 60 | N/A |
| | | 120 | $3.75*64*T_c$ |

NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]

**Table 5.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (KHz) | The Maximum timing change in one adjustment $T_q$ | The Minimum aggregate adjustment rate $T_p$ | The Maximum aggregate adjustment rate $T_q$ |
|---|---|---|---|---|
| 2 | 120 | 3.125*64*$T_c$ | -1.225*64*$T_c$ | +3.725*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

**Table 5.4.1.1.5-6: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [8] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.<br>NOTE 2: Void | |

## 5.4.1.2 NR UE Transmit Timing Test with 2-TA for FR2 UE supporting multiDCI-IntraCellMultiTRP-TwoTA-r18

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits, for UE supporting *multiDCI-IntraCellMultiTRP-TwoTA-r18* and is configured with 2 TAGs for multi-DCI multi-TRP operation. UE is also configured with *dl-OrJointTCI-StateList* or *ul-TCI-State-List*. This test will verify the requirements in clause 7.1.2.

### 5.4.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 18 and forward supporting EN-DC FR2.

### 5.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.1.2

### 5.4.1.2.4 Test Description

#### 5.4.1.2.4.1 Initial Conditions

Supported test configurations are shown in Table 5.4.1.2.1-1.

**Table 5.4.1.2.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 5.4.1.2.4.1-2

**Table 5.4.1.2.4.1-2: Initial conditions for EN-DC FR2 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5 4.1.2.4.3.

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.6.1.1-1. Tables 5.4.1.2.1-2 and 5.4.1.2.1-3 define the parameters to be configured and strength of the transmitted signals. The NR PSCell is configured with two TRPs in the test. Each TRP is associated with a CORESET, with coresetPoolIndex-r16 is set to 0 for the first TRP and set to 1 for the second TRP. UE is also configured with tag2 in ServingCellConfig. Two SRS resource sets are configured and associated to different TAGs via TCI state configuration. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table 5.4.1.2.5-3.

For UE not supporting the capability of “rxTimingDiff-r18”, the UE is only required to be tested in Test1 and Test3.

For UE supports the capability of “rxTimingDiff-r18”, the UE is only required to be tested in Test2 and Test4.

### 5.4.1.2.4.2 Test procedure

The test consists of E-UTRA PCell and NR PSCell. The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test

1) Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2) Set up E-UTRA PCell according to parameters given in Table A.6.1.1-1 and setup NR PSCell according to parameters given in Table 5.4.1.2.5-1.

3) The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 5.4.1.2.4.3.

4) The UE shall transmit RRCConnectionReconfigurationComplete message.

5) Set the UE in the Rx beam peak direction found with a 3D EIS scan as performed in Annex I.1 - I.3. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.

6) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB for each TAG.

a. The $N_{TA}$ offset value (in $T_c$ units) is 13792

b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 5.4.1.2.5-4.

7) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.2.2-1 for only TRP#1. The timing of the DL path of TRP#2 is not changed.

**Table 5.4.1.2.2-1 Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1&Test2 | Test3&Test4 |
| 240 | +8*64$T_c$ | +4*64$T_c$ |

8) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 of TS 38.133 until the UE transmit timing offset is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ respective to the first path (in time) of DL SSB of each TAG used by the UE to determine downlink timing is received from the reference cell at the UE antenna. For TRP#2, the test system shall verify there is no adjustment. Skip this step for Test 3 and Test 4 with DRX configured.

9) The test system shall verify that the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first path (in time) of DL SSB of each TAG used by the UE to determine downlink timing is received from the reference cell at the UE antenna. For Test 3 and Test 4 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

### 5.4.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.4.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Specific message contents exceptions for Test Configuration 7.4.1.3-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |

**Table 5.4.1.2.4.3-2: SRS-Config for UE transmit timing accuracy for EN-DC FR2 UE**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 17 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |

| | | | |
|---|---|---|---|
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| Sl2 | 0 | | Test 1 |
| Sl2 | 1 | | Test 2 |
| sl2560 | 4 | | Test 3 |
| sl2560 | 9 | | Test 4 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.4.1.2.4.3-3: DRX-Config for UE transmit timing accuracy Test 2 for EN-DC FR2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | NOT PRESENT | |
| } | | | |

5.4.1.2.5 Test Requirements

**Table 5.4.1.2.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | | Test2 | | Test3 | | Test4 | | Band Group |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TRP #1 | TRP #2 | TRP #1 | TRP #2 | TRP #1 | TRP #2 | TRP #1 | TRP #2 | |
| SSB ARFCN | | 1,2 | Freq1 | | | | | | | | |
| Duplex Mode | | 1,2 | TDD | | | | | | | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | | | | | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | | | | | | | |
| Data RBs allocated | | 1,2 | 66 | | | | | | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | | | | | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | | | | | | | | |
| TRS Configuration | | 1,2 | TRS.2.1 TDD<br>TRS.2.2 TDD | | | | | | | | |
| DRx Cycle | ms | 1,2 | N/A | | | | DRX.8[Note5] | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | 1,2 | SR.3. 3 TDD | | | | | | | | |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.1 TDD | | | | | | | | |
| coresetPoolIndex for dedicated CORESET Reference Channel | | 1,2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | |
| TCI configuration | | 1,2 | DLorJoint TCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJoint TCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJoint TCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJoint TCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJoint TCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJoint TCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJoint TCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJoint TCI.State.1 with tag-Id-ptr-r18 = n1 | |
| Timing difference compared to TRP#1 | us | 1,2 | 0 | 0.1 | 0 | 7 | 0 | 0.1 | 0 | 7 | |
| OCNG Patterns | | 1,2 | OP.1 | | | | | | | | |
| SSB Configuration | | 1,2 | SSB.1 FR2 | | | | | | | | |
| SMTC Configuration | | 1,2 | SMTC.1 | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | | | | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | | | | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| Propagation condition | | 1,2 | AWGN | | |
| SRS Config | | 1,2 | SRSConf.1[Note6] | SRSConf.2[Note6] | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: DRx related parameters are given in Table A.3.3.8-1
Note 6: SRS configs are given in Table 5.4.1.2.5-3

**Table 5.4.1.2.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beams[Note 6] | | Fine | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -112 | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -100 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SSB_RP[Note2] | dBm/SCS [Note4] | -96 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io[Note2] | dBm/95.04 MHz [Note4] | -68.5 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 5.4.1.2.5-3: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | | SRSConf.2 | | Comments |
|---|---|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 1 | 0 | 1 | |
| | srs-ResourceIdList | 0 | 1 | 0 | 1 | |
| | resourceType | Periodic | Periodic | Periodic | Periodic | |
| | Usage | Codebook | Codebook | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 1 | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | 0 | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | resourceMapping nrofSymbols | n1 | n1 | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | 0 | 0 | |
| | freqDomainShift | 0 | 0 | 0 | 0 | |
| | freqHopping c-SRS | 17 | 17 | 17 | 17 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | 0 | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | Neither | Neither | |
| | resourceType | Periodic | Periodic | Periodic | Periodic | |
| | periodicityAndOffset-p | sl2, 0 | sl2, 1 | sl2560, 4 | sl2560, 9 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | 0 | 0 | Any 10 bit number |
| | TCI state | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | |

**Table 5.4.1.2.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals ( kHz) | SCS of uplink signals ( kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 60 | N/A |
| | | 120 | N/A |
| | 240 | 60 | N/A |
| | | 120 | 3.75*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 5.4.1.2.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (KHz) | The Maximum timing change in one adjustment $T_q$ | The Minimum aggregate adjustment rate $T_p$ | The Maximum aggregate adjustment rate $T_q$ |
|---|---|---|---|---|
| 2 | 120 | 3.125*64*$T_c$ | -1.225*64*$T_c$ | +3.725*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

**Table 5.4.1.2.5-6: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [8] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell. | |
| NOTE 2: Void | |

## 5.4.2 UE timer accuracy

FFS

## 5.4.3 Timing advance

### 5.4.3.0 Minimum conformance requirements

#### 5.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 5.4.3.0.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 5.4.3.0.3-1: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 | 120 |
|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ |

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.3.

### 5.4.3.1 EN-DC FR2 timing advance adjustment accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

#### 5.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 5.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 5.4.3.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.3.1.

#### 5.4.3.1.4 Test description

##### 5.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of TS 38.521-2 [17].

This test shall be tested using any of the test configurations in Table 5.4.3.1.4.1-1.

**Table 5.4.3.1.4.1-1: EN-DC FR2 timing advance adjustment accuracy supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.4.3.1.4.1-2

**Table 5.4.3.1.4.1-2: Initial conditions for EN-DC FR2 timing advance adjustment accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, E.1.2, and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.4.3.1.4.1-3: General test parameters for timing advance**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 of TS 38.133 [6] |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 of TS 38.133 [6] |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 of TS 38.133 [6] |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 of TS 38.133 [6] |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | $N_{TA_new} = N_{TA_old} + 1024*T_c$ (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | s | 5 | |
| T2 | s | 5 | |

1. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.1.

2. Downlink signals for NR cell are initially set up according to clause C.1.2, C.1.3.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.4.3.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 5.4.3.1.5-1 and Table 5.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception

of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message content are defined in clause 5.4.3.1.2.3.

2. Set the parameters according to values in Tables 5.4.3.1.4.1-3 and Table 5.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value of 39 as specified in Table 5.4.3.1.4.1-3.

7. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay shall be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 5.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 5.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

13. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

14. If any of the above Reconfiguration in Step 12 or 13 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 3-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 5.4.3.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 5.4.3.1.4.3-1: srs-Config setup**

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 16 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | Periodic | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 4 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in Table 5.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90% with a confidence level of 95%.

Table 5.4.3.1.5-1, Table 5.4.3.1.5-1a and Table 5.4.3.1.5-2 define the primary level settings.

**Table 5.4.3.1.5-1: Cell specific test parameters for timing advance**

| Parameter | Unit | Test1 | |
|---|---|---|---|
| | | T1 | T2 |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | |
| CORESET Reference Channel | | CR.3.1 TDD | |

| | | |
|---|---|---|
| TRS configuration | | TRS.2.1 TDD |
| PDSCH/PDCCH TCI state | | TCI.State.2 |
| OCNG Patterns | | OCNG pattern 1 |
| SMTC configuration | | SMTC.1 |
| SSB configuration | | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 kHz |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 kHz |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation condition | - | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 5.4.3.1.5-1a: OTA specific test parameters for timing advance**

| Parameter | Unit | Test 1 | |
|---|---|---|---|
| | | T1 | T2 |
| Angle of arrival configuration | | Setup 1 | |
| Assumption for UE beams[Note 6] | | Fine | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -112 | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -103 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SS-RSRP[Note2] | dBm/SCS [Note4] | -99 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io[Note2] | dBm/95.04 MHz [Note4] | -68.53 | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | |
| NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | | |
| NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | | |
| NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | |

**Table 5.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance**

| Field | Value | Comment |
|---|---|---|
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 | |
| b-hop | 0 | |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=4 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |

| usage | Codebook | Codebook based UL transmission |
|---|---|---|
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 | |
| repetitionFactor | n1 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| NOTE: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

**Table 5.4.3.1.5-3: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 60 | 120 |
|---|---|---|
| UE Timing Advance adjustment accuracy | ±128 $T_c$ | ±72 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 5.5 Signaling characteristics

## 5.5.1 Radio link monitoring

The requirements in this clause apply for radio link monitoring on PSCell in EN-DC operation mode. The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

### 5.5.1.0 Minimum conformance requirements

#### 5.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ [ms] evaluation period. The requirements in this clause apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 5.5.1.0.1-1.

$T_{Evaluate_out_SSB}$ is defined in Table 5.5.1.0.1-1 for FR2.

**Table 5.5.1.0.1-1: Evaluation period $T_{Evaluate_out}$ for FR2**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) |
|---|---|
| no DRX | max(200,ceil(10*P*N)*$T_{SSB}$) |
| DRX cycle≤320 | max(200,ceil(15*P*N)*max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 | ceil(10*P*N)*$T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | |

For FR2,

- $P=1/(1 - T_{SSB}/T_{SMTCperiod})$, when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- P is 1/(1- $T_{SSB}$/MGRP - $T_{SSB}/T_{SMTCperiod}$), when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq$ MGRP or

- $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- P is 1/(1- $T_{SSB}$ /MGRP)*3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$

- P is 1/{1- $T_{SSB}$ /min ($T_{SMTCperiod}$ ,MGRP)}, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- P is 1/(1- $T_{SSB}$ /MGRP)*3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2.

### 5.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ [ms] period becomes better than the threshold $Q_{in_SSB}$ within $T_{Evaluate_in_SSB}$ [ms] evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 8.1.2.2-1 for FR1.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 8.1.2.2-2 for FR2 with scaling factor N=8.

For FR2,

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when RLM-RS is not overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is $P_{sharing\ factor}$, when the RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- $P = \frac{1}{1-\frac{T_{SSB}}{MRGP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$

- $P = \frac{1}{1-\frac{T_{SSB}}{Min(MRGP,T_{SMTCperiod})}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{sharing\ factor} = 1$

  - if all of the reference signals configured for RLM outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

  - if all of the reference signal configured for RLM outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped by with the SSB symbols indicated by SSB-ToMeasure and 1 symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1 symbol after each consecutive SSB symbols indicated by SSB-ToMeasure, given that SSB-ToMeasure is configured;

- $P_{sharing\ factor} = 3$, otherwise.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet previous conditions.

**Table 5.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ for FR2**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) | $T_{Evaluate_in_SSB}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil(10*P*N)*$T_{SSB}$) | Max(100, Ceil(5*P*N)*$T_{SSB}$) |
| DRX cycle≤320 | Max(200, Ceil(15*P*N)*Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5*P*N)*Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 | Ceil(10*P*N)*$T_{DRX}$ | Ceil(5*P*N)*$T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

Figure 5.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

### 5.5.1.0.3 Minimum conformance requirements for out-of-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133, clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

**Table 5.5.1.0.3-1: PDCCH transmission parameters for out-of-sync**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |

| | |
|---|---|
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 4dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4dB |
| Bandwidth (MHz) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out_CSI-RS}$ within $T_{Evaluate_out_CSI-RS}$ [ms] evaluation period.

- $T_{Evaluate_out_CSI-RS}$ is defined in Table 5.5.1.0.3-2 for FR2 with N=1. The requirements of $T_{Evaluate_out_CSI-RS}$ applies provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements doesn't apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when RLM-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 – T_{CSI-RS}/MGRP)$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 – T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P$ is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P$ is $1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P$ is $1/\{1- T_{CSI-RS} /\min (T_{SMTCperiod} ,MGRP)\}$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- $P$ is $1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

NOTE: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The value of $M_{out}$ used in Table 5.5.1.0.3-2 is defined as:

- $M_{out}$ = 20 if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 5.5.1.0.3-2: Evaluation period $T_{Evaluate_out_CSI\text{-}RS}$ for FR2**

| Configuration | $T_{Evaluate_out_CSI\text{-}RS}$ (ms) |
|---|---|
| no DRX | $\max(200, \text{ceil}(M_{out}\times P\times N)\times T_{CSI\text{-}RS})$ |
| DRX ≤ 320ms | $\max(200, \text{ceil}(1.5\times M_{out}\times P\times N)\times \max(T_{DRX}, T_{CSI\text{-}RS}))$ |
| DRX > 320ms | $\text{ceil}(M_{out}\times P\times N)\times T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI\text{-}RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clause 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331.

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331.

The out-of-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in clause 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI-RS}$ specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

#### 5.5.1.0.4 Minimum conformance requirements for in-sync CSI-RS based RLM

[TS 38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

**Table 5.5.1.0.4-1: PDCCH transmission parameters for in-sync**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | [0]dB |
| Bandwidth (MHz) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS}$ [ms] period becomes better than the threshold $Q_{in_CSI-RS}$ within $T_{Evaluate_in_CSI-RS}$ [ms] evaluation period.

- $T_{Evaluate_in_CSI-RS}$ is defined in Table 5.5.1.0.4-2 for FR2 with N=1. The requirements of $T_{Evaluate_in_CSI-RS}$ applies provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements don't apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for

RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when RLM-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 - T_{CSI-RS}/MGRP)$ , when RLM-RS is partially overlapped with measurement gap and RLM-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 - T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P$ is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P$ is $1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P$ is $1/\{1- T_{CSI-RS} /\min (T_{SMTCperiod} ,MGRP)\}$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- $P$ is $1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

NOTE: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of $M_{in}$ used in Table 5.5.1.0.4-2 are defined as:

- $M_{in} = 10$, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 5.5.1.0.4-2: Evaluation period $T_{Evaluate_in_CSI-RS}$ for FR2**

| Configuration | $T_{Evaluate_in_CSI-RS}$ (ms) |
|---|---|
| no DRX | $\max(100, \text{ceil}(M_{in}\times P\times N) \times T_{CSI-RS})$ |
| DRX ≤ 320ms | $\max(100, \text{ceil}(1.5\times M_{in}\times P\times N)\times \max(T_{DRX}, T_{CSI-RS}))$ |
| DRX > 320ms | $\text{ceil}(M_{in}\times P\times N) \times T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS 38.133, clause 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

[TS 38.133, clause 8.1.6]

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in}$, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in clause 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM\text{-}RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

#### 5.5.1.0.5 Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cell(s) in the bands due to radio link monitoring performed on FR2 serving PCell or PSCell in different bands, provided that UE is capable of independent beam management on this FR2 band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

#### 5.5.1.0.6 Requirements for UE configured with Relaxed Measurement Criteria

Same requirements apply as in clause 4.5.1.0.5.

##### 5.5.1.0.6.1 Minimum requirement of SSB based radio link monitoring for UE fulfilling relaxed measurement criteria

[TS 38.133, clause 8.1.2.4]

This clause contains minimum requirements for relaxed radio link monitoring based on SSB.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB_Relax}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB_Relax}$ [ms] evaluation period.

$T_{Evaluate_out_SSB_Relax}$ is defined in Table 5.5.1.0.6.1-1 for FR2 with scaling factor N=8.

The value of P is defined in clause 5.5.1.0.12.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 5.5.1.0.6.1-1: Evaluation period $T_{Evaluate_out_SSB_Relax}$ for FR2**

| Configuration | $T_{Evaluate_out_SSB_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX},T_{SSB}) \leq 80ms$ | $Max(200\times K4^{NOTE3}, Ceil(15 \times K2^{NOTE2} \times P \times N) \times Max(T_{DRX},T_{SSB}))$ |
| $80ms < Max(T_{DRX},T_{SSB}) \leq 160ms$ | $Ceil(15 \times P \times N) \times Max(T_{DRX},T_{SSB})$ |
| NOTE 1: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>NOTE 2: K2 = 2.<br>NOTE 3: K4 = K2, if K2 ≤ 2; otherwise K4 = 1. | |

## 5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

### 5.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM-RS in non-DRX mode. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

### 5.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 5.5.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 5.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.1.

### 5.5.1.1.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.1.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states and Figure 5.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms).

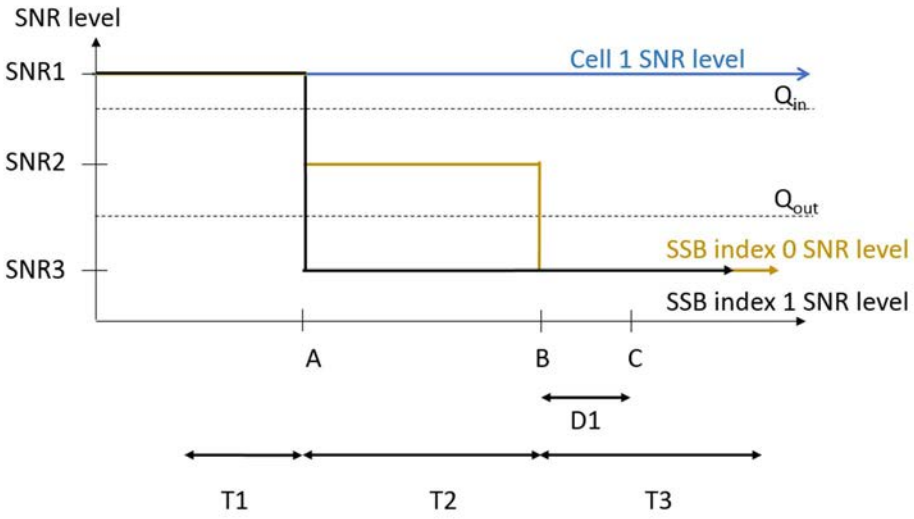


**Figure 5.5.1.1.4-1: SNR variation for out-of-sync testing**

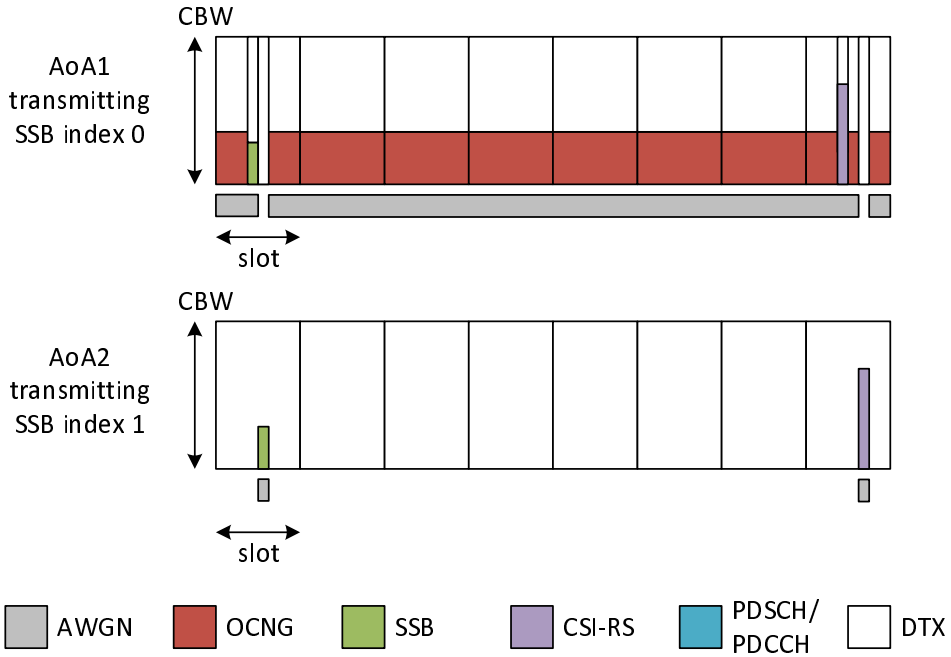


**Figure 5.5.1.1.4-2: Time multiplexed downlink transmissions**

### 5.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.1.4.1-1.

**Table 5.5.1.1.4.1-1: EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode supported test configurations**

| Configuration | Description |
|---|---|
| 5.5.1.1-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.1.1-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.1.4.1-2

**Table 5.5.1.1.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

PDCCH transmission parameters are given in Table 5.5.1.1.4.1-4

**Table 5.5.1.1.4.1-3: Void**

1. Message contents are defined in clause 5.5.1.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The test parameters are given in Table 5.5.1.1.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.1.1.4.1-4: General test parameters for FR2 out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 2 | | TDD |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1, 2 | | 24 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 2 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.3.1 TDD |

| | | | | |
|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 120 KHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | | Config 1, 2 | | 0,1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *gp0* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 | | CSI-RS.3.1 TDD Note 4 |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.
Note 3: E-UTRAN is in non-DRX mode under test.
Note 4: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations.

**Table 5.5.1.1.4.1-5: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |

Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM-RS is partially overlapped with measurement gap).

### 5.5.1.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

1a. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

1b. The UE shall transmit *RRCReconfigurationComplete* message.

2. Set the parameters according to T1 in Table 5.5.1.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.1.5-1. T3 starts.

5. If the SS:

a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

b) does not detect any uplink power from time point C (D1 seconds after the start of T3) until T3 expires,

the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.1.4.4-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.1.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of Adjacent range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-4 with condition gapUE<br>Table H.3.4-5 with condition BFD<br>Table H.3.5-4<br>Table H.3.1-8 with Condition SSB RLM |

**Table 5.5.1.1.4.3-1: Void**

**Table 5.5.1.1.4.3-2: RLF-TimersAndConstants**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 5.5.1.1.4.3-3: Void**

### 5.5.1.1.5 Test Requirement

Table 5.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 5.5.1.1.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | | Setup 3 defined in A.9.3 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams[Note 5] | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 4.1 Note 6 | -3.9 Note 6 | -15 | | | |
| ssb-Index 1 SNR | Config 1, 2 | | Not sent | | | 4.1 Note 6 | -15 | -15 |
| $N_{oc}$ | Config 1, 2 | dBm/ 15kHz | -94.8 | | | -94.8 | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 5.5.1.1.4-2 | | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 4: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6. |
| Note 5: | Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 6: | This value allows up to 1dB degradation from applied SNR to UE baseband |

### 5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 5.5.1.2.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 PSCell radio link monitoring requirements in clause 8.1 of TS 38.133 [3].

#### 5.5.1.2.2 Test Applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC FR2.

#### 5.5.1.2.3 Minimum Conformance Requirements

The minimum requirements are specified in clause 5.5.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.2.

#### 5.5.1.2.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states and Figure 5.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms.

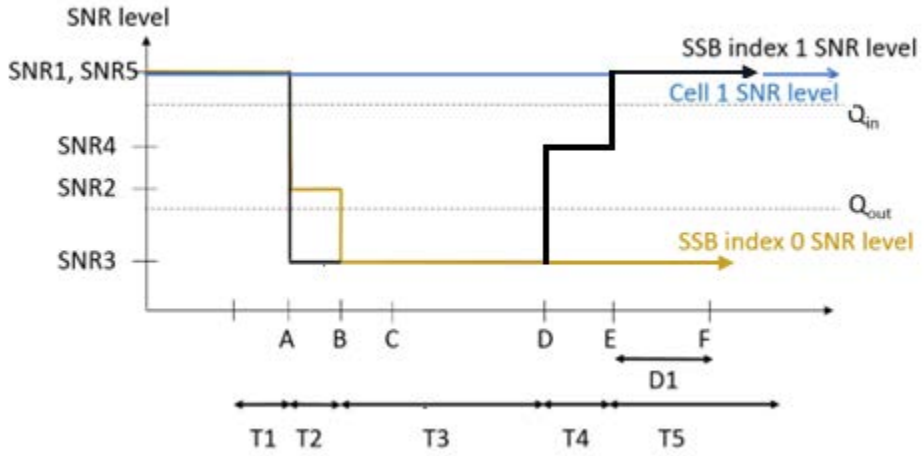


**Figure 5.5.1.2.4-1: SNR variation for in-sync testing**

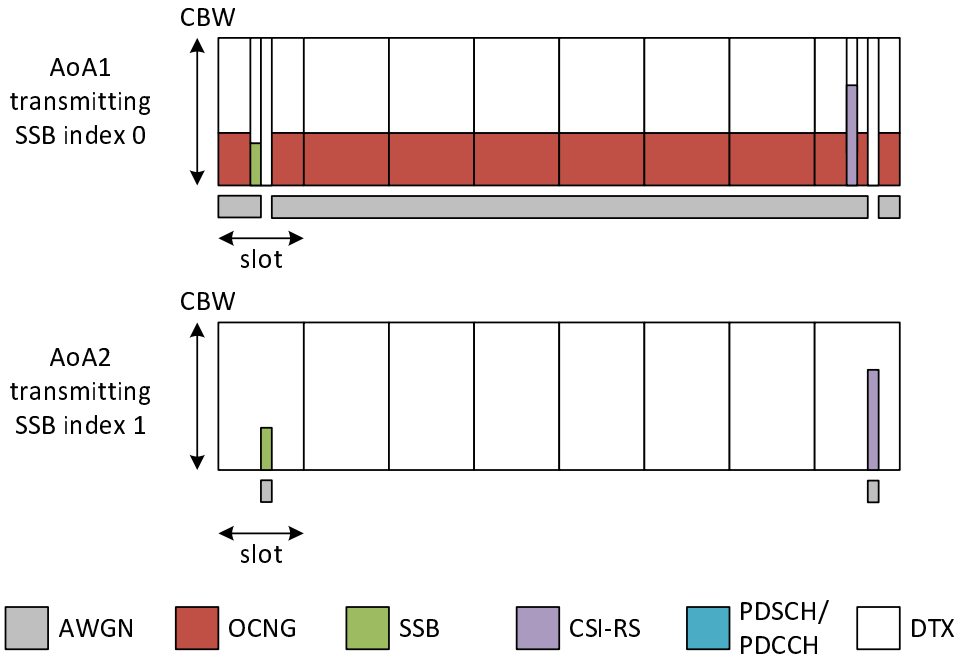


**Figure 5.5.1.2.4-2: Time multiplexed downlink transmissions**

### 5.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table 5.3.5-1 of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.2.4.1-1.

**Table 5.5.1.2.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.2-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 5.5.1.2-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.2.4.1-2.

**Table 5.5.1.2.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

PDCCH transmission parameters are given in Table 5.5.1.2.4.1-4.

**Table 5.5.1.2.4.1-3: Void**

1. Message contents are defined in clause 5.5.1.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The general test parameters are given in Table 5.5.1.2.5-4 below.

4. Downlink signals for NR cell are initially set up according to clause C.1.

**Table 5.5.1.2.4.1-4: General test parameters for FR2 in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 2 | | TDD |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 2 | | TDDConf.3.1 |
| CORESET Reference Channel | Config 1, 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.3.1 TDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1, 2 | | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 120 KHz |
| PRACH Configuration | Config 1, 2 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | Config 1, 2 | | 0,1 |
| OCNG parameters | | | OP.2 |
| CP length | | | Normal |
| DCI format | | | 1-0 |

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| In-sync transmission parameters | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 | | CSI-RS.3.1 TDD NOTE 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 | | TRS.2.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 1.88 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.84 |
| D1 | | | s | 3.8 |

NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.
NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.
NOTE 3: E-UTRAN is in non-DRX mode under test.
NOTE 4: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations.

#### 5.5.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 5.5.1.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 5.5.1.2.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 5.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 5.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power in each subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1 seconds after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 5.5.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.1-8 with Condition SSB RLM |

**Table 5.5.1.2.4.3-2: Void**

**Table 5.5.1.2.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms4000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 5.5.1.2.4.3-4: Void**

#### 5.5.1.2.5 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a 95% confidence interval.

**Table 5.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | Unit | Test 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 3 defined in A.9.3 | | | | | | | | | |
| | | AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams[Note 5] | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 4.1 Note 6 | - 3.9 Note 6 | -15 | -15 | -15 | | | | | |
| ssb-Index 1 SNR | Config 1, 2 | | Not sent | | | | | 4.1 Note 6 | -15 | -15 | -4.5 | 4.1 Note 6 |
| $N_{oc}$ | Config 1, 2 | dBm/ 15kHz | -94.8 | | | | | -94.8 | | | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 5.5.1.2.4-2 | | | | | | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

## 5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 5.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM-RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

### 5.5.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

#### 5.5.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 5.5.1.0.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.3.

#### 5.5.1.3.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2 as defined in TS 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.3.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

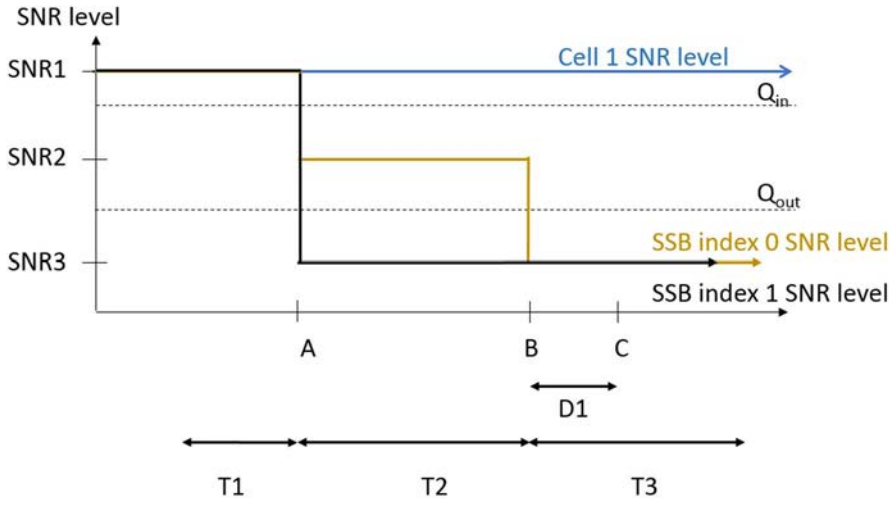


**Figure 5.5.1.3.4-1: SNR variation for out-of-sync testing**

##### 5.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.3.4.1-1.

**Table 5.5.1.3.4.1-1: EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode supported test configurations**

| Configuration | Description |
|---|---|
| 5.5.1.3-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.1.3-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.3.4.1-2

**Table 5.5.1.3.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

PDCCH transmission parameters are given in Table 5.5.1.3.4.1-4

**Table 5.5.1.3.4.1-3: Void**

1. Message contents are defined in clause 5.5.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The test parameters are given in Table 5.5.1.3.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.1.3.4.1-4: General test parameters for FR2 out-of-sync testing in DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active E-UTRA PCell | | | | Cell 1 |
| E-UTRA RF Channel Number | | | | 1 |
| Active PSCell | | | | Cell 2 |
| RF Channel Number | | | | 2 |
| Duplex mode | | Config 1, 2 | | TDD |
| $BW_{channel}$ | | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1, 2 | | 66 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 120 KHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | | Config 1, 2 | | 0,1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |

| | | | | |
|---|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 14.48 |
| T3 | | | s | 14.48 |
| D1 | | | s | 14.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 5.5.1.3.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. Set the parameters according to T1 in Table 5.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.3.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in the On-Duration part of every DRX cycle in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.3.4.4-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 5.5.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.1.3.4.3-2: Void**

**Table 5.5.1.3.4.3-3: RLF-TimersAndConstants**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 5.5.1.3.4.3-4: Void**

**Table 5.5.1.3.4.3-5: CSI-ReportConfig**

| Derivation Path: Table H.3.5-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots40 | 4 | | |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.5.1.3.5 Test Requirement

Table 5.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 5.5.1.3.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| AoA setup | | | Setup 1 defined in A.9.1 | | |
| Assumption for UE beams[Note 5] | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 3.3[Note 6] | -4.7[Note 6] | -15.4 |
| ssb-Index 1 SNR | Config 1, 2 | | 3.3[Note 6] | -15.4 | -15.4 |
| $N_{oc}$ | Config 1, 2 | dBm/15K Hz | -104.7dBm | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

### 5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 5.5.1.4.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell with DRX configured. This test will partly verify the FR2 PSCell radio link monitoring requirements in clause 8.1.

#### 5.5.1.4.2 Test Applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC

#### 5.5.1.4.3 Minimum Conformance Requirements

The minimum requirements are specified in clause 5.5.1.0.2. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.2.

#### 5.5.1.4.4 Test Description

#### 5.5.1.4.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

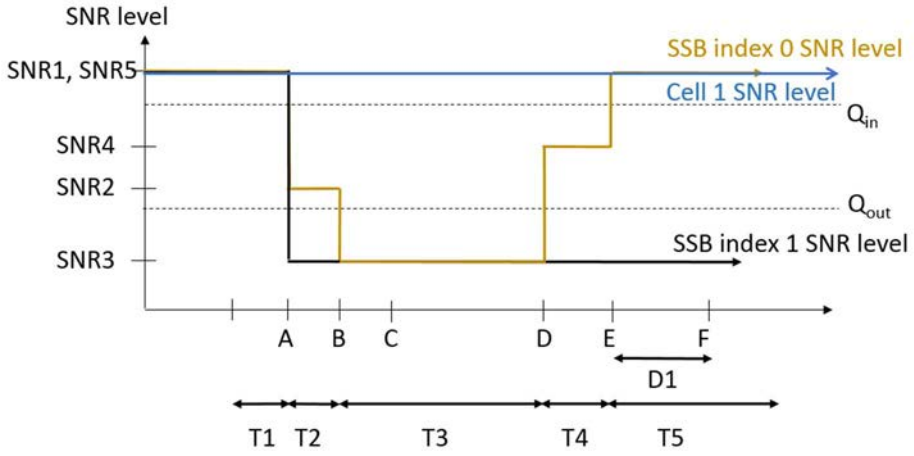


**Figure 5.5.1.4.4-1: SNR variation for in-sync testing**

#### 5.5.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table 5.3.5-1 of TS 38.of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.4.4.1-1.

**Table 5.5.1.4.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.4-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.1.4-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.4.4.1-2.

**Table 5.5.1.4.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

PDCCH transmission parameters are given in Table 5.5.1.4.4.1-4.

**Table 5.5.1.4.4.1-3: Void**

1. Message contents are defined in clause 5.5.1.4.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The general test parameters are given in Table 5.5.1.4.5-4 below.

4. Downlink signals for NR cell are initially set up according to clause C.1.

**Table 5.5.1.4.4.1-4: General test parameters for FR2 in-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex mode | Config 1, 2 | | TDD |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 2 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.3.1 TDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1, 2 | | SMTC.3 |

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 120 KHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | | Config 1, 2 | | 0,1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.11 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 5.5.1.4.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 5.5.1.4.4-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 5.5.1.4.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 5.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 5.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ( D1after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions.

**Table 5.5.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.11 |

**Table 5.5.1.4.4.3-2: Void**

**Table 5.5.1.4.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms4000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311 | ms1000 | | |
| } | | | |

**Table 5.5.1.4.4.3-4: Void**

**Table 5.5.1.4.4.3-5: CSI-ReportConfig**

| Derivation Path: Table H.3.5-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots40 | 4 | | |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 5.5.1.4.5 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a 95% confidence interval.

**Table 5.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 5 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 3.3 Note 6 | -4.7 Note 6 | -15.4 | -4.9 | 3.3 Note 6 |
| ssb-Index 1 SNR | Config 1, 2 | | 3.3 Note 6 | -15.4 | -15.4 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1, 2 | dBm/15 KHz | -104.7dBm | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

## 5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is made at Test frequency f ≤ 40.8 GHz

- Connection diagram is TBD

- Test Procedure and message contents will need further editing and review

#### 5.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

#### 5.5.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

#### 5.5.1.5.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.3. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.5.

#### 5.5.1.5.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

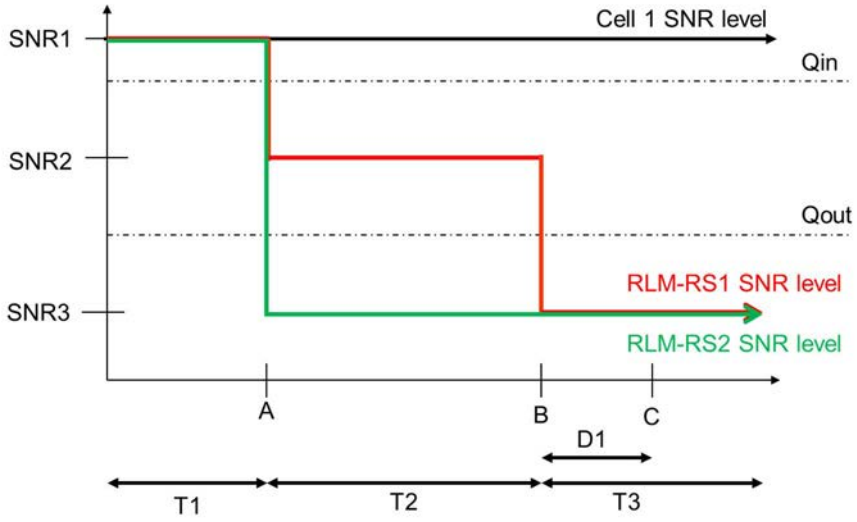


**Figure 5.5.1.5.4-1: SNR variation for out-of-sync testing**

##### 5.5.1.5.4.1 Initial conditions

Test 5.5.1.5 can be run in one of the configurations defined in Table 5.5.1.5.4.1-1.

**Table 5.5.1.5.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.5-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.5-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.5.4.1-2

**Table 5.5.1.5.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in non-DRX mode**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 5.5.1.5.4.1-3 below.

2. Message contents are defined in clause 5.5.1.5.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.1.5.4.1-3: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex Mode | | | TDD |
| $BW_{channel}$ | | Config 1, 2 | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1, 2 | 24 |
| $BW_{occupied}$ | | Config 1, 2 | 24 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| | Config 2 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.4 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| | Config 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.4 TDD<br>CCR.3.6 TDD |
| | Config 2 | | CCR.3.4 TDD<br>CCR.3.6 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| | Config 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| | Config 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz |
| | Config 2 | | 120 KHz |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD NOTE 3 |
| | Config 2 | | CSI-RS.3.1 TDD NOTE 3 |
| T1 | | s | 0.2 |
| T2 | | s | 0.35 |
| T3 | | s | 0.35 |
| D1 | | s | 0.31 |

NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.
NOTE 2: E-UTRAN is in non-DRX mode under test.
NOTE 3: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations.

**Table 5.5.1.5.4.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |

NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM-RS is partially overlapped with measurement gap)

### 5.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.5.5-1. T3 starts.

5. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect any uplink power on NR carrier from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.5.5-1.
7. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.
8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].
10. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.1.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED;<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR2, SMTC.1 and RLM<br><br>Table H.3.1-4 with a3-offset = -6dB;<br><br>Table H.3.1-8 with Condition CSI RLM<br><br>Table H.3.1-9 |

**Table 5.5.1.5.4.3-2: MeasConfig for E-UTRAN PCell**

| Derivation Path: TS 36.508 [25], Table 4.6.6-1 with condition RF | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig-DEFAULT ::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| measGapConfig | MeasGapConfig-GP1 | TS 36.508, table 4.6.6-1A | |
| } | | | |

#### 5.5.1.5.5 Test requirement

Tables 5.5.1.5.4.1-2 and 5.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 5.5.1.5.5-1: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |

| AoA setup | | | Setup 3 defined in A.9.3 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams[Note 10] | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 4.1[Note 11] | -3.9[Note 11] | -15 | | | |
| SNR on RLM-RS2 | Config 1, 2 | dB | Not sent | | | 4.1[Note 11] | -15 | -15 |
| $N_{oc}$ | Config 1, 2 | dBm/ 15kHz | -94.8 | | | -94.8 | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.1.5.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is made at Test frequency f ≤ 40.8 GHz

- Connection diagram is TBD.

### 5.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

#### 5.5.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

#### 5.5.1.6.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.6.

#### 5.5.1.6.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

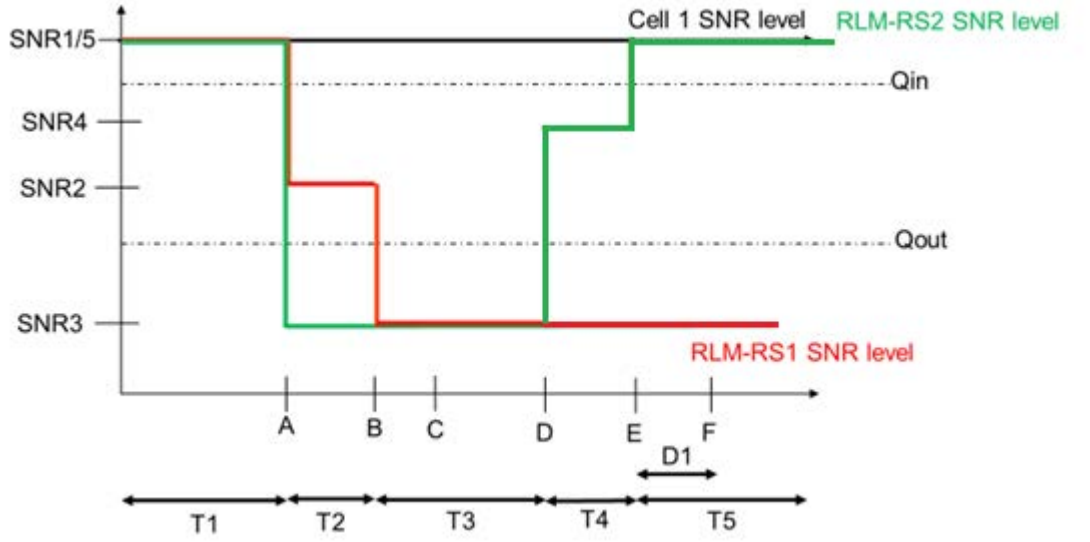


**Figure 5.5.1.6.4-1: SNR variation for in-sync testing**

##### 5.5.1.6.4.1 Initial conditions

Test 5.5.1.6 can be run in one of the configurations defined in Table 5.5.1.6.4.1-1.

**Table 5.5.1.6.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.6-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.6-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.6.4.1-2

**Table 5.5.1.6.4.1-2: Initial conditions for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |

| Parameter | Value | | Comment |
|---|---|---|---|
| Connection Diagram | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 5.5.1.6.4.1-3 below.

2. Message contents are defined in clause 5.5.1.6.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.1.6.4.1-3: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex Mode | | | TDD |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1, 2 | | 24 |
| $BW_{occupied}$ | Config 1, 2 | | 24 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| | Config 2 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.4 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| | Config 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| | Config 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| | Config 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz |
| | Config 2 | | 120 KHz |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| OCNG parameters | | | OP.5 |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to | dB | 4 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | average CSI-RS RE energy | | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD NOTE 3 |
| | Config 2 | | CSI-RS.3.1 TDD NOTE 3 |
| T1 | | s | 0.2 |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test.<br>NOTE 3: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations. | | | |

### 5.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.1.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition INTRA-FREQ, L3 FILTERING NEEDED;<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR2, SMTC.1 and RLM<br><br>Table H.3.1-8 with Condition CSI RLM<br><br>Table H.3.1-9 |

### 5.5.1.6.5 Test requirement

Tables 5.5.1.6.4.1-2 and 5.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring in-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 5.5.1.6.5-1: Cell specific test parameters for FR2 for CSI-RS is-sync radio link monitoring in non-DRX mode**

| Parameter | Unit | Test 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 3 defined in A.9.3 | | | | | | | | | |
| | | AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams[Note 10] | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 4.1 Note 11 | -3.9 Note 11 | -15 | -15 | -15 | | | | | | |
| SNR on RLM-RS2 | Config 1, 2 | | Not sent | | | | | 4.1 Note 11 | -15 | -15 | -4.5 | 4.1 Note 11 | |
| $N_{oc}$ | Config 1, 2 | dBm/ 15KHz | -94.8 | | | | | -94.8 | | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 5.5.1.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least in all slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

#### 5.5.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS based RLM and long DRX cycle.

#### 5.5.1.7.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.7.

#### 5.5.1.7.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

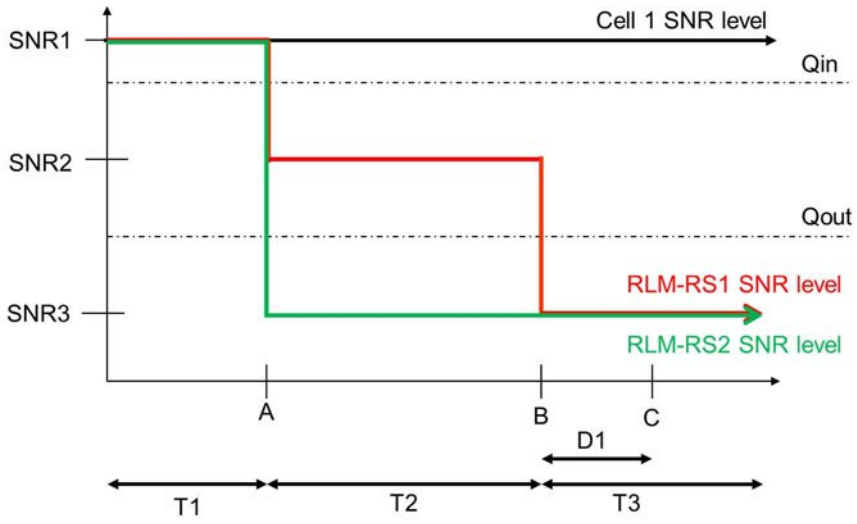


**Figure 5.5.1.7.4-1: SNR variation for out-of-sync testing**

##### 5.5.1.7.4.1 Initial conditions

Test 5.5.1.7 can be run in one of the configurations defined in Table 5.5.1.7.4.1-1.

**Table 5.5.1.7.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.7-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.7-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.7.4.1-2

**Table 5.5.1.7.4.1-2: Initial conditions for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 5.5.1.7.4.1-3 below.

2. Message contents are defined in clause 5.5.1.7.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.1.7.4.1-3: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex Mode | | | TDD |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| | Config 2 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR. 3.1 TDD |
| | Config 2 | | CR. 3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR. 3.4 TDD<br>CCR.3.6 TDD |
| | Config 2 | | CCR. 3.4 TDD<br>CCR.3.6 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| | Config 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| | Config 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz |
| | Config 2 | | 120 KHz |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| SSB index for BFD-RS | Config 1, 2 | | 0, 1 |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| | Config 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

### 5.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power on NR carrier in the On-duration part of every DRX cycle in the slots configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 5.5.1.7.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-9<br><br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.1.7.4.3-2: CSI-ReportConfig**

| Derivation Path: Table H.3.5-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots40 | 4 | | |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.1.7.4.3-3: *RadioLinkMonitoringConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF { | 4 entries | | |
| RadioLinkMonitoringRS[1] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 0 | | |
| purpose | beamFailure | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[2] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 1 | | |
| purpose | beamFailure | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| RadioLinkMonitoringRS[3] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 2 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[4] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 3 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.5.1.7.5 Test requirement

Tables 5.5.1.7.4.1-2 and 5.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode.

**Table 5.5.1.7.5-1: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| AoA setup | | | Setup 1 defined in A.9.1 | | |
| Assumption for UE beams[Note 10] | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 3.3[Note] | -4.7[Note] | -15.4 |
| SNR on RLM-RS2 | Config 1, 2 | | 3.3[Note] | -15.4 | -15.4 |
| $N_{oc}$ | Config 1 | dBm/15KHz | -104.7 | | |
| | Config 2 | | -104.7 | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.1.7.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6. |
| Note 10: | Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 11: | This value allows up to 1dB degradation from applied SNR to UE baseband |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least once every DRX cycle, in the On-duration part of the cycle in the slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

### 5.5.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS based RLM and long DRX cycle.

### 5.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.4. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.8.

#### 5.5.1.8.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

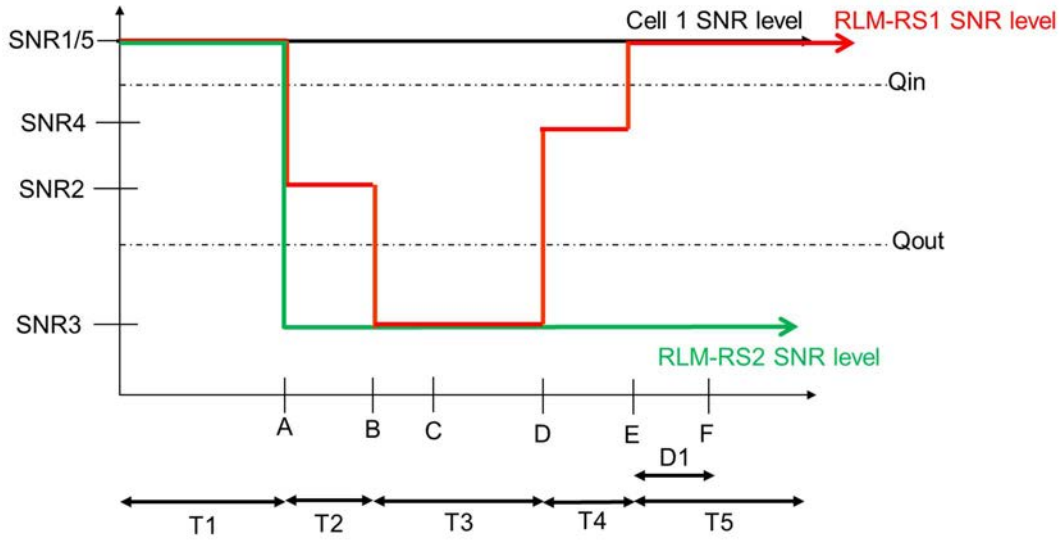


**Figure 5.5.1.8.4-1: SNR variation for In-sync testing**

##### 5.5.1.8.4.1 Initial conditions

Test 5.5.1.8 can be run in one of the configurations defined in Table 5.5.1.8.4.1-1.

**Table 5.5.1.8.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 5.5.1.8-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.8-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.8.4.1-2

**Table 5.5.1.8.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 5.5.1.8.4.1-2 below.

2. Message contents are defined in clause 5.5.1.8.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.1.8.4.1-3: General test parameters for FR2 PSCell for CSI-RS In-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| Duplex Mode | | | TDD |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| | Config 2 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| | Config 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| | Config 2 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| | Config 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz |
| | Config 2 | | 120 KHz |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| SSB index for BFD-RS | Config 1, 2 | | 0, 1 |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In-sync transmission | DCI format | | 1-0 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| parameters | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| | Config 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.64 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 2: E-UTRAN is in non-DRX mode under test. | | | |

**Table 5.5.1.8.4.1-4: Measurement gap configuration for FR2 CSI-RS In-sync radio link monitoring in DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM-RS is partially overlapped with measurement gap) | |

### 5.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters of Cell 2 according to T1 in Table 5.5.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.8.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.8.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.1.8.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.1.8.5-1. T5 starts.

9. If the SS detects uplink power on NR carrier in the On-duration part of every DRX cycle in the configured slots for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

11. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

12. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG and SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].

13. Repeat steps 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 5.5.1.8.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED;<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, (where ssbFrequency is set to the ARFCN value of carrier center of High range),and RLM<br><br>Table H.3.1-4 with a3-offset = 0dB;<br><br>Table H.3.7-1 with condition DRX.3 and Gap |

**Table 5.5.1.8.4.3-2: MeasConfig for E-UTRAN PCell**

| Derivation Path: TS 36.508, Table 4.6.6-1 with condition RF | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig-DEFAULT ::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| measGapConfig | MeasGapConfig-GP1 | TS 36.508, table 4.6.6-1A | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 5.5.1.8.4.3-3: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| } | | | |

**Table 5.5.1.8.4.3-4: CSI-ReportConfig**

| Derivation Path: Table H.3.5-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots40 | 4 | | |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.1.8.4.3-5: *RadioLinkMonitoringConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF { | 4 entries | | |
| RadioLinkMonitoringRS[1] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 0 | | |
| purpose | beamFailure | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[2] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 1 | | |
| purpose | beamFailure | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[3] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 2 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[4] SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| radioLinkMonitoringRS-Id | 3 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.5.1.8.5 Test requirement

Tables 5.5.1.8.4.1-2 and 5.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode.

**Table 5.5.1.8.5-1: Cell specific test parameters for FR2 for CSI-RS In-sync radio link monitoring in DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 3.3[Note] | -4.7[Note 11] | -15.4 | -4. 9 | 3.3[Note 11] |
| SNR on RLM-RS2 | Config 1, 2 | dB | 3.3[Note] | -15.4 | -15.4 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1, 2 | dBm/15KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 5.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 after the start of time duration T5) the UE shall transmit uplink signal at least once every DRX cycle, in the ON-duration part of the cycle in the slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

### 5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3

The test is incomplete for test frequencies > 40.8 GHz

#### 5.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

#### 5.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

#### 5.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 5.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.9.

#### 5.5.1.9.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in Table 5.5.1.9.4.1-1, table 5.5.1.9.4.1-3 and table 5.5.1.9.5-1 below and the parameters and applicability for the E-UTRAN cell are defined in A.6.1.2. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

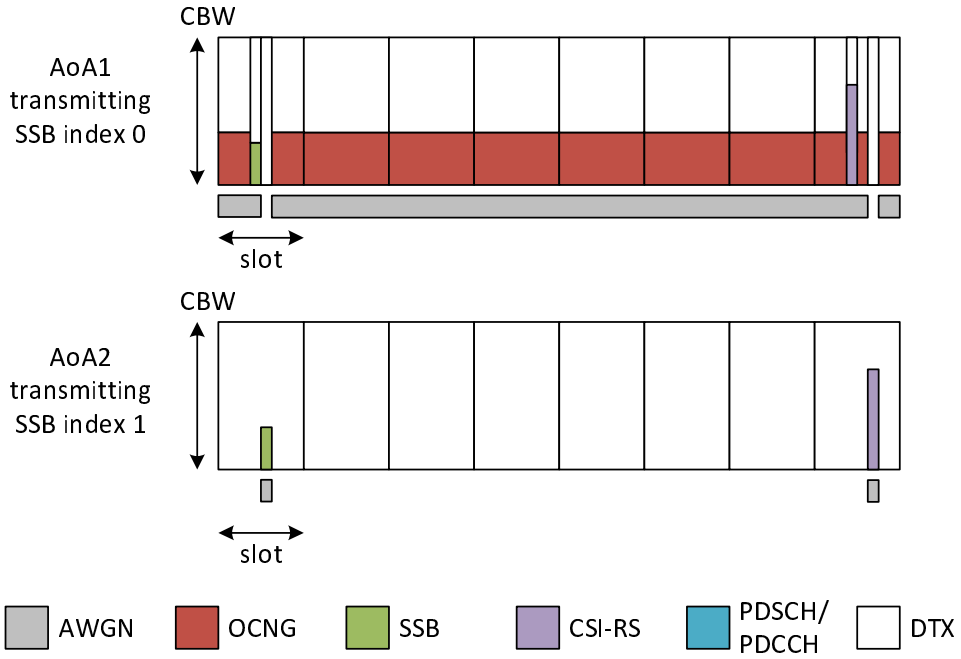


**Figure 5.5.1.9.4-1: Time multiplexed downlink transmissions**

### 5.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.1.9.4.1-1.

**Table 5.5.1.9.4.1-1: Supported test configurations for EN-DC FR2 radio link monitoring UE scheduling restrictions**

| Configuration | Description |
|---|---|
| 5.5.1.9-1 | FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.9-2 | TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.9.4.1-2

**Table 5.5.1.9.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PSCell are given in Table 5.5.1.9.4.1-3
2. Message contents are defined in clause 5.5.1.9.4.3.

3. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

**Table 5.5.1.9.4.1-3: General test parameters for EN-DC FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | 1, 2 | 1 and 2 | 1 for NR PSCell and 2 for LTE PCell |
| SSB configuration | | 1, 2 | SSB.1 FR2 | |
| SMTC configuration | | 1, 2 | SMTC.3 | |
| DRX cycle length | s | 1, 2 | OFF | |
| T1 | s | 1, 2 | 5 | During T1 the UE is required to correctly transmit ACK/NACK |

### 5.5.1.9.4.2 Test Procedure

1. Set the parameters according to T1 in Table 5.5.1.9.4.4-1. Propagation conditions are set according to clause C.2.2. T1 starts.

2. The SS continuously schedules DL reception on the symbol #2-3 right before each SSB which is not covered by SMTC.

3. If the SS observes no ACK/NACK DTX on each UL transmission occasion scheduled during step 2 via PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. otherwise the number of failed tests is increased by one.

4. The UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG and SCG*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

5. Repeat steps 1-3 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.5.1.9.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.1.9.4.3-1: Common Exception messages for EN-DC FR2 radio link monitoring UE scheduling restrictions**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1a<br>Table H.3.1-2<br>Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and set smtc1 as SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.3<br>Table H.3.1-8 with condition SSB RLM |

**Table 5.5.1.9.4.3-2: *SearchSpace***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 with condition USS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| monitoringSymbolsWithinSlot | 00100000000000 | Ensure that the UE monitors PDCCH on symbols right | |

| | | | |
|---|---|---|---|
| | | before SSB#0 (symbol #2 and #3) | |
| } | | | |

5.5.1.9.5 Test Requirement

Table 5.5.1.9.4.1-3 and 5.5.1.9.5-1 define the primary level settings including test tolerances for EN-DC FR2 radio link monitoring UE scheduling restrictions.

**Table 5.5.1.9.5-1: Cell specific test parameters for EN-DC FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| AoA setup | | 1, 2 | Setup 3 defined in A.9.3 | |
| | | | **AoA1** | **AoA2** |
| Assumption for UE beams Note 1 | | | Rough | Rough |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 24 | |
| PDSCH Reference measurement channel | | 1, 2 | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration | | 1, 2 | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.3.2 TDD | Not sent |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state | | 1, 2 | TCI.State.2 | Not sent |
| OCNG Pattern | | 1, 2 | OP.5 | Not sent |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB with index 0 | SSB with index 1 |
| $N_{oc}$ | dBm/15kHz | 1, 2 | -94.8 | -94.8 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -85.8 | -85.8 |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 4.1 | 4.1 |
| $\hat{E}_s / I_{ot}$ BB Note 4 | dB | 1, 2 | 2.37 | 2.37 |
| SSB_RP Note3 | dBm/SCS | 1, 2 | -81.7 | -81.7 |
| Io | dBm/95.04 MHz | 1, 2 | -55.65 | -55.65 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure 5.5.1.9.4-1 | |
| Propagation Condition | | 1, 2 | AWGN | AWGN |

| | |
|---|---|
| Note 1: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. |
| Note 3: | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4. |

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

The UE shall be continuously scheduled by PDCCH on the symbols right before each SSB which is not covered by SMTC during the entire length of T1. The UE shall transmit ACK/NACK for every scheduled PDCCH during the time duration T1.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 5.5.1.10 EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 5.5.1.10.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 5.5.1.0.6.1 for UE fulfilling good serving cell quality criterion.

### 5.5.1.10.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC FR2 and RLM relaxation criteria *rlm-Relaxation-r17*.

### 5.5.1.10.3 Minimum conformance requirement

The requirements for UE supporting relaxed measurement criterion are specified in clause 5.5.1.0.6. The minimum requirements for SSB-based RLM with this criterion are specified in clause 5.5.1.0.6.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.10.

### 5.5.1.10.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 5.5.1.10.4.1-1. The test parameters are given in Tables 5.5.1.10.4.1-3 and 5.5.1.10.5-1.

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.10.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

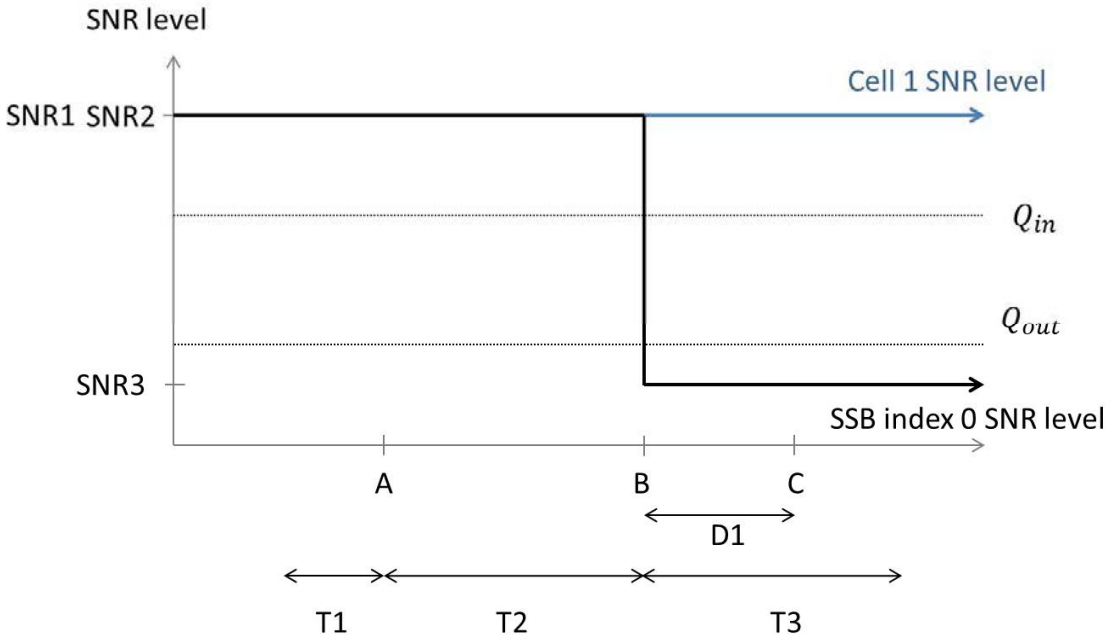


**Figure 5.5.1.10.4-1: SNR variation for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

### 5.5.1.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.1.10.4.1-1.

**Table 5.5.1.10.4.1-1: Supported test configurations for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Test Case ID | Description |
|---|---|
| 5.5.1.10-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.1.10-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.10.4.1-2.

**Table 5.5.1.10.4.1-2: Initial conditions for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.10.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.1.10.4.1-3.
2. Message contents are defined in clause 5.5.1.10.4.3.
3. There are two cells (one E-UTRAN carrier and one NR carrier) specified in the test. Cell 1 is the PCell on the E-UTRAN carrier and Cell 2 is the PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 shall be configured according to clause C.1.1 and C.1.2.

**Table 5.5.1.10.4.1-3: General test parameters for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active E-UTRA PCell | | | | Cell 1 |
| E-UTRA RF Channel Number | | | | 1 |
| Active PSCell | | | | Cell 2 |
| RF Channel Number | | | | 2 |
| Duplex mode | | Config 1, 2 | | TDD |
| $BW_{channel}$ | | Config 1, 2 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1, 2 | | 66 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 120 KHz |
| PRACH Configuration | | Config 1, 2 | | Table A.7.2 |
| SSB index assigned as RLM-RS | | Config 1, 2 | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |

| | | | |
|---|---|---|---|
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1, 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | Periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | TCI.State.2 |
| CSI-RS for tracking | Config 1, 2 | | TRS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 14.48 |
| T3 | | s | 28.88 |
| D1 | | s | 28.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. | | | |

### 5.5.1.10.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) configuring the UE with *goodServingCellEvaluationRLM* and measurements as specified in clause 5.5.1.10.4.3.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfiguration* message).

4. Set the parameters according to T1 in Table 5.5.1.10.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.10.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.10.5-1. T3 starts.

7. If the SS:

   a) detects uplink power in the On-Duration part of every DRX cycle in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

   b) does not detect any uplink power in any of such CSI transmission occasions from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one. Otherwise, the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.10.5-1.

9. If the UE has not re-established the connection in at least 1s, go to step 10. Otherwise go to step 11.

10. The SS shall ensure the PSCell is released. Then it shall transmit an *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If the reconfiguration fails go to step 11, otherwise go to step 12.

11. Switch off and on the UE and go to step 12.
12. Repeat steps 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.10.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with the following exceptions.

**Table 5.5.1.10.4.3-1: Common Exception messages for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-3<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with Condition DRX.3 |

**Table 5.5.1.10.4.3-2: *RLF-TimersAndConstant* for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 5.5.1.10.4.3-3: *CellGroupConfig* for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| goodServingCellEvaluationRLM-r17 SEQUENCE { | | | |
| offset-r17 | Not present | If this field is absent, the UE applies the (default) value of 0 dB | |
| } | | | |
| } | | | |
| } | | | |

#### 5.5.1.10.5 Test Requirement

Table 5.5.1.10.5-1 defines the cell specific primary level settings including test tolerances for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion.

**Table 5.5.1.10.5-1: Cell specific test parameters for EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| AoA setup | | | Setup 1 defined in A.9 | | |
| Assumption for UE beams[Note 5] | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 3.25[Note 6] | 3.25 [Note 6] | -15.50 |
| $N_{oc}$ | Config 1, 2 | dBm/15K Hz | -104.7dBm | | |
| goodServingCellEvaluationRLM | | | configured | | |
| offset in goodServingCellEvaluationRLM | | dB | Not configured | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is D.4.
Note 5: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

## 5.5.1.11 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx

Editor's Note: This test case is incomplete in following aspects:

- MU and TT are missing
- Message contents may need to be updated
- Test procedure needs to be updated
- Applicability needs to be updated
- Annex E and F need to be updated
- Configuration of 3AoA setup and testability of the device is still FFS
- UE positioning procedure is still FFS

#### 5.5.1.11.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements defined in clause 5.5.1.

#### 5.5.1.11.2 Test applicability

This test applies to all types of E-UTRA UE release 18 and forward, supporting EN-DC and [fast beam sweeping in multi-Rx].

#### 5.5.1.11.3 Minimum conformance requirement

The minimum requirements are specified in clause 5.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.11.

#### 5.5.1.11.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 5.5.1.11.4.1-1. The test parameters are given in Table 5.5.1.11.5-1.

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.2-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.11.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 5.5.1.11.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2 and configured with *groupBasedBeamReporting-r17*. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

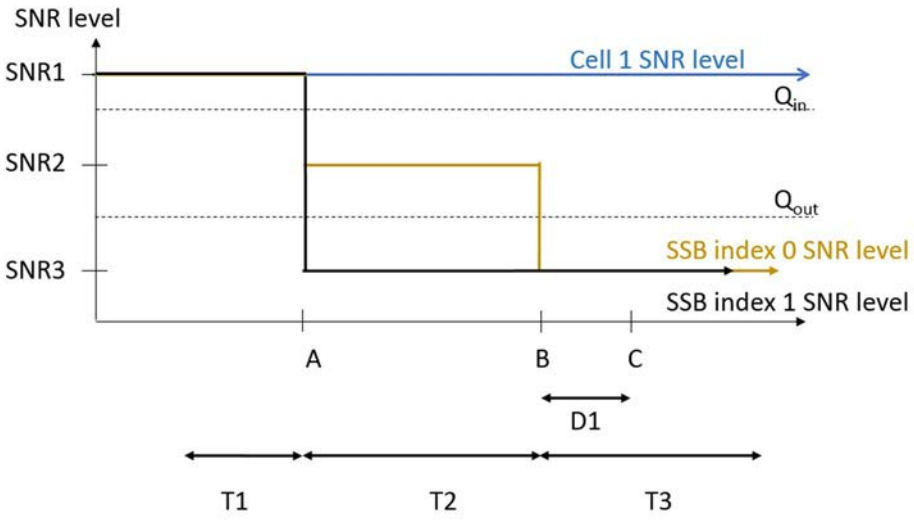


**Figure 5.5.1.11.4-1: SNR variation for out-of-sync testing**

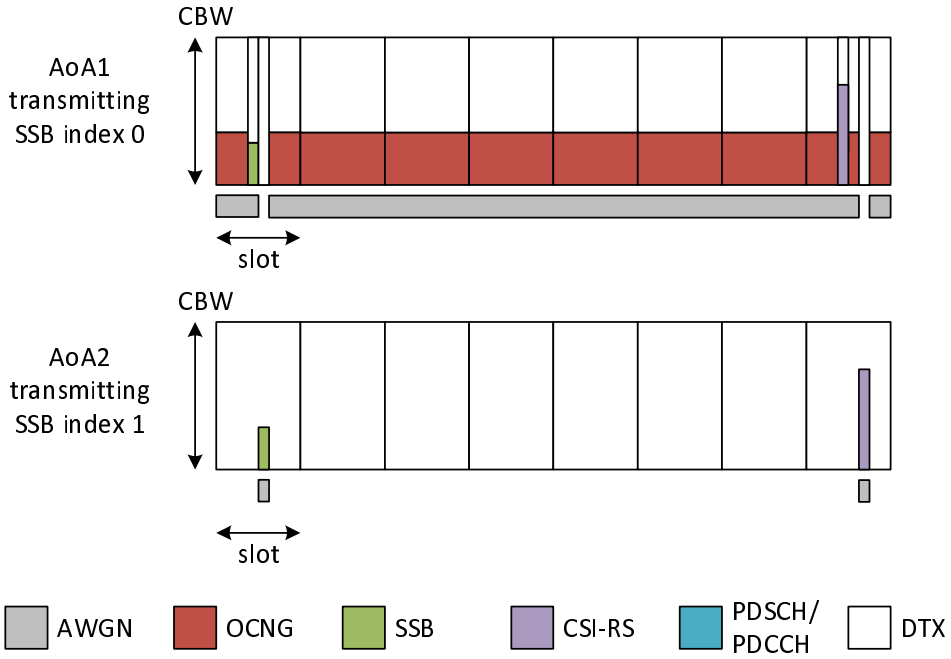


**Figure 5.5.1.11.4-2: Time multiplexed downlink transmissions**

### 5.5.1.11.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.11.4.1-1.

**Table 5.5.1.11.4.1-1: Supported Test Configurations for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Configuration | Description |
|---|---|
| 5.5.1.11-1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.1.11-2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.11.4.1-2

**Table 5.5.1.11.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.1.11.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.5.1.11.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.2-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The test parameters are given in Table 5.5.1.11.5-1 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.1.11.4.1-3: General test parameters for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active E-UTRA PCell | | | | Cell 1 |
| E-UTRA RF Channel Number | | | | 1 |
| Active PSCell | | | | Cell 2 |
| RF Channel Number | | | | 2 |
| Duplex mode | | Config 1, 2 | | TDD |
| $BW_{channel}$ | | Config 1, 2 | | 100: $N_{PRB,c}$ = 66 |
| Data PRBs allocated | | Config 1, 2 | | 24 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 120 KHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | | Config 1, 2 | | 0,1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *NA* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 | | TRS.2.1 TDD |

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| T1 | s | 0.2 |
| T2 | s | 1.2*N +0.08 Note 4 |
| T3 | s | 1.2*N +0.08 Note 4 |
| D1 | s | 1.2*N +0.04 Note 4 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. | | |
| NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. | | |
| NOTE 3: E-UTRAN is in non-DRX mode under test. | | |
| NOTE 4: N is the value indicated by UE for *fastBeamSweepingMultiRx-r18*. | | |

#### 5.5.1.11.4.2 Test Procedure

Before the start of T1, the UE shall be fully synchronized with Cell 1 and Cell 2. The UE shall be configured for periodic CQI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 5.5.1.11.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message containing an *RRCReconfiguration* message configuring the UE with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, *purpose* set to '*rlf*', and *groupBasedBeamReporting-r17*, as specified in clause 5.5.1.11.4.3.

3. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 5.5.1.11.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.11.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.11.5-1. T3 starts.

7. If the SS:
   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH format 2) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C (D1 seconds after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

8. Otherwise, the number of failed tests is increased by one and proceed with Step 10.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.11.5-1.

10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released, the UE shall switched off and then on.

11. Repeat steps 1-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.1.11.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.1.11.4.3-1: Common Exception messages for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-7<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.4-1<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.5.1.11.4.3-2: RLF-TimersAndConstants for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

5.5.1.11.4 Test Requirement

Table 5.5.1.11.5-1 defines the cell specific primary level settings for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx.

**Table 5.5.1.11.5-1: OTA related cell specific test parameters for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| **Parameter** | | **Unit** | **Test 1** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| AoA setup | | | Setup 5 defined in A.9 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams[Note 5] | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| ssb-Index 0 SNR | Config 1, 2 | dB | 2+TT Note 6 | -6+TT Note 6 | -15+TT | | | |
| ssb-Index 1 SNR | Config 1, 2 | dB | Not sent | | | 2+TT Note 6 | -15+TT | -15+TT |
| $N_{oc}$ | Config 1, 2 | dBm/ 15 kHz | -92.1+TT | | | -92.1+TT | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in figure 5.5.1.11.4-2 | | | | | |
| Propagation condition | | | TDL-A 30ns 75 Hz | | | TDL-A 30ns 75 Hz | | |

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is defined in clause D.4.1.1.
NOTE 5: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 6: This value allows up to 1 dB degradation from applied SNR to UE baseband

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

## 5.5.2 Interruption

### 5.5.2.0 Minimum conformance requirements

#### 5.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active during DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slots as defined in Table 5.5.2.0.1-1.

Each interruption shall not exceed X slots as defined in Table 5.5.2.0.1-1.

**Table 5.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX**

| $\mu$ | NR Slot length (ms) | Interruption length X | |
|---|---|---|---|
| | | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 1 | 2 |
| 2 | 0.25 | 3 | |
| 3 | 0.125 | 5 | |

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

#### 5.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS 38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 5.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in

Table 5.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

**Table 5.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 2 |
| 3 | 0.125 | 4 |

**Table 5.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ |
| 1 | 0.5 | 1 + $T_{SMTC_duration}$ |
| 2 | 0.25 | 2 + $T_{SMTC_duration}$ |
| 3 | 0.125 | 4 + $T_{SMTC_duration}$ |
| NOTE: $T_{SMTC_duration}$ is<br>- the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated;<br>- the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

### 5.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS 38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or
- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

**Table 5.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC**

| $\mu$ | NR Slot length (ms) | Interruption length X3 slot | Interruption length Y3 slot |
|---|---|---|---|
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |

| | | | |
|---|---|---|---|
| 2 | 0.25 | 2 | 2 |
| 3 | 0.125 | 4 | 4 |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

### 5.5.2.0.4 Minimum conformance requirements for interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS 38.331 [13];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG.
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [13], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 5.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 5.5.2.0.4-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 5.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 5.5.2.0.4-2.

**Table 5.5.2.0.4-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) |
|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) |

| | | | 15 | 30 |
|---|---|---|---|---|
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
| | | 300, 500 | 5 | 4 |
| | | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
| | | 300, 500 | 9 | 7 |
| | | 900 | 12 | 10 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

**Table 5.5.2.0.4-2: Interruption length X2 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) Note1 | Interruption length X2 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 60 | 120 |
| 0 | 1 | $\leq$ 200 | 2 | 2 |
| 1 | 0.5 | $\leq$ 200 | 2 | 2 |
| 2 | 0.25 | $\leq$ 200 | 3 | 3 |
| 3 | 0.125 | $\leq$ 200 | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 5.5.2.0.4-1 and in Table 5.5.2.0.4-2 based on SRS carrier switching time $\leq$ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 5.5.2.0.4-1 and in Table 5.5.2.0.4-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.12.

### 5.5.2.0.5 Minimum conformance requirements for interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex [15];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [26];
- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [26];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 5.5.2.0.5-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 5.5.2.0.5-1

**Table 5.5.2.0.5-1: Interruption length X3 (slot)**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.13.

## 5.5.2.1 EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.2.1.1 Test purpose

The purpose of this test is:

- To verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 5.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and long DRX cycle.

### 5.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.1.

### 5.5.2.1.4 Test description

#### 5.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.1.4.1-1.

**Table 5.5.2.1.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Configuration | Description |
|---|---|
| 5.5.2.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.2.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.1.4.1-2.

**Table 5.5.2.1.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.1.4.1-3.
2. Message contents are defined in clause 5.5.2.1.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.1.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to cell1 and cell 2 |
| DRX | | DRX.4 | DRX related parameters are defined in TS 38.133 [6] Table A.3.3.4-1 |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 6.25 | |

### 5.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 5.5.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

6. Set the parameters according to T1 in Table 5.5.2.1.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

8. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

9. If no two consecutive missing PUCCH transmissions are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

10. After the RRC connection release, the SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    or

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 3-10 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

### 5.5.2.1.5 Test requirement

Table 5.5.2.1.4.1-1, 5.5.2.1.5-1 and 5.5.2.1.5-2 define the NR cell specific primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

**Table 5.5.2.1.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |

| | | | |
|---|---|---|---|
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TDDConf.3.1 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1,2 | | 66 |
| Initial DL BWP Configuration | Config 1,2 | | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 | | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 | | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD |
| TCI state | Config 1,2 | | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET parameters | Config 1,2 | | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.3 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | µs | 3 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table 5.5.2.1.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC**

| Parameter | Unit | Cell2 |
|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 |
| Assumption for UE beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SSB_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.90 |

| | |
|---|---|
| NOTE 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 2: | SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| NOTE 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| NOTE 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| NOTE 5: | As observed with 0dBi gain antenna at the centre of the quiet zone |
| NOTE 6: | Information about types of UE beam is given in B.2.1.3 of TS 38.133[6], and does not limit UE implementation or test system implementation |

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause TS 38.133 clause 8.2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.2 EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.2.2.1 Test purpose

The purpose of this test is:

- To verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 5.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and long DRX cycle.

### 5.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.2.

### 5.5.2.2.4 Test description

#### 5.5.2.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.2.4.1-1.

**Table 5.5.2.2.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 5.5.2.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.2.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.2.4.1-2.

**Table 5.5.2.2.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.2.4.1-3.
2. Message contents are defined in clause 5.5.2.2.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.2.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to cell1 and cell 2 |
| DRX | | DRX.4 | DRX related parameters are defined in TS 38.133 [6] Table A.3.3.4-1 |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 6.25 | |

### 5.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an *RRCConnectionReconfiguration* message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 5.5.2.2.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.
6. Set the parameters according to T1 in Table 5.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.
7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
8. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
9. If no two consecutive missing PUCCH transmissions are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.
10. After the RRC connection release, the SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    or

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 3-10 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-2 with Condition DRX.4 |

### 5.5.2.2.5 Test requirement

Table 5.5.2.2.4.1-1, 5.5.2.2.5-1 and 5.5.2.2.5-2 define the NR cell specific primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

**Table 5.5.2.2.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TDDConf.3.1 |

| | | | |
|---|---|---|---|
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1,2 | | 66 |
| Initial DL BWP Configuration | Config 1,2 | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,2 | | DLBWP.1.1 |
| Initial UL BWP configuration | Config 1,2 | | ULBWP.0.1 |
| Dedicated UL BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD |
| TCI state | Config 1,2 | | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET parameters | Config 1,2 | | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.3 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | µs | 62.5 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table 5.5.2.2.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

| Parameter | Unit | Cell2 |
|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 |
| Assumption for UE beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SSB_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.90 |

| | |
|---|---|
| NOTE 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 2: | SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| NOTE 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| NOTE 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| NOTE 5: | As observed with 0dBi gain antenna at the centre of the quiet zone |
| NOTE 6: | Information about types of UE beam is given in B.2.1.3 of TS 38.133[6], and does not limit UE implementation or test system implementation |

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in TS 38.133 clause 8.2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.2.3.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 5.5.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC. and 2 DL CA

### 5.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.3.

### 5.5.2.3.4 Test description

#### 5.5.2.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.3.4.1-1.

**Table 5.5.2.3.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Configuration | Description |
|---|---|
| 5.5.2.3-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 5.5.2.3-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.3.4.1-2.

**Table 5.5.2.3.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.3.4.1-3.
2. Message contents are defined in clause 5.5.2.3.4.3.
3. There are three cells (one E-UTRAN carrier and two NR carriers) specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.3.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to cell1, cell 2 and cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 5.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1, Cell2 and Cell3. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell DL and NR PSCell DL.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 5.5.2.3.4.3.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels. Set the parameters according to values in Table 5.5.2.3.4.1-3 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.3.5-1 and Table 5.5.2.3.5-2. Propagation conditions are set according to clause C.2.2.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no longer than X consecutive DTXs are observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX", where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRC connection release. Afterwards, the SS shall:

   9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b

   or

   9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.2.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Specific message contents exceptions for Test Configuration 5.5.2.3-1 and 5.5.2.3-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1;<br>Table H.3.1-2 with Condition Deactivated SCell;<br>Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1;<br>Table H.3.1-4 with A3-offset = -6dB;<br>Table H.3.1-7 with Condition Deactivated SCell; |

### 5.5.2.3.5 Test requirement

Table 5.5.2.3.5-1 and Table 5.5.2.3.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations.

**Table 5.5.2.3.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Frequency Range | | | FR2 | FR2 |
| Duplex mode | Config 1,2 | | TDD | TDD |
| TDD configuration | Config 1,2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1,2 | | 66 | 66 |
| Downlink initial BWP Configuration | Config 1,2 | | DLBWP.0.1 | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 | | DLBWP.1.1 | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 | | ULBWP.0.1 | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | CCR 3.1 TDD | CCR 3.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 | SMTC.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| TCI state | Config 1,2 | | TCI.State.0 | TCI.State.0 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Propagation Condition | | | AWGN | AWGN |
| Time offset to cell1 Note 2 | | µs | 3 | 3+ Time offset to cell2 |
| Time offset to cell2 Note 3 | | µs | - | 3 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells
Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

**Table 5.5.2.3.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 defined in clause A.9 | |
| Assumption for UE beams Note 6 | | | Fine | Rough |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -111.7 | -104.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS Note3 | -102.7 | -95.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| SSB_RP Note2 | NR_TDD_FR2_A | dBm/SCS Note4 | -90.7 | -90.7 |

| | | | | |
|---|---|---|---|---|
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $\hat{E}_s/I_{ot}$ | NR_TDD_FR2_A | dB | 12 | 5 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $\hat{E}_s/N_{oc}$ | NR_TDD_FR2_A | dB | 12 | 5 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -61.45 | -60.52 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.3.5-3.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on NR PSCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. The interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.3.5-4.

**Table 5.5.2.3.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 4 |

**Table 5.5.2.3.5-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 8 + SMTC duration |

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.4 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.2.4.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 5.5.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA.

### 5.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.4.

### 5.5.2.4.4 Test description

#### 5.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.4.4.1-1.

**Table 5.5.2.4.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Configuration | Description |
|---|---|
| 5.5.2.4-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.2.4-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.4.4.1-2.

**Table 5.5.2.4.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.4.4.1-3.

2. Message contents are defined in clause 5.5.2.4.4.3.

3. There are three cells (one E-UTRAN carrier and two NR carriers) specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.4.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to cell1, cell 2 and cell3 |
| AoA number | | 1 | Applicable to cell2 and cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 5.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1, Cell2 and Cell3. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell DL and NR PSCell DL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 5.5.2.4.4.3.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels. Set the parameters according to values in Table 5.5.2.3.4.1-3 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.4.5-1 and Table 5.5.2.4.5-2. Propagation conditions are set according to clause C.2.2.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no longer than X consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”, where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRC connection release. Afterwards, the SS shall:

9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b

or

9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.2.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Specific message contents exceptions for Test Configuration 5.5.2.4-1 and 5.5.2.4-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1;<br>Table H.3.1-2 with Condition Deactivated SCell;<br>Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1;<br>Table H.3.1-4 with A3-offset = -6dB;<br>Table H.3.1-7 with Condition Deactivated SCell; |

### 5.5.2.4.5 Test requirement

Table 5.5.2.4.5-1 and Table 5.5.2.4.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations.

**Table 5.5.2.4.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | FR2 |
| Duplex mode | Config 1,2 | | TDD | TDD |
| TDD configuration | Config 1,2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1,2 | | 66 | 66 |
| Downlink initial BWP Configuration | Config 1,2 | | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | Config 1,2 | | DLBWP.1.1 | |
| Uplink initial BWP configuration | Config 1,2 | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SSB Configuration | | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 | SMTC.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD | TRS.2.1 TDD |

| TCI state | Config 1,2 | | TCI.State.0 | TCI.State.0 |
|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Propagation Condition | | | AWGN | AWGN |
| Time offset to cell1 Note 2 | | µs | 62.5 | 62.5+ Time offset to cell2 |
| Time offset to cell2 Note 3 | | µs | - | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells<br>Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells | | | | |

**Table 5.5.2.4.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 defined in clause A.9 | |
| Assumption for UE beams Note 6 | | | Fine | Rough |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -111.7 | -104.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS Note3 | -102.7 | -95.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| SSB_RP Note2 | NR_TDD_FR2_A | dBm/SCS Note4 | -90.7 | -90.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 12 | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 12 | 5 |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -61.45 | -60.52 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | | | |

| Note 6: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation |
|---|---|

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.4.5-3.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on NR PSCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. The interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.4.2-4.

**Table 5.5.2.4.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 4 |

**Table 5.5.2.4.2-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 8 + SMTC duration |

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.5 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Editor's note:

- Connection diagram is TBD.

- Test tolerance is missing.

- Test procedure may be further modified.

### 5.5.2.5.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

### 5.5.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

### 5.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.5.

5.5.2.5.4 Test description

5.5.2.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.5.4.1-1.

**Table 5.5.2.5.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Configuration | Description |
|---|---|
| 5.5.2.5-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.2.5-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.5.4.1-2.

**Table 5.5.2.5.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.5.4.1-3.
2. Message contents are defined in clause 5.5.2.5.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.5.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to cell1, cell 2 and cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

5.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN

PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCell to perform measurements on the deactivated SCC.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.5.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no longer than 8 consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.2.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 5.5.2.5.4.3-2: MeasObjectEUTRA for E-UTRAN deactivated SCell**

| Derivation Path: 36.508 Table 4.6.6-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectEUTRA ::= SEQUENCE { | | | |
| carrierFreq | Downlink EARFCN for E-UTRAN SCell | | |
| measCycleSCell-r10 | sf640 | | |
| } | | | |

5.5.2.5.5 Test requirement

Table 5.5.2.5.5-1 and Table 5.5.2.5.5-2 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

**Table 5.5.2.5.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TBD |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 |
| Initial BWP Configuration | Config 1,2 | | TBD |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET parameters | Config 1,2 | | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | TBD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | TBD+TT |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | µs | 3 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table 5.5.2.5.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| UE orientation around TBD axis and TBD axis | | | TBD |
| Relative difference in angle of arrival of cell 2 relative to cell 1 | | degrees | TBD |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz Note4 | TBD+TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_A | dBm/SCS Note3 | TBD+TT |

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| $N_{oc}$ Note1 | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note4 | TBD+TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| $\hat{E}_s / I_{ot}$ | | dB | TBD+TT |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | TBD+TT |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | |
| NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | | |
| NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | | |

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.5.5-3.

**Table 5.5.2.5.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 5 |

**Table 5.5.2.5.5-4: Void**

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.6 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Editor's note:

- Connection diagram is TBD.

- Test tolerance is missing.

- Test procedure may be further modified.

### 5.5.2.6.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits.

-To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

#### 5.5.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

#### 5.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.6.

#### 5.5.2.6.4 Test description

##### 5.5.2.6.4.1 Initial conditions

Test 5.5.2.6 can be run in one of the configurations defined in Table 5.5.2.6.4.1-1.

**Table 5.5.2.6.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Configuration | Description |
|---|---|
| 5.5.2.6-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.2.6-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.6.4.1-2.

**Table 5.5.2.6.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.TBD | |
| Exceptions to connection diagram | N/A | | |

2. The general test parameter settings are set up according to Table 5.5.2.6.4.1-3.

4. Message contents are defined in clause 5.5.2.6.4.3.

5. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

**Table 5.5.2.6.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell3 | Deactivated SCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to cell1, cell 2 and cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |

| | | | |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

#### 5.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCell to perform measurements on the deactivated SCC.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.6.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no longer than 8 consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.5.2.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 5.5.2.6.4.3-2: MeasObjectEUTRA for EUTRAN deactivated SCell**

| Derivation Path: 36.508 Table 4.6.6-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectEUTRA ::= SEQUENCE { | | | |
| carrierFreq | Downlink EARFCN for E-UTRAN SCell | | |
| measCycleSCell-r10 | sf640 | | |
| } | | | |

5.5.2.6.5 Test requirement

Table 5.5.2.6.5-1 and Table 5.5.2.6.5-2 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

**Table 5.5.2.6.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TBD |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 |
| Initial BWP Configuration | Config 1,2 | | TBD |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET parameters | Config 1,2 | | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 | | TBD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | TBD |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | µs | 62.5 |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

**Table 5.5.2.6.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC**

| Parameter | Unit | Cell 2 |
|---|---|---|
| UE orientation around TBD axis and TBD axis | | TBD |

| | | | |
|---|---|---|---|
| Relative difference in angle of arrival of cell 2 relative to cell 1 | | degrees | TBD |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz Note4 | TBD |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS Note3 | TBD |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note4 | TBD |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_C | | |
| | NR_TDD_FR2_D | | |
| | NR_TDD_FR2_E | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| $\hat{E}_s / I_{ot}$ | | dB | TBD |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | TBD |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the center of the quiet zone

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.6.5-3.

**Table 5.5.2.6.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 3 | 0.125 | 5 |

**Table 5.5.2.6.5-4: Void**

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.2.7 E-UTRAN - NR FR2 interruptions at E-UTRA SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability needs to be updated
- Test procedure needs to be corrected to reflect the interruption criteria
- E-UTRA - FR2 OTA testability is still FFS.

#### 5.5.2.7.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one PUSCH-less SCCs from a CC with PUSCH, when a UE needs to transmit aperiodic SRS.

#### 5.5.2.7.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in E-UTRA.

#### 5.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.7.

#### 5.5.2.7.4 Test description

##### 5.5.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.7.4.1-1.

**Table 5.5.2.7.4.1-1: Supported test configurations for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching**

| Configuration | Description |
|---|---|
| 5.5.2.7-1 | LTE FDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.2.7-2 | LTE TDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.7.4.1-2.

**Table 5.5.2.7.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.7.4.1-3.
2. Message contents are defined in clause 5.5.2.7.4.3.
3. There are two E-UTRA carriers and one NR carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E-UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is E-UTRA activated SCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

**Table 5.5.2.7.4.1-3: General test parameters for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell | | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

**Table 5.5.2.7.4.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Field | Value | Comment |
|---|---|---|
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | Sc8 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | N/A | Not applicable |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigIndexAp | 17 | SRS periodicity of 10ms. See Table 8.2-5 in TS 36.213 for aperiodic SRS transmission. |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. | | |

### 5.5.2.7.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR FR1 PSCell with PUCCH/PUSCH transmission, Cell3 is E-UTRAN activated SCell which operates in downlink without PUCCH/PUSCH. The test consists of two time periods, with duration of T1 and T2. Prior to the start of the test, the UE is configured with the SRS carrier based switching between PCell and SCell. UE shall also indicate SRS-SwitchingTimeNR in the capabilities.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.7.

2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A, with the message content exceptions defined in clause 4.5.2.9.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.9.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. The SS activates SCell (Cell3) and starts to schedule DL transmission continuously on PCell and PSCell.

6. Set the parameters according to T2 in Tables 4.5.2.9.5-1. T2 starts.

7. Immediately at the beginning of T2, SRS is requested via DCI format 2_3 and the UE shall initiate NR SRS switching.

8. If the interruption on NR PSCell during the switching from NR PSCell to E-UTRA SCell exceeds the value as defined in Table 4.5.2.9.5-2, increase the number of failed iterations by one and move to step 12, otherwise increase the number of passed iterations by one and continue with step 9.

9. The SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

12. Repeat step 2-11 until a test verdict has been achieved.5.5.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 5.5.2.7.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| carrierSwitching | *SRS-CarrierSwitching* | | |
| } | | | |
| } | | | |

**Table 5.5.2.7.4.3-2: *SRS-CarrierSwitching***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-181 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-CarrierSwitching ::= SEQUENCE { | | | |
| srs-SwitchFromServCellIndex | 0 | | |
| srs-SwitchFromCarrier | nUL | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| } | | | |

**Table 5.5.2.7.4.3-3: SoundingRS-UL-Config**

| Derivation Path: 36.508 Table 4.6.3-22 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw5 | | |
| srsSubframeConfig | Sc8 | | |
| ackNackSrsSimultaneousTransmission | FALSE | | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | | |
| srs-ConfigIndex | 47 | See Table 8.2-1 in TS 36.213 | FDD |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | | |

| | | | |
|---|---|---|---|
| SRS-AntennaPort | an1 | | |
| } | | | |
| } | | | |

5.5.2.7.5 Test requirement

Tables 5.5.2.7.5-1 and 5.5.2.7.5-2 define the primary level settings including test tolerances for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching in asynchronous EN-DC.

**Table 5.5.2.7.5-1: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| **Frequency Range** | | | **FR2** |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | [TDDConf.3.2] |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 |
| Downlink initial BWP Configuration | Config 1,2 | | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 | | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 | | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD |
| TCI state | Config 1,2 | | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | ms | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table 5.5.2.7.5-2: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter | Unit | Cell2 |
|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 |
| Assumption for UE beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |

| | | |
|---|---|---|
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s / N_{oc}$ | dB | 17 |
| SS-RSRP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s / I_{ot}$ | dB | 17 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | |
| Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | |
| Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | |
| Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

The UE shall be continuously scheduled in NR FR2 PSCell throughout the test. During T2 two interruption time periods are allowed on Cell2 and Cell1, each interruption due to SRS carrier based switching on Cell2 shall not exceed X defined in Table A.5.5.2.7.2-1.

**Table 5.5.2.7.5-3: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 5.5.2.8 E-UTRAN - NR FR2 interruptions at NR SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability needs to be updated
- Test procedure needs to be corrected to reflect the interruption criteria
- E-UTRA - FR2 OTA testability is still FFS.

### 5.5.2.8.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

### 5.5.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in NR.

### 5.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.8.

5.5.2.8.4 Test description

5.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.8.4.1-1.

**Table 5.5.2.8.4.1-1: Supported test configurations for EN-DC FR2 interruptions at NR SRS carrier based switching**

| Configuration | Description |
|---|---|
| 5.5.2.8-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.2.8-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.8.4.1-2.

**Table 5.5.2.8.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.2.8.4.1-3.
2. Message contents are defined in clause 5.5.2.8.4.3.
3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 is E-UTRAN PCell, Cell2 is NR FR2 PSCell and Cell 3 is NR activated SCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 5.5.2.8.4.1-3: General test parameters for EN-DC FR2 interruptions at NR SRS carrier based switching**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell | | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Configured SCell | | Cell3 | SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to cell1 and cell 2 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 5 | |
| T2 | s | 0.1 | |

5.5.2.8.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR FR1 PSCell with PUCCH/PUSCH transmission, Cell3 is activated SCell which operates in downlink without PUCCH/PUSCH. The test

consists of two time periods, with duration of T1 and T2. Prior to the start of the test, the UE is configured with the SRS carrier based switching between PSCell and SCell. UE shall also indicate SRS-SwitchingTimeNR in the capabilities.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.7.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.\
4. Set the parameters according to T1 in Table 5.5.2.8.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.
5. The SS activates SCell (Cell3) and starts to schedule DL transmission continuously on PCell and PSCell.
6. Set the parameters according to T2 in Tables 5.5.2.8.5-1. T2 starts.
7. Immediately at the beginning of T2, SRS is requested via DCI format 2_3 and the UE shall initiate NR SRS switching.
8. If the interruption on NR PSCell during the switching from NR PSCell to NR SCell exceeds the value as defined in Table 5.5.2.8.5-2 or the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell exceeds the value as defined in Table 4.5.2.9.5-3, increase the number of failed iterations by one and move to step 12, otherwise increase the number of passed iterations by one and continue with step 9.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5
11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5
12. Repeat step 2-11 until a test verdict has been achieved.

#### 5.5.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 5.5.2.8.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| carrierSwitching | *SRS-CarrierSwitching* | | |
| } | | | |
| } | | | |

**Table 5.5.2.8.4.3-2: *SRS-CarrierSwitching***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-181 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-CarrierSwitching ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| srs-SwitchFromServCellIndex | 1 | | |
| srs-SwitchFromCarrier | nUL | | |
| } | | | |

**Table 5.5.2.8.4.3-3: SRS-Config**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| srs-ResourceSetId | 0 | | |
| srs-ResourceIdList SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-ResourceId { | 1 entry | | |
| SRS-ResourceId[1] | 0 | entry 1 | |
| } | | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| usage | antennaSwitching | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-Resource { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| resourceMapping SEQUENCE { | | | |
| startPosition | 1 | | |
| nrofSymbols | n1 | | |
| repetitionFactor | n1 | | |
| } | | | |
| freqDomainPosition | 0 | | |
| freqDomainShift | 0 | | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.5.2.8.5 Test requirement

Tables 5.5.2.8.5-1 and 5.5.2.8.5-2 define the primary level settings including test tolerances for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching in asynchronous EN-DC.

**Table 5.5.2.8.5-1: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching**

| **Parameter** | | **Unit** | **Cell 2** | **Cell 3** |
|---|---|---|---|---|
| Frequency Range | | | FR2 | |
| Duplex mode | Config 1,2 | | TDD | |
| TDD configuration | Config 1,2 | | [TDDConf.3.2] | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | |

| | | | |
|---|---|---|---|
| Downlink initial BWP Configuration | Config 1,2 | | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 | | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 | | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD |
| SRS configuration | Config 1,2 | | SRS.6 TDD |
| TCI state | Config 1,2 | | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | µs | 33 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table 5.5.2.8.5-2: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching**

| Parameter | Unit | Test 1 | |
|---|---|---|---|
| | | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -103 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -99 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io Note2 | dBm/95.04 MHz Note4 | -68.5 | |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone |
| Note 6: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

In T2 UE shall transmit SRS on Cell3 as requested. During T2 interruption on Cell2 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS 38.133 clause 8.2.1.2.12.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 5.5.3 SCell activation and deactivation delay

### 5.5.3.0 Minimum conformance requirements

#### 5.5.3.0.1 Minimum conformance requirements for SCell activation delay for deactivated SCell

[TS 38.133, Clause 8.3.2]

The requirements in this clause shall apply for the UE configured with at least one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot $n + \frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where:

$T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

$T_{activation_time}$ is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, $T_{activation_time}$ is:

- $T_{FirstSSB}$+ 5ms, if the measurement period of the SCell being activated is equal to or smaller than 2400ms.
- $T_{FirstSSB_MAX}$ + $T_{rs}$ + 5ms, if the measurement period of the SCell being activated is larger than 2400ms.

If the SCell is unknown and belongs to FR1, and if one of the following conditions is met

- 'ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
- 'ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation,

provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, $T_{activation_time}$ is:

- $T_{FirstSSB_MAX,\ enhanced}$ + $T_{SMTC_MAX,\ enhanced}$ + $T_{rs,\ enhanced}$ + 5ms, if the following conditions are met,
  - the SCell is contiguous to an active serving cell in the same band, and
    - its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and
    - its SMTC offset is same as the one of contiguous FR1 active serving cell, and

- its RTD with contiguous FR1 active serving cell is smaller than or equal to 260ns with respect to the to-be-activated SCell's SSB numerology, and its reception power difference with contiguous FR1 active serving cell is smaller than or equal to 6dB;

- $T_{FirstSSB_MAX, enhanced} + T_{SMTC_MAX, enhanced} + 2*T_{rs, enhanced}$ + 5ms, otherwise.

- Otherwise

- $T_{FirstSSB_MAX} + T_{SMTC_MAX} + T_{rs}$ + 5ms, if the following conditions are met,

  - the SCell is contiguous to an active serving cell in the same band, and

  - its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and

  - its SMTC offset is same as the one of contiguous FR1 active serving cell, and

  - its RTD with contiguous FR1 active serving cell is smaller than or equal to 260ns, and its reception power difference with contiguous FR1 active serving cell is smaller than or equal to 6dB;

- $T_{FirstSSB_MAX} + T_{SMTC_MAX} + 2*T_{rs}$ + 5ms, otherwise.

otherwise, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, $T_{activation_time}$ is:

- If UE supports *shortMeasInterval-r18*, then

  - 6ms + $T_{FirstSSB_MAX, enhanced} + T_{SMTC_MAX, enhanced} + T_{rs, enhanced} + T_{L1\text{-}RSRP, enhanced_measure} + T_{L1\text{-}RSRP, report} + T_{HARQ}$ + max($T_{uncertainty_MAC} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), if semi-persistent CSI-RS is used for CSI reporting,

  - 3ms + $T_{FirstSSB_MAX, enhanced} + T_{SMTC_MAX, enhanced} + T_{rs, enhanced} + T_{L1\text{-}RSRP, enhanced_measure} + T_{L1\text{-}RSRP ,report}$ + max($T_{HARQ} + T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC} + T_{RRC_delay}$), if periodic CSI-RS is used for CSI reporting.

- Otherwise

  - 6ms + $T_{FirstSSB_MAX} + T_{SMTC_MAX} + T_{rs} + T_{L1\text{-}RSRP, measure} + T_{L1\text{-}RSRP,report} + T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), if semi-persistent CSI-RS is used for CSI reporting,

  - 3ms + $T_{FirstSSB_MAX} + T_{SMTC_MAX} + T_{rs} + T_{L1\text{-}RSRP, measure} + T_{L1\text{-}RSRP,report}$ + max($T_{HARQ} + T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC} + T_{RRC_delay}$), if periodic CSI-RS is used for CSI reporting.

- However, when the following conditions are fulfilled, no activation requirement will be applied for this unknown SCell:

  - the SCell is contiguous to an active serving cell in the same band, and

  - A single SSB is used in the unknown SCell; or multiple SSBs are used in the SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and

  - its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and

  - its SMTC offset is same as the one of contiguous FR1 active serving cell

  - its RTD with contiguous FR1 active serving cell is larger than 260ns, or its reception power difference with contiguous FR1 active serving cell is larger than 6dB;

If the SCell being activated belongs to FR1 and if there is at least one active serving cell contiguous to the SCell on that FR1 band, if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration for the target SCell, $T_{activation_time}$ is 3 ms for UE supporting *scellWithoutSSB*, provided

- The RTD between the target SCell and the contiguous active serving cell is within ±260ns, and

- The difference of the reception power with the contiguous active serving cell is <= 6dB, and

- The RS(s) of SCell being activated is (are) QCL-TypeA with TRS(s) of the SCell being activated, and the TRS(s) of the SCell being activated is (are) further QCL-TypeC with SSB(s) of any active serving cell that is contiguous to the SCell being activated on that FR1 band.

For a UE supporting [*scellWithoutSSB-interband*], if the SCell being activated belongs to FR1 and if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) in the target SCell (FrequencyInfoDL) nor SMTC configuration for the target SCell, and if there is one collocated active reference serving cell on different FR1 band, when the following conditions are fulfilled,

- The RTD between the target SCell and the collocated reference serving cell is within CP where CP is corresponding to the SCS of SSB-less SCell, and
- The [EPRE] difference at the UE is smaller than or equal to [9] dB, where [EPRE] difference is the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell [after the compensation for AGC], and
- The RS(s) of the SSB-less SCell being activated is (are) QCL-TypeA with TRS(s) of the SSB-less SCell being activated, and the TRS(s) of the SSB-less SCell being activated is (are) further QCL-TypeC with SSB(s) of an inter-band active serving cell, and the inter-band active serving cell shall be same as the reference serving cell.

where the reference serving cell can be indicated by higher layer parameter [*SSB-less-Referencecell*]. If UE is not indicated with [*SSB-less-Referencecell*], the reference serving cell is assumed to be the QCL-typeC source cell if there is only one active QCL-typeC source cell configured.

*Editor notes: FFS whether and how to capture if there are more than one QCL source cell.*

*Editor notes: FFS whether and how to capture the wording* "after the compensation for AGC".

$T_{activation_time}$ is

- $T_{first_TRS} + T_{TRS}$ +5 ms, [if aperiodic CSI-RS resources are not configured for SCell activation or UE do not support [*ATRS based SSB-less operation*]]
- $T_{first_ATRS} + T_{gap} + T_{ATRS}$ + 5 ms [if aperiodic CSI-RS resources are configured for SCell activation for UE supporting [*ATRS based SSB-less operation*]]

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then $T_{activation_time}$ is $T_{FirstSSB}$+ 5ms provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in clause 3.6.3 in TS 38.133 [6], and
- The parameter ssb-PositionsInBurst is same for the serving cell(s) and the SCell, and
- SSB is in the same half-frame on the SCell and the contiguous FR2 active serving cell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE supporting *scellWithoutSSB* is not provided with any SMTC for the target SCell, $T_{activation_time}$ is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the FR2 power class 6 UE supporting *scellWithoutSSB* and [*Enhanced FR2 HST RRM requirements for intra-band CA and inter-frequency measurements in connected mode*] is configured with *highSpeedMeasFlagFR2-r17*, $T_{activation_time}$ is 3 ms , provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is in FR1 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- 3ms + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- max($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC}$ + $T_{RRC_delay}$-$T_{HARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2-1 CA or if the PCell/PSCell and the target SCell are in a FR2-1 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), or

- 6ms + $T_{FirstSSB_MAX,enhanced}$ + 15*$T_{SMTC_MAX,\ enhanced}$ + X1*$T_{rs,\ enhanced}$ + $T_{L1\text{-}RSRP,\ enhanced_measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$) if UE supports [*LowerRxBeamSweepingFactorForCellSearch-FR2*] and/or [*LowerRxBeamSweepingFactorForL1-RSRPmeasurement-FR2*] and/or *shortMeasInterval-r18* capabilities, and when SCell activation triggered L3 report is not configured or SCell activation triggered L3 report is configured but not triggered.

If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 23*$T_{SMTC_MAX}$ + 12*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$).

If the PCell/PSCell and the target SCell are configured as FR1-FR2-1 CA or if the PCell/PSCell and the target SCell are in a FR2-1 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)}, or

- 3ms + $T_{FirstSSB_MAX,\ enhanced}$ + 15*$T_{SMTC_MAX,\ enhanced}$ + X1*$T_{rs,\ enhanced}$ + $T_{L1\text{-}RSRP,\ enhanced_measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)} if UE supports [*LowerRxBeamSweepingFactorForCellSearch-FR2*] and/or [*LowerRxBeamSweepingFactorForL1-RSRPmeasurement-FR2*] and/or *shortMeasInterval-r18* capabilities, and when SCell activation triggered L3 report is not configured or SCell activation triggered L3 report is configured but not triggered.

If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 23*$T_{SMTC_MAX}$ + 12*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)}.

where,

$T_{SMTC_MAX}$:

- In FR1, in case of intra-band contiguous SCell activation or in case of intra-band non-contiguous SCell activation for UE not capable of *intraBandNR-CA-non-collocated-r18* or UE is capable of *intraBandNR-CA-non-collocated-r18* and *nonCollocatedTypeNR-CA-r18* is provided, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of intra-band non-contiguous SCell activation for UE capable of *intraBandNR-CA-non-collocated-r18* and *nonCollocatedTypeNR-CA-r18* is not provided or in case of inter-band SCell

activation, $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated. $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated.

- In FR2, in case of intra-band SCell activation, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA; in case of FR2 inter-band SCell activation, $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated.

- $T_{SMTC_MAX}$ is bounded to a minimum value of 10ms.

$T_{SMTC_MAX, enhanced}$:

- In FR1 or FR2-1, a UE supporting *shortMeasInterval-r18* if the SMTC for SCell being activated is only configured in measObjectNR, $T_{SMTC_MAX, enhanced}$ is the SSB periodicity of SCell being activated. Otherwise, $T_{SMTC_MAX, enhanced} = T_{SMTC_MAX}$.

$T_{rs}$ is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, $T_{rs}$ is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves $T_{rs}$ is applied with $T_{rs}$ = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms.

$T_{rs, enhanced}$ is the SSB periodicity of the SCell being activated for a UE supporting *shortMeasInterval-r18* in FR1 or FR2-1, if the SMTC for SCell being activated is only configured in the *measObjectNR*. Otherwise, $T_{rs, enhanced} = T_{rs}$

$T_{FirstSSB}$: is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

$T_{FirstSSB_MAX}$: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band contiguous SCell activation or in case of intra-band non-contiguous SCell activation for UE not capable of *intraBandNR-CA-non-collocated-r18*, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of intra-band non-contiguous SCell activation for UE capable of *intraBandNR-CA-non-collocated-r18* or in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{FirstSSB_MAX, enhanced}$: For a UE supporting *shortMeasInterval-r18* in FR1 or FR2-1, if the SMTC for SCell being activated is only configured in the measObjectNR, $T_{FirstSSB_MAX, enhanced}$ is the time to the end of the first complete SSB burst indicated by the SSB periodicity of the SCell being activated, after slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$. Otherwise, $T_{FirstSSB_MAX, enhanced} = T_{FirstSSB_MAX}$

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

X1 is equal to the reported value in [*LowerRxBeamSweepingFactorForCellSearch-FR2*] in FR2. Otherwise, if [*LowerRxBeamSweepingFactorForCellSearch-FR2*] is absent, X1 is 8.

$T_{L1\text{-}RSRP, measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ ms or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ based on applicability as defined in clause 9.5 in TS 38.133 [6] assuming M=1 and $T_{Report}$=0.

$T_{L1\text{-}RSRP, enhanced_measure}$ is

- SSB based L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ ms based on applicability as defined in clause 9.5 in TS 38.133 [6] assuming M=1 and $T_{Report}$=0; N is equal to the value reported by the UE in

[*LowerRxBeamSweepingFactorForL1-RSRPmeasurement-FR2]*. Otherwise, if [*LowerRxBeamSweepingFactorForL1-RSRPmeasurement-FR2]* is absent, N= 8. Or,

- CSI-RS based L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ ms based on applicability as defined in clause 9.5 in TS 38.133 [6] assuming M=1 and $T_{Report}$=0.

- If UE supports *shortMeasInterval-r18* capability, L1-RSRP measurement for $T_{L1\text{-}RSRP,\ enhanced_measure}$ can be performed based on non-DRX mode even if DRX is configured.

  $T_{L1\text{-}RSRP,\ report}$ is delay of acquiring CSI reporting resources.

  $T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

  - SCell activation command for known case;

  - First valid L1-RSRP reporting for unknown case.

  $T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

  - SCell activation command for known case;

  - First valid L1-RSRP reporting for unknown case.

  $T_{uncertainty_SP}$ is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

  - SCell activation command for known case;

  - First valid L1-RSRP reporting for unknown case.

  $T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

  Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

  When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.

$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

$T_{FirstTRS}$: is the time to the end of the first complete periodic CSI-RS burst for SCell activation after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

$T_{TRS}$ is the periodicity of periodic CSI-RS burst for SCell activation.

$T_{FirstATRS}$: is the time to the end of the first complete CSI-RS burst for SCell activation after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots.

$T_{ATRS}$ is the CSI-RS burst for SCell activation where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots.

$T_{gap}$ is a gap length between two aperiodic CSI-RS bursts,

- at least 2 slots for 15kHz and 30kHz

- at least 3 slots for 60kHz

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5*measCycleSCell, 5*DRX cycles) for FR1 before the reception of the SCell activation command:

- the UE has sent a valid measurement report for the SCell being activated and
- the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3 in TS 38.133 [6].

- the SSB measured during the period equal to max(5*measCycleSCell, 5*DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3 in TS 38.133 [6].

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class 1/5 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index, and
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in clauses 9.2 and 9.3 in TS 38.133 [6], and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, $T_{SMTC_SCell}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. $T_{SMTC_MAX}$ follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on SpCell or any activated SCell, as specified in clause 8.2 in TS 38.133 [6], shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot slot $n+1+\frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being activated, and $T_X$ is:

- 0, if $T_{activation_time}$ is 3ms;
- $T_{FirstSSB}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB}$;
- $T_{FirstSSB_MAX}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB_MAX}$;
- $T_{uncertainty_MAC} + T_{FineTiming}$, for any scenario where $T_{activation_time}$ includes only $T_{FineTiming}$ and no $T_{FirstSSB_MAX;}$
- [$T_{first_TRS}$, for FR1 inter-band SSB-less SCell activation scenario where $T_{activation_time}$ includes $T_{first_TRS}$];
- [$T_{first_ATRS}$, for FR1 inter-band SSB-less SCell activation scenario where $T_{activation_time}$ includes $T_{first_ATRS}$].

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this clause and requirements on interruption due to SCell activation in clause 8.2 in TS 38.133 [6] apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

#### 5.5.3.0.2 Minimum conformance requirements for SCell deactivation delay for activated SCell

[TS 38.133, Clause 8.3.3]

The requirements in this clause shall apply for the UE configured with at least one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being deactivated.

Upon receiving SCell deactivation command in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{T_{HARQ}+3ms}{NR\,slot\,length}$. The starting point of an interruption window on SpCell or any activated SCell, as specified in clause 8.2 in TS 38.133 [6], shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\,slot\,length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\,slot\,length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{3ms}{NR\,slot\,length}$. The starting point of an interruption window on SpCell or any activated SCell, as specified in clause 8.2 in TS 38.133 [6], shall not occur before slot n+1 and not occur after slot $n+1+\frac{3ms}{NR\,slot\,length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

#### 5.5.3.0.3 Minimum conformance requirements for SCell activation delay for deactivated SCell with multiple downlink SCells

[TS 38.133, Clause 8.3.7]

The requirements in this clause shall apply for the UE configured with more than one downlink SCells.

In EN-DC, NE-DC, standalone NR carrier aggregation, or in one CG of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE only receives one single MAC command for multiple SCell activation within the activation period defined in this clause
- in each single CG, there are no other SCell activation, deactivation, addition or release before activation is completed for all the SCells activated by the single MAC CE in this clause, and
- in EN-DC and NE-DC, there are no E-UTRAN SCell activation, deactivation, addition or release before multiple SCell activation is completed in this clause, and
- any to-be-activated unknown SCell has active serving cell(s) or known to-be-activated SCell(s) on the same band

In two CGs of NR-DC, the requirements in this clause shall apply when the following conditions are met:

- UE receives one MAC command per CG for multiple SCell activation within the activation period defined in this clause, and
- UE supports per-FR measurement gap capability, and
- any to-be-activated unknown SCell has active serving cell(s) or known to-be-activated SCell(s) on the same band

The delay within which the UE shall be able to activate the deactivated SCell with other downlink to-be-activated SCell(s) depends upon the specified conditions.

Upon receiving SCell activation command in slot *n* for more than one SCell, for each of the to-be-activated SCell, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot $n + \frac{T_{HARQ}+T_{activation_time_multiple_scells}+T_{CSI_Reporting}}{NR\ slot\ length}$, where:

$T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

$T_{activation_time_multiple_scells}$ is the target SCell activation delay in millisecond in multiple SCell activation scenario.

If the SCell is known and belongs to FR1 and the measurement period of the SCell being activated is equal to or smaller than [2400ms], $T_{activation_time_multiple_scells}$ is:

- $T_{FirstSSB_MAX_multiple_scells} + T_{rs}$ + 5ms, if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 known SCell with the measurement period larger than [2400ms] but does not have any parallel to-be-activated SCell which is FR1 unknown SCell.
- $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs}$ + 5ms, if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 unknown SCell
- otherwise, $T_{FirstSSB_MAX_multiple_scells}$ + 5ms.

If the SCell is known and belongs to FR1 and the measurement period of the SCell being activated is larger than [2400ms], $T_{activation_time_multiple_scells}$ is:

- $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs}$ + 5ms, if on the same band UE also has at least one parallel to-be-activated SCell which is FR1 unknown SCell
- otherwise, $T_{FirstSSB_MAX_multiple_scells} + T_{rs}$ + 5ms

If the SCell is unknown and belongs to FR1, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, $T_{activation_time_multiple_scells}$ is:

- $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs}$ +5ms, if the SCell is not counted in $N_1$
  - The activation delay may be longer if SSB is not in the same half-frame on the SCell and the contiguous FR1 known cell or contiguous FR1 active serving cell

otherwise

- if the following conditions are met
  - 'ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
  - 'ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation,
- $T_{activation_time_multiple_scells}$ is:
  - $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs} * N_1 + T_{rs}$ +5ms,
- Otherwise:

  $T_{activation_time_multiple_scells}$ is:

  - 6ms + $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs} * N_1 + T_{L1\text{-}RSRP,measure} + T_{L1\text{-}RSRP,report} + T_{HARQ}$ + max($T_{uncertainty_MAC_multiple_scells} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP_multiple_scells}$), if semi-persistent CSI-RS is used for CSI reporting,
  - 3ms + $T_{FirstSSB_MAX_multiple_scells} + T_{SMTC_MAX_multiple_scells} + T_{rs} * N_1 + T_{L1\text{-}RSRP,measure} + T_{L1\text{-}RSRP,report}$ + max($T_{HARQ} + T_{uncertainty_MAC_multiple_scells}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC_multiple_scells} + T_{RRC_delay}$), if periodic CSI-RS is used for CSI reporting.

If the SCell being activated belongs to FR1 and if there is at least one active serving cell contiguous to the SCell on that FR1 band, if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration for the target SCell, $T_{activation_time_multiple_scells}$ is same as single SCell activation delay requirement as defined in clause 8.3.2 in TS 38.133 [6].

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then $T_{activation_time_multiple_scells}$ is same as single SCell activation delay requirement as defined in clause 8.3.2 in TS 38.133 [6].

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time_multiple_scells}$ is same as single SCell activation delay requirement as defined in clause 8.3.2 in TS 38.133 [6].

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time_multiple_scells}$ is same as single SCell activation delay requirement as defined in clause 8.3.2 in TS 38.133 [6].

If the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq -2dB$ is fulfilled, then $T_{activation_time_multiple_scells}$ is:

- 3 ms + max($T_{uncertainty_MAC_multiple_scells}$ +$T_{FineTiming}$ + 2ms, $T_{uncertainty_SP_multiple_scells}$), if on the same band UE also has at least one parallel to-be-activated SCell which is FR2 known SCell. $T_{uncertainty_MAC_multiple_scells}$ =0 and $T_{uncertainty_SP_multiple_scells}$ =0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation commands at the same time.

If the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq -2dB$ is fulfilled, then $T_{activation_time_multiple_scells}$ is:

- max($T_{uncertainty_MAC_multiple_scells}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC_multiple_scells}$ + $T_{RRC_delay}$-$T_{HARQ}$), if on the same band UE also has at least one parallel to-be-activated SCell which is FR2 known SCell $T_{uncertainty_MAC_multiple_scells}$ =0 if UE receives the SCell activation command and TCI state activation commands at the same time.

The requirements for FR2 unknown SCells apply provided that the parameter *ssb-PositionsInBurst* is same for the SCell and the known serving cell on the same FR2 band. The activation delay FR2 unknown SCell may be longer if SSB is not in the same half-frame on the SCell and the contiguous FR2 known cell.

Where,

$N_1$ is the number counting for parallel FR1 unknown to-be-activated SCell(s) only except the ones which fulfilled the following conditions:

- contiguous to an active serving cell in the same band, or to a known SCell in the same band being activated by the same MAC PDU, and
- A single SSB is used in the unknown SCell; or multiple SSBs are used in the unknown SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and
- its *ssb-PositionInBurst* is same as the one of contiguous FR1 known cell or contiguous FR1 active serving cell, and
- its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to 260ns and its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to 6dB, and
- its SMTC offset is same as the one of contiguous FR1 known cell or contiguous FR1 active serving cell

However, when the following conditions are fulfilled, no activation requirement will be applied for this unknown SCell and other SCells being activated and counted in $N_1$:

- contiguous to an active serving cell in the same band, or to a known SCell in the same band being activated by the same MAC PDU, and
- A single SSB is used in the unknown SCell; or multiple SSBs are used in the unknown SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and
- its *ssb-PositionInBurst* is same as the one of FR1 known cell or FR1 active serving cell, and

- its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than 260ns or its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than 6dB, and
- its SMTC offset is same as the one of FR1 known cell or FR1 active serving cell

$T_{SMTC_MAX_multiple_scells}$:

- In FR1, in case of intra-band SCell activation, $T_{SMTC_MAX_multiple_scells}$ is the longest SMTC periodicity between active serving cells and SCells being activated on the same band provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, $T_{SMTC_MAX_multiple_scells}$ is the longest SMTC periodicity of SCells being activated on the same band.
- In FR2, $T_{SMTC_MAX_multiple_scells}$ is the longest SMTC periodicity between active serving cells and SCell(s) being activated in FR2 intra-band CA.
- $T_{SMTC_MAX_multiple_scells}$ is bounded to a minimum value of 10ms.

$T_{FirstSSB_MAX_multiple_scells}$: is the time to the end of the first complete SSB burst indicated by the SMTC after slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCells being activated are transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{uncertainty_MAC_multiple_scells}$ is the time period between reception of the activation command for PDCCH TCI, PDSCH TCI (when applicable) and SCell activation command of this unknown SCell.

$T_{uncertainty_SP_multiple_scells}$ is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting and SCell activation command of this unknown SCell.

$T_{uncertainty_RRC_multiple_scells}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) and SCell activation command of this unknown SCell.

$T_{rs}$, $T_{FineTiming}$, and $T_{RRC_delay}$ is defined in clause 8.3.2 in TS 38.133 [6].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

The condition of known SCell in FR1 or FR2 is defined in clause 8.3.2 in TS 38.133 [6].

If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the activation command, $T_{SMTC_SCell}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. $T_{SMTC_MAX_multiple_scell}$ follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

The starting point and the end-point of an interruption window on PCell or any activated SCell in MCG for NR standalone mode, or on PSCell or any activated SCell in SCG for EN-DC mode is same as single SCell activation requirement in clause 8.3.2 in TS 38.133 [6].

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Upon receiving SCell activation command in slot *n*, if the start of the first complete SSB used in the $T_X$ in the different bands which have SCells being activated after $n+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ are not aligned on time domain among

- SCells in different bands being activated by the same MAC CE if UE does not support per FR gap, or
- SCells in different FR1 bands being activated by the same MAC CE if UE supports per FR gap,

additional interruptions may be expected for the activated serving cells, where

- The number of additional interruptions is no more than the number of FR1 bands which have both SCell being activated for which the activation requirements involve $T_{FirstSSB_MAX\ multiple_scells}$ with $T_{rs}$ and the active serving cell, and
- In each interruption occasion, the interruption length is defined in clause 8.2.2.2.2 in TS 38.133 [6], and
- Longer activation delay may be expected for multiple SCell activation under one MAC CE with multiple interruptions, and
- $T_X$ is:
  - $T_{FirstSSB}$, for any scenario where $T_{activation_time\ multiple_scells}$ includes $T_{FirstSSB}$;
  - $T_{FirstSSB_MAX\ multiple_scells}$, for any scenario where $T_{activation_time\ multiple_scells}$ includes $T_{FirstSSB_MAX\ multiple_scells}$;
  - $T_{uncertainty_MAC}+T_{FineTiming}$ or $T_{uncertainty_MAC\ multiple_scells}+T_{FineTiming}$, for any scenario where $T_{activation_time\ multiple_scells}$ includes $T_{FineTiming}$.

Otherwise, no additional interruption is expected due to activation of multiple SCells.

Starting from slot $n + T_{HARQ} + 3$ ms where slot $n$ is the slot where SCell activation command is received (as specified in clause 4.3 of TS 38.213 [8]) and until the SCell activation completion at UE, after at least one CSI-RS transmission occasion for the channel measurement and reporting (specified in clause 5.2.2.5 of TS 38.214 [9]), the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

#### 5.5.3.0.4 Minimum conformance requirements for SCell deactivation delay for activated SCell with multiple downlink SCells

[TS 38.133, Clause 8.3.8]

The requirements in this clause shall apply for the UE configured with multiple downlink SCells in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC, provided that,

- in each single CG, there are no other SCell activation, deactivation, addition or release before deactivation is completed for all the SCells deactivated by the single MAC CE in this clause, and
- in EN-DC and NE-DC, there are no E-UTRAN SCell activation, deactivation, addition or release before multiple SCell deactivation is completed in this clause, and
- in EN-DC, NE-DC, NR-DC and standalone NR, UE only receives one single MAC command for multiple SCell deactivation within the deactivation period defined in this clause, or, in NR-DC, per-FR measurement gap capable UE receives one MAC command per CG for multiple SCell deactivation within the deactivation period defined in this clause

Upon receiving SCell deactivation command in slot $n$, the UE shall accomplish the deactivation actions for the SCell being deactivated within the same delay as specified in clause 8.3.3 in TS 38.133 [6].

The starting point and the end-point of an interruption window on PCell or any activated SCell in MCG for NR standalone mode, or on PSCell or any activated SCell in SCG for EN-DC mode is same as single SCell activation requirement in clause 8.3.3 in TS 38.133 [6].

### 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX

*Editor's* Note: This test case has been completed for the following configurations: (?)

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*

- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

#### 5.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR2 intra-band is known by the UE at the time of activation.

#### 5.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA.

#### 5.5.3.1.3 Minimum conformance requirements

Same minimum conformance requirements as described in clause 4.5.3.1.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.1.

#### 5.5.3.1.4 Test description

##### 5.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.3.1.4.1-1.

**Table 5.5.3.1.4.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

| Test Case ID | Description |
|---|---|
| 5.5.3.1-1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.3.1-2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.1.4.1-2 and Table 5.5.3.1.4.1-3.

**Table 5.5.3.1.4.1-2: Initial conditions for known FR2 SCell activation case with FR2 PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.3.1.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2 of TS 38.133 [6] |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |

| | | | |
|---|---|---|---|
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell3 timing offset to cell2 | µs | 0 | |
| Time alignment error between cell3 and cell2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |
| k | ms | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 5.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where

$m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] section 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$. The starting point of any PSCell interruption due to the deactivation shall occur in the slot $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{HARQ}+3ms}{EUTRA\ subframe\ length}$, where $n_1$ and $n_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters according to T1 in Tables 5.5.3.1.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $m + 1 + \frac{T_{HARQ}+3ms+T_(CSI_Reporting)}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+3ms+T_(CSI_Reporting)+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $m + 1 + \frac{T_{HARQ}+3ms+T_(CSI_Reporting)}{NR\ slot\ length}$ was subject to interruption,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $m + \frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot $m + \frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{\text{NR slot length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with following exception:

**Table 5.5.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.5.3.1.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 5.5.3.1.4.3-5 | |
| measConfig | MeasConfig | Table 5.5.3.1.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.1.4.3-2A: MeasConfig (Table 5.5.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 5.5.3.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 5.5.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.1.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 5.5.3.1.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.1.4.3-5: CellGroupConfig-SCell (Table 5.5.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |

| | | | |
|---|---|---|---|
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| SpCellConfigDedicated | ServingCellConfig-SpCell | Table 5.5.3.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 5.5.3.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 5.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 5.5.3.1.4.3-7: ServingCellConfig-SCell (Table 5.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 5.5.3.1.5 Test requirement

Table 5.5.3.1.5-1 will replace the values of corresponding parameters in Table 4.5.3.1.5-1 and Table 5.5.3.1.5-2 defines OTA related test parameters.

**Table 5.5.3.1.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| **Parameter**[Note 5] | **Unit** | **Cell 2** | | | **Cell 3** | | |
|---|---|---|---|---|---|---|---|
| | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| SSB ARFCN | | freq1 | | | freq2 | | |
| Duplex mode | | TDD | | | TDD | | |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| DL initial BWP configuration | | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| OCNG Patterns | | OP.1 | | | | | |
| SMTC configuration | | SMTC.1 | | | | | |
| SSB configuration | | SSB.1 FR2 | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |

| | | | |
|---|---|---|---|
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | |
| reportConfigType | | periodic | N/A |
| reportQuantity | | cri-RI-PMI-CQI | N/A |
| CSI reporting periodicity | slot | 40 | N/A |
| CSI reporting offset | slot | 4 | N/A |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | |
| TRS configuration | | TRS.2.1 TDD | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS note 1 | | | |
| Propagation conditions | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: All parameters apply for configuration 1 and 2.

**Table 5.5.3.1.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter Note 6 | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | | | | | |
| Assumption for UE beams Note 7 | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -104.7 | | | -104.7 | | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -95.7 | | | -95.7 | | |
| $\hat{E}_s / N_{oc}$ | dB | 7 | | | 7 | | |
| SS-RSRP Note2 | dBm/SCS Note4 | -88.7 | | | -88.7 | | |
| $\hat{E}_s / I_{ot}$ | dB | 7 | | | 7 | | |
| Io Note2 | dBm/95.04 MHz Note4 | -58.92 | | | -58.92 | | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: Void
NOTE 6: All parameters apply for configuration 1 and 2
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The test requirements defined in clause 4.5.3.1.5 shall apply to this test case, with the following exceptions:

- Placement of interruptions is only verified in NR PSCell.

## 5.5.3.2 to 5.5.3.5

## 5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2

Editor's Note: This test case is incomplete in following aspects:

- Test procedure and message contents need further work.

### 5.5.3.6.1 Test purpose

This test is to verify that the multiple SCell activation and deactivation delay and interruption are within the requirements, when the two SCells to be activated are in FR2 and one SCell is known and the other SCell is unknown by the UE at the time of activation.

### 5.5.3.6.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and supporting 3DL CA.

### 5.5.3.6.3 Minimum conformance requirements

Same minimum conformance requirements as described in clause 5.5.3.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.6.

### 5.5.3.6.4 Test description

#### 5.5.3.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.3.6.4.1-1.

**Table 5.5.3.6.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.5.3.6-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.3.6-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.6.4.1-2 and Table 5.5.3.6.4.1-3.

**Table 5.5.3.6.4.1-2: Initial conditions for a known FR2 SCell and an unknown FR2 SCell activation case with FR1 PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.3.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.3.6.4.1-3: General test parameters for FR2 SCell activation case with FR1 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| RF Channel Number | | 1,2,3,4 | One E-UTRAN radio channel (1) and three NR radio channels (2,3,4) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2 in TS 38.133 [6] |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2 in FR1. |
| Configured deactivated SCells | | Cell 3, Cell 4 | Configured deactivated secondary cell on NR RF channel number 3 and RF channel number 4, both in FR2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| SCell measurement cycle (measCycleSCell) | ms | 160 | For both Cell 3 and Cell 4 |
| T1 | s | 7 | During this time the PSCell shall be known and the SCells configured, SCell1 detected but SCell2 not detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [8] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 5.5.3.6.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR cell in FR1. Cell 3 and Cell 4 are NR FR2 cells in the same frequency. Cell 2 is the PSCell, and Cell 3 and Cell 4 are the deactivated SCells.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.5.3.6.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers, one E-UTRA cell, and three NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on the E-UTRA carrier and Cell 2 (PSCell) on the NR carrier in FR1, but is not aware of Cell 3 (SCell1) or Cell 4 (SCell2) on the NR carriers both in FR2. Cell 1, Cell 2 and Cell 3 have constant signal levels throughout the test. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the Cell 3 (SCell1) and Cell 4 (SCell2) are configured on NR. The test equipment sends a single MAC message for activation of both SCells within 3s for UE power class 2/3/4 or 4s for UE power class 1 after RRM reports is sent for SCell1.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. In the same MAC PDU, the test equipment activates the TCI state of RMC CORESET. In slot #m, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell1 and SCell2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for SCell is discontinued.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters according to T1 in Tables 5.5.3.6.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCells (Cell 3 and Cell 4) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. In the same MAC PDU, the test equipment activates the TCI state of RMC CORESET. In slot #m, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell1 and SCell2. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot m + 1 + $\frac{\mathrm{T_{HARQ}+3ms+T_(CSI_Reporting)}}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+3ms+T_(CSI_Reporting)+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{\mathrm{T_{HARQ}+3ms+T_(CSI_Reporting)}}{NR\ slot\ length}$ was subject to interruption,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}+3ms}}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

- Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

#### 5.5.3.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with following exception:

**Table 5.5.3.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.5.3.6.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 5.5.3.6.4.3-5 | |
| measConfig | MeasConfig | Table 5.5.3.6.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.6.4.3-2A: MeasConfig (Table 5.5.3.6.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |

| | | | |
|---|---|---|---|
| measObjectNR | MeasObjectNR for SCell | entry 2 Table 5.5.3.6.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 5.5.3.6.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.6.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 5.5.3.6.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.6.4.3-5: CellGroupConfig-SCell (Table 5.5.3.6.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| SpCellConfigDedicated | ServingCellConfig-SpCell | Table 5.5.3.6.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 5.5.3.6.4.3-7 | |

| | | | |
|---|---|---|---|
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.6.4.3-6: ServingCellConfig-SpCell (Table 5.5.3.6.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 5.5.3.6.4.3-7: ServingCellConfig-SCell (Table 5.5.3.6.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 5.5.3.6.5 Test requirement

Table 5.5.3.6.5-1 defines the cell specific test parameters and Table 5.5.3.6.5-2 defines OTA related test parameters.

**Table 5.5.3.6.5-1: Cell specific test parameters for FR2 SCell activation case with FR1 PSCell**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| **SSB ARFCN** | | | **freq1** | | | **freq2** | | | **freq3** | | |
| Duplex mode | Config 1,2 | | TDD | | | | | | | | |
| TDD configuration | Config 1,2 | | TDDConf.3.1 | | | | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | | | | | | | | |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 | | | | | | | | |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 | | | | | | | | |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 | | | | | | | | |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | | | | | | | | |
| Timing offset to Cell 2 | | ms | Not Applicable | | | 0 | | | 0 | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD | | | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | | | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | | | CCR.3.1 TDD | | | CCR.3.1 TDD | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TRS configuration | Config 1,2 | | TRS.2.1 TDD | TRS.2.1 TDD | | TRS.2.1 TDD | |
| CSI-RS configuration | Config 1,2 | | CSI-RS.3.1 TDD | N/A | CSI-RS.3.1 TDD | N/A | CSI-RS.3.1 TDD |
| CSI reporting periodicity | Config 1,2 | ms | 5 | 5 | | 5 | |
| OCNG Patterns | | | OP.1 | | | | |
| SMTC configuration | | | SMTC.1 | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR2 | SSB.1 FR2 | | N/A | SSB.1 FR2 |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| Propagation condition | | - | AWGN | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |

**Table 5.5.3.6.5-2: OTA related test parameters for FR2 SCell activation case with FR1 PSCell**

| Parameter[Note 6] | Unit | Cell 3 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to A.3.15.1 in TS 38.133 [6] | | | | | |
| Assumption for UE beams[Note 7] | | Rough | | | Rough | | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -112 | | | -112 | | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -102.97 | | | -102.97 | | |
| $\hat{E}_s / N_{oc}$ | dB | 14 | | | N/A | 14 | 14 |
| SS-RSRP[Note2] | dBm/SCS [Note4] | -88.97 | | | N/A | -88.97 | -88.97 |
| $\hat{E}_s / I_{ot}$ | dB | 14 | | | N/A | 14 | 14 |
| Io[Note2] | dBm/95.04 MHz [Note4] | -59.81 | | | -73.98 | -59.81 | -59.81 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1 and 2
Note 7: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PSCell in the slot.

During T2 the UE shall start sending CSI reports for SCell1 and SCell2 with non-zero CQI index in the configured slots for CSI reporting no later than slot $m + \frac{T_{HARQ} + T_{activtion_time} + T_{CSI_Reporting}}{NR\ slot\ length}$, where

- $T_{HARQ}$ is defined in Table 5.5.3.6.4.1-3
- $T_{activation_time}$ = 5ms + $T_{FineTiming}$ = 25ms
- $T_{CSI_Reporting}$ = 10ms
- NR slot length is 0.125ms

During T3 the UE shall stop sending CSI reports for both SCells no later than slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 5.5.3.7 EN-DC FR2 direct SCell activation at SCell addition of known SCell

*Editor's* Note: This test case has been completed for the following configurations:

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

### 5.5.3.7.1 Test Purpose

The purpose of this test is to verify that the direct SCell activation time is within the requirements, when the SCell in FR2 is known by the UE at the time of activation.

### 5.5.3.7.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and supporting 2DL CA and direct SCell activation.

### 5.5.3.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.7.

### 5.5.3.7.4 Test description

#### 5.5.3.7.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 5.5.3.7.4.1-1.

**Table 5.5.3.7.4.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

| Test Case ID | Description |
|---|---|
| 5.5.3.7-1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.3.7-2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to pass in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.7.4.1-2 and Table 5.5.3.7.4.1-3.

**Table 5.5.3.7.4.1-2: Initial conditions for known FR2 SCell activation case with FR2 PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.3.7.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | Two radio channels are used for this test. One for E-UTRA cell and two for NR Cell |
| Active PCell | | Cell1 | PCell on RF channel number 1. As specified in clause TS 38.133[6] A.3.7.2.2 |
| Active PSCell | | Cell2 | PSCell on RF channel number 2. |
| SCell | | Cell3 | secondary cell on RF channel number 3 |
| DRX | | OFF | Continuous monitoring of PCell/PSCell |
| PRACH configuration on cell2 | | FR2 configuration 2 | Captured in TS 38.133[6] A.3.8.3.2 |
| PSCell CQI/PMI periodicity and offset configuration index | | slot5 | CQI reporting for PSCell every uplink slot |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on carrier frequency of cell1. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on carrier frequency of cell3. |
| T1 | s | 7 | During this time the PCell/PSCell shall be known and cell3 is detected, and UE shall report a valid CQI for PCell/PSCell. |
| T2 | s | $N_{direct}$ | During this time the UE shall be configured with directly activated SCell1. |
| T3 | s | 1 | During this time the UE shall report a valid CQI for PCell/PSCell and SCell. |

1. Message contents are defined in clause 5.5.3.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the SCell.

### 5.5.3.7.4.2 Test procedure

Same as in 4.5.3.5.4.2 with the following exception:

2. Set the parameters according to T1 in Tables 5.5.3.7.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

#### 5.5.3.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the exception as described in clause 4.5.3.5.4.3.

### 5.5.3.7.5 Test requirement

Table 5.5.3.7.5-1 defines the cell specific test parameters will replace corresponding values in Table 4.5.3.5.5-1 and Table 4.5.3.5.5-1A, and Table 5.5.3.7.5-2 defines OTA related test parameters.

**Table 5.5.3.7.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| ParameterNote 5 | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| SSB ARFCN | | freq1 | | | freq2 | | |
| Duplex mode | | TDD | | | TDD | | |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| DL initial BWP configuration | | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| OCNG Patterns | | OP.1 | | | | | |
| SMTC configuration | | SMTC.1 | | | | | |
| SSB configuration | | SSB.1 FR2 | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | | | | | |
| reportConfigType | | periodic | | | N/A | | |
| reportQuantity | | cri-RI-PMI-CQI | | | N/A | | |
| CSI reporting periodicity | slot | 40 | | | N/A | | |
| CSI reporting offset | slot | 4 | | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| Propagation conditions | | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: All parameters apply for configuration 1 and 2.

**Table 5.5.3.7.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| ParameterNote 6 | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | | | | | |
| Assumption for UE beams Note 7 | | Rough | | | Rough | | |

| | | | |
|---|---|---|---|
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -104.7 ~~+TT~~ | -104.7~~+TT~~ |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -95.7~~+TT~~ | -95.7~~+TT~~ |
| $\hat{E}_s / N_{oc}$ | dB | 7~~+TT~~ | 7+TT |
| SS-RSRP Note2 | dBm/SCS Note4 | -88.7~~+TT~~ | -88.7~~+TT~~ |
| $\hat{E}_s / I_{ot}$ | dB | 7~~+TT~~ | 7~~+TT~~ |
| Io Note2 | dBm/95.04 MHz Note4 | -58.92~~+TT~~ | -58.92~~+TT~~ |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1 and 2
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall accomplish the activation of the SCell no later than subframe m+$N_{direct}$ as defined in TS 38.133[6], clause 8.3.4. Time period T3 starts at (m+ $N_{direct}$), at which point UE shall be reporting a valid CQI for both PSCell and SCell.

During T3 the UE shall send CSI reports for SCell with non-zero CQI index and continue to send CSI reports for SCell 1 with non-zero CQI index until the end of T3. All of the above test requirements shall be fulfilled in order for the observed SCell1 direct activation delay to be counted as correct. The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

NOTE: In this test case the placement of interruptions is only verified in NR PSCell.

### 5.5.3.8 EN-DC FR2 fast SCell Activation of SCell in FR2 intra-band

Editor's note: This test case is incomplete only in following aspects:

-

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.5.3.8.1 Test purpose

The purpose of this test is to verify that the fast SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the SCell in FR2 is known by the UE at the time of activation.

#### 5.5.3.8.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting 2DL CA in NR and fast SCell activation.

#### 5.5.3.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

5.5.3.8.4 Test description

5.5.3.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell, NR PSCell and NR SCell are shown in Table 5.5.3.8.4.1-1.

**Table 5.5.3.8.4.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.8.4.1-2 and Table 5.5.3.8.4.1-3.

**Table 5.5.3.8.4.1-2: Initial conditions for fast known FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from 5.5.3.8.5-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | Connection Diagram |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.3.8.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1.<br>As specified in clause A.3.7.2.2 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| Cell3 timing offset to cell2 | µs | 0 | |
| Time alignment error between cell3 and cell2 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 | |

| | | | |
|---|---|---|---|
| $T_{HARQ}$ | ms | $k_1$NR slot length | $k_1$ is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1.Message contents are defined in clause 5.5.3.8.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the known activated SCell.

### 5.5.3.8.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m (where m mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3.16. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters according to T1 in Tables 5.5.3.8.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.8.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{\mathrm{T_{HARQ}+3ms}+T_{CSI_Reporting}}{NR\ slot\ length}$,

   - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

   - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, where $T_{activation_time} = T_{FirstATRS}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.16,

   - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

   - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+\mathrm{TRRC_process}+T_1+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

10. Repeat steps 2-9 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 5.5.3.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with following exception:

**Table 5.5.3.8.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell |

**Table 5.5.3.8.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 5.5.3.8.4.3-5 | |
| measConfig | MeasConfig | Table 5.5.3.8.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.8.4.3-2A: MeasConfig (Table 5.5.3.8.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 5.5.3.8.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 5.5.3.8.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.8.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 5.5.3.8.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.8.4.3-5: CellGroupConfig-SCell (Table 5.5.3.8.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| SpCellConfigDedicated | ServingCellConfig-SpCell | Table 5.5.3.8.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 5.5.3.8.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.3.8.4.3-6: ServingCellConfig-SpCell (Table 5.5.3.8.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 5.5.3.8.4.3-7: ServingCellConfig-SCell (Table 5.5.3.8.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |

| | | | |
|---|---|---|---|
| servingCellMO | 2 | | |
| } | | | |

5.5.3.8.5 Test requirement

Table 5.5.3.8.5-1 defines the primary level settings including test tolerances for all tests and Table 5.5.3.8.5-2 defines OTA related test parameters.

**Table 5.5.3.8.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter[Note 5] | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| SSB ARFCN | | freq1 | | freq2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | | CR.3.1 TDD | |
| RMC CORESET Reference Channel | | CCR.3.1 TDD | | CCR.3.1 TDD | |
| DL initial BWP configuration | | DLBWP.0.1 | | | |
| DL dedicated BWP configuration | | DLBWP.1.1 | | | |
| UL initial BWP configuration | | ULBWP.0.1 | | | |
| UL dedicated BWP configuration | | ULBWP.1.1 | | | |
| OCNG Patterns | | OP.1 | | | |
| SMTC configuration | | SMTC.1 | | | |
| SSB configuration | | SSB.1 FR2 | | | |
| Aperiodic CSI-RS for SCell activation | | - | | TRS.2.3 | |
| gapBetweenBursts | slots | N/A | | | |
| TCI state | | TCI.State.0 | | | |
| TRS configuration | | TRS.2.1 TDD | | | |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | | | |
| reportConfigType | | periodic | | N/A | |
| reportQuantity | | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | slot | 40 | | N/A | |
| CSI reporting offset | slot | 4 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | | |
| Propagation conditions | | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: All parameters apply for configuration 1 and 2.

**Table 5.5.3.8.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter[Note 6] | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | | | |
| Assumption for UE beams[Note 7] | | Rough | | Rough | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -104.7 | | -104.7 | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -95.7 | | -95.7 | |
| $\hat{E}_s / N_{oc}$ | dB | 7 | | 7 | |
| SS_RP[Note2] | dBm/SCS [Note4] | -88.7 | | N/A | |
| CSI-RS_RP[Note2] | dBm/SCS [Note4] | N/A | | -88.7 | |
| $\hat{E}_s / I_{ot}$ | dB | 7 | | 7 | |
| Io[Note2] | dBm/95.04 MHz [Note4] | -58.92 | | -58.92 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: Es/Iot, SS_RP, CSI_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Void

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: Void

Note 6: All parameters apply for configuration 1 and 2

Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + 5ms$, as defined in TS 38.133 [6] clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] Clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI. In this test case the placement of interruptions is only verified in NR PSCell.

## 5.5.4 UE UL carrier RRC reconfiguration delay

## 5.5.5 Link recovery procedures

### 5.5.5.0 Minimum conformance requirements

#### 5.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

[TS 38.133, clause 8.5.2.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in TS 38.133 [6] clause 8.5.2.2. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band.

**Table 5.5.5.0.1-1: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 5.5.5.0.1-2 for FR2 with scaling factor N=8.

For FR2,

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$, when BFD-RS is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- $P = P_{sharing\ factor}$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- $P=1/(1-T_{SSB}/MGRP-T_{SSB}/T_{SMTCperiod})$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- P= $P_{sharing\ factor}$ /(1-$T_{SSB}$/MGRP), when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB}$ = 0.5*$T_{SMTCperiod}$

- P=1/(1-$T_{SSB}$/ $T_{SMTCperiod}$), when the BFD-RS resource is partially overlapped with measurement gap ($T_{SSB}$ <MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- P= $P_{sharing\ factor}$ /(1-$T_{SSB}$/MGRP), when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{SSB}$ = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the BFD-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, given the SMTC offset of all CCs in FR2 provided the same offset.

Longer evaluation period would be expected if the combination of BFD resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 5.5.5.0.1-2: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR2**

| Configuration | $T_{Evaluate_BFD_SSB}$ (ms) |
|---|---|
| no DRX | Max([50], Ceil(5*P*N)*$T_{SSB}$) |
| DRX cycle ≤ 320ms | Max([50], Ceil(7.5*P*N)*Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320ms | Ceil(5*P*N)*$T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.5. 2.3]

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR2, when the SSB for BFD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

[TS 38.133, clause 8.5.4]

When the radio link quality on all the RS resources in set $\bar{q}_0$ is worse than $Q_{out_LR}$, Layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set $\overline{q}_0$ shall be performed as specified in clause 6 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{SSB-RS,M}$) ) or max(2ms, $T_{CSI-RS,M}$), where $T_{SSB-RS,M}$ and $T_{CSI-RS,M}$ is the shortest periodicity of all RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, for SSB based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{SSB-RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

[TS 38.133, clause 8.5.5.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_1$ configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 [6] clause 8.5.5.2. The requirements in this clause could not be applicable if UE is required to perform candidate beam detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

[TS 38.133, clause 8.5.5.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate_CBD_SSB}$ ms period becomes better than the threshold $Q_{in_LR}$ provided SSB_RP and SSB Ês/Iot are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in Table 5.5.5.0.1-3 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB}$ is defined in Table 5.5.5.0.1-3 for FR2 with scaling factor N=8.

Where,

For FR2,

- P=1/(1-$T_{SSB}$/$T_{SMTCperiod}$), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ($T_{SSB}$ = $T_{SMTCperiod}$).
- P=1/(1-$T_{SSB}$/MGRP-$T_{SSB}$/$T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod}$ ≠ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB}$ < 0.5*$T_{SMTCperiod}$
- P= $P_{sharing\ factor}$ /(1-$T_{SSB}$/MGRP), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB}$ = 0.5*$T_{SMTCperiod}$
- P=1/(1-$T_{SSB}$/ $T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB}$ < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P= $P_{sharing\ factor}$ /(1-$T_{SSB}$/MGRP), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{SSB}$ = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the candidate beam detection RS outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured - $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $P_{CBD}$ used in Table 5.5.5.0.1-3 are defined as

For each SSB resource in the set $\overline{q}_1$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD}$ = 1.

For each SSB resource in the set $\overline{q}_1$ configured for PSCell in NR-DC

- $P_{CBD}$ = 2 if UE is configured for candidate beam detection on SCell, 1 otherwise.

For each SSB resource in the set $\overline{q}_1$ configured for a SCell

- $P_{CBD}$ = Z in EN-DC or NE-DC or SA.

- $P_{CBD}$ = 2* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell Table 5.5.5.0.1-3: Evaluation period $T_{Evaluate_CBD_SSB}$ for FR2

| Configuration | $T_{Evaluate_CBD_SSB}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $Max(25, Ceil(3 \times P \times N \times P_{CBD}) \times T_{SSB})$ |
| DRX cycle > 320ms | $Ceil(3 \times P \times N \times P_{CBD}) \times T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB in the set $\overline{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.5.5.3]

For FR2, when the SSB for CBD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.2.1, 8.5.2.2, 8.5.2.3, 8.5.4, 8.5.5.1, 8.5.5.2 and 8.5.5.3.

#### 5.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

[TS 38.133, clause 8.5.3.1]

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_0$ of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set $\overline{q}_0$ for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.5.3.2. UE is not expected to perform beam failure detection measurements on the CSI-RS configured as BFD-RS if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

**Table 5.5.5.0.2-1: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 5.5.5.0.2-2 for FR2 with N=1. The requirements of $T_{Evaluate_BFD_CSI-RS}$ apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when the BFD-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 - T_{CSI-RS}/MGRP)$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 - T_{CSI-RS} /T_{SMTCperiod})$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P \text{ is } 1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- P is $1/(1- T_{CSI-RS} /MGRP)* P_{sharing\ factor}$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- P is $1/\{1- T_{CSI-RS} / T_{SMTCperiod} \}$, when the BFD-RS resource is partially overlapped with measurement gap ($T_{CSI-RS} <$ MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- P is $1/(1- T_{CSI-RS} /MGRP)* P_{sharing\ factor}$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} <$ MGRP)

- $P_{sharing\ factor}$ = 1, if the BFD-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,

- $P_{sharing\ factor}$ is 3, otherwise.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

NOTE: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{BFD}$ used in Table 5.5.5.0.2-2 are defined as

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in set $\bar{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 5.5.5.0.2-2 are defined as

For each CSI-RS resource in the set $\bar{q}_0$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{BFD}$ = 1.

For each CSI-RS resource in the set $\bar{q}_0$ configured for PSCell in NR-DC

$P_{BFD}$ = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\bar{q}_0$ configured for a SCell

- $P_{BFD}$ = Z in EN-DC or NE-DC or SA.
- $P_{BFD}$ = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 5.5.5.0.2-2: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR2**

| Configuration | $T_{Evaluate_BFD_CSI-RS}$ (ms) |
|---|---|
| no DRX | $Max(50, Ceil(M_{BFD} \times P \times N \times P_{BFD}) \times T_{CSI-RS})$ |
| DRX cycle ≤ 320ms | $Max(50, Ceil(1.5 \times M_{BFD} \times P \times N \times P_{BFD}) \times Max(T_{DRX}, T_{CSI-RS}))$ |
| DRX cycle > 320ms | $Ceil(M_{BFD} \times P \times N \times P_{BFD}) \times T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\overline{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.5.3.3]

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for BFD measurement and the other CSI-RS. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.
  - The CSI-RS for BFD measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in set $\overline{q}_1$ and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

[TS 38.133, clause 8.5.4]

When the radio link quality on all the RS resources in set $\overline{q}_0$ is worse than $Q_{out_LR}$, Layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set $\overline{q}_0$ shall be performed as specified in clause 6 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{SSB-RS,M}$) ) or max(2ms, $T_{CSI-RS,M}$), where $T_{SSB-RS,M}$ and $T_{CSI-RS,M}$ is the shortest periodicity of all RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{CSI-RS,M}$), if DRX_cycle_length ≤ 320ms,

- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

[TS 38.133, clause 8.5.6.1]

The requirements in this clause apply for each CSI-RS resource in the set $\bar{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.5.6.2. The requirements in this clause could not be applicable if UE is required to perform candidate beam detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

[TS 38.133, clause 8.5.6.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI-RS}$ [ms] period becomes better than the threshold $Q_{in_LR}$ within $T_{Evaluate_CBD_CSI-RS}$ [ms] period provided CSI-RS Ês/Iot is according to TS 38.133 Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 5.5.5.0.2-3 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI-RS}$ is defined in Table 5.5.5.0.2-3 for FR2 with scaling factor N=8.

For FR2,

- P=1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 – T_{CSI-RS}/MGRP)$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 – T_{CSI-RS} /T_{SMTCperiod})$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- $P = P_{sharing\ factor}$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- P is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- P is $1/(1- T_{CSI-RS} /MGRP)* P_{sharing\ factor}$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- P is $1/\{1- T_{CSI-RS} / T_{SMTCperiod} \}$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is $1/(1- T_{CSI-RS} /MGRP)* 3$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)- $P_{sharing\ factor} = 1$, if the candidate beam detection RS outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor} = 3$, otherwise.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in TS 38.133 clause 8.5.6.3.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{CBD}$ used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

- $M_{CBD} = 3$, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{CBD}$ used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

For each CSI-RS resource in the set $\bar{q}_1$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD} = 1$.

For each CSI-RS resource in the set $\bar{q}_1$ configured for PSCell in NR-DC

- $P_{CBD} = 2$ if UE configured for candidate beam detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\bar{q}_1$ configured for a SCell

- $P_{CBD}$ = Z in EN-DC or NE-DC or SA.

- $P_{CBD} = 2^*$ Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

**Table 5.5.5.0.2-3: Evaluation period $T_{Evaluate_CBD_CSI\text{-}RS}$ for FR2**

| Configuration | $T_{Evaluate_CBD_CSI\text{-}RS}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $\text{Max}(25, \text{Ceil}(M_{CBD} \times P \times N \times P_{CBD}) \times T_{CSI\text{-}RS})$ |
| DRX cycle > 320ms | $\text{Ceil}(M_{CBD} \times P \times N \times P_{CBD}) \times T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

[TS 38.133, clause 8.5.6.3]

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and the other CSI-RS. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.3.1, 8.5.3.2, 8.5.3.3, 8.5.4, 8.5.6.1, 8.5.6.2 and 8.5.6.3.

#### 5.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

[TS 38.133, clause 8.5.7.3]

The following scheduling restriction applies due to beam failure detection.

- For the case where no RSs are provided for BFD, or when CSI-RS is configured for BFD is explicitly configured and is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to beam failure detection performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on BFD-RS resource symbols to be measured for beam failure detection.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for BFD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for BFD measurement.

[TS 38.133, clause 8.5.8.3]

The following scheduling restriction applies due to candidate beam detection

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, CSI-RS for tracking or CSI-RS for CQI on reference symbols to be measured for candidate beam detection.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for CBD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for CBD measurement.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.7.4, 8.5.8.3.

#### 5.5.5.0.4 Requirements for Beam Failure Recovery in SCell

[TS 38.133, clause 8.5.9.1]

For the UE provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [8], if beam recovery procedure is triggered for any of SCells, the UE shall transmit SR for UL resource, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index $q_{new}$ for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS 38.321 [12], if any, for a corresponding SCell.

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [8], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index $q_{new}$ for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS 38.321 [12], if any, for a corresponding SCell.

[TS 38.133, clause 8.5.9.2]

Provided that UE is configured by *schedulingRequestIDForBFR* a configuration for LRR in a PUCCH transmission, after BFR is triggered on any of SCells as described in clause 5.17 of TS 38.321 [12], UE shall be capable of transmit PUCCH with a LRR within a period of T, where

- $T = T_1 \times Ceil((T_2+D)/T_1)$ in which $T_1$, $T_2$ and D are defined as
  - $T_1$ is equal to the periodicity of PUCCH configured with *schedulingRequestIDForBFR*.
  - $T_2 = T_{Evaluate_CBD}$ is the evaluation period specified in TS 38.133 clause 8.5.5 or 8.5.6 for SSB or CSI-RS based candidate beam detection, that is $T_{Evaluate_CBD_SSB}$ or $T_{Evaluate_CBD_CSI\text{-}RS}$, depending on the applicable reference signal configured for candidate beam detection.
  - D = 2ms is the UE Processing time.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.9.1, 8.5.9.2.

#### 5.5.5.0.5 Requirements for SSB based beam failure detection for UE fulfilling relaxed measurement criteria

[TS 38.133, clause 8.5.2.4]

This clause contains minimum requirements for SSB based relaxed beam failure detection.

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB_Relax}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB_Relax}$ ms period.

The value of $T_{Evaluate_BFD_SSB_Relax}$ is defined in Table 5.5.5.0.5-1 for FR2 with scaling factor N=8

The value of P is defined in 5.5.5.0.1.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 5.5.5.0.5-1: Evaluation period $T_{Evaluate_BFD_SSB_Relax}$ for FR2**

| Configuration | $T_{Evaluate_BFD_SSB_Relax}$ (ms) |
|---|---|
| $Mas(T_{DRX}, T_{SSB}) \le 80$ ms | $Max(50 \times K4, Ceil(7.5 \times K2 \times P \times N) \times Max(T_{DRX},T_{SSB}))$ |
| $80ms < Max(T_{DRX}, T_{SSB}) \le 160$ ms | $Max(50, Ceil(7.5 \times P \times N) \times Max(T_{DRX},T_{SSB}))$ |
| Note 1: $T_{SSB}$ is the periodicity of SSB in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>Note 2: K2 is the relaxation factor. K2 = 2.<br>Note 3: K4 is the relaxation factor for the lower bound. K4 = K2, if 1 < K2 ≤ 2; K4 = 1 otherwise. | |

## 5.5.5.0.6 TRP specific Minimum conformance requirements

### 5.5.5.0.6.1 Requirements for TRP specific CSI-RS based beam failure detection

[TS 38.133, clause 8.18.3]

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 5.5.5.0.6.1 for FR2 with N=1. The requirements of $T_{Evaluate_BFD_CSI-RS}$ apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{BFD}$ used in Table 5.5.5.0.6.1 is defined as

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 5.5.5.0.6.1 is defined as

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{BFD}$ = 1.

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for PSCell in NR-DC

$P_{BFD}$ = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for a SCell

- $P_{BFD}$ = Z in EN-DC or NE-DC or SA.

- $P_{BFD}$ = 2* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell.

**Table 5.5.5.0.6.1: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR2**

| Configuration | $T_{Evaluate_BFD_CSI-RS}$ (ms) |
|---|---|
| no DRX | Max(50, Ceil($M_{BFD} \times P \times N \times P_{BFD}$*$P_{TRP}$) × $T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | Max(50, Ceil(1.5 × $M_{BFD} \times P \times N \times P_{BFD}$*$P_{TRP}$) × Max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX cycle > 320ms | Ceil($M_{BFD} \times P \times N \times P_{BFD}$*$P_{TRP}$) × $T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$. $T_{DRX}$ is the DRX cycle length. | |

### 5.5.5.0.6.2 Requirements for CSI-RS based candidate beam detection

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ estimated over the last $T_{Evaluate_CBD_CSI-RS}$ [ms] period becomes better than the threshold $Q_{in_LR}$ within $T_{Evaluate_CBD_CSI-RS}$ [ms] period provided CSI-RS Ês/Iot is according to Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 5.5.5.0.6.2-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI-RS}$ is defined in Table 8.18.6.2-2 for FR2 with scaling factor N=8.

measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.18.6.3.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{CBD}$ used in Table 5.5.5.0.6.2-1 is defined as

- $M_{CBD}$ = 3, if the CSI-RS resource configured in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{CBD}$ used in Table 5.5.5.0.6.2-1 is defined as

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD}$ = 1.

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PSCell in NR-DC

- $P_{CBD}$ = 2 if UE configured for candidate beam detection on SCell, 1 otherwise.

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for a SCell

- $P_{CBD}$ = Z in EN-DC or NE-DC or SA.
- $P_{CBD}$ = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell
- $P_{CBD}$ is the number of band(s) on which UE is performing candidate beam detection only for SCell.

The values of $P_{TRP}$ defined in Table 8.18.6.2-2 is defined as 2, if SSB/CSI-RS resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ are overlapped, else it is 1.

**Table 5.5.5.0.6.2-1: Evaluation period $T_{Evaluate_CBD_CSI\text{-}RS}$ for FR2**

| Configuration | $T_{Evaluate_CBD_CSI\text{-}RS}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $Max(25, Ceil(M_{CBD} \times P \times N \times P_{CBD} \times P_{TRP}) \times T_{CSI\text{-}RS})$ |
| DRX cycle > 320ms | $Ceil(M_{CBD} \times P \times N \times P_{CBD} \times P_{TRP}) \times T_{DRX}$ |
| Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$. $T_{DRX}$ is the DRX cycle length. | |

### 5.5.5.0.6.3 Requirements for TRP specific Beam Failure Recovery

Same as in the clause 4.5.5.0.5.3.

### 5.5.5.0.6.4 Scheduling availability of UE during TRP specific beam failure detection

The following scheduling restriction applies due to TRP specific beam failure detection.

- For the case where no RSs are provided for BFD, or when CSI-RS is configured for BFD is explicitly configured and is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to TRP specific beam failure detection performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on BFD-RS resource symbols to be measured for TRP specific beam failure detection.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to beam failure detection performed on FR2 serving cell(s) in different band(s), provided that UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for BFD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for BFD measurement.

### 5.5.5.0.6.5 Scheduling availability of UE during TRP specific candidate beam detection

The following scheduling restriction applies due to TRP specific candidate beam detection

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, CSI-RS for tracking or CSI-RS for CQI on reference symbols to be measured for TRP specific candidate beam detection.

When intra-band carrier aggregation in FR2 is configured, the scheduling restrictions on to one serving cell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to candidate beam detection performed on FR2 serving cell(s) in different band(s), provided that the FR2 serving cell(s) and the FR2 serving cell(s) for candidate beam detection are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for CBD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for CBD measurement.

### 5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 5.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test he downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 5.5.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards.

#### 5.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.1.

#### 5.5.5.1.4 Test description

There are two cells configured in this test: E-UTRAN PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR of the PCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.1.4-2 shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

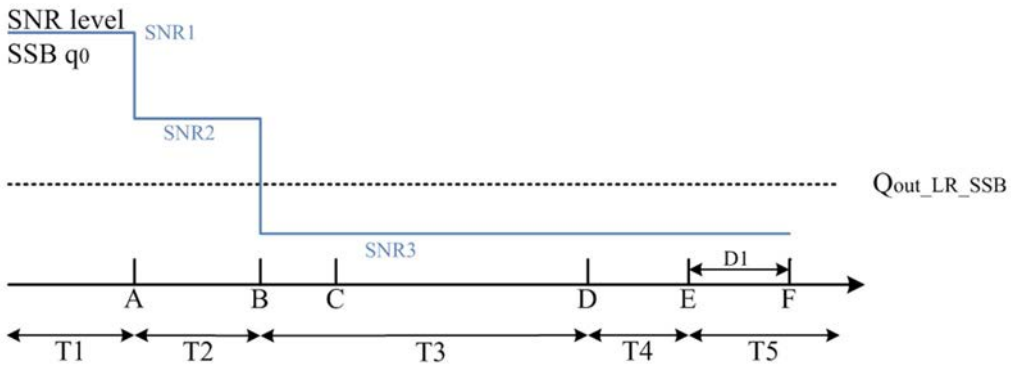


**Figure 5.5.5.1.4-1: SNR for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

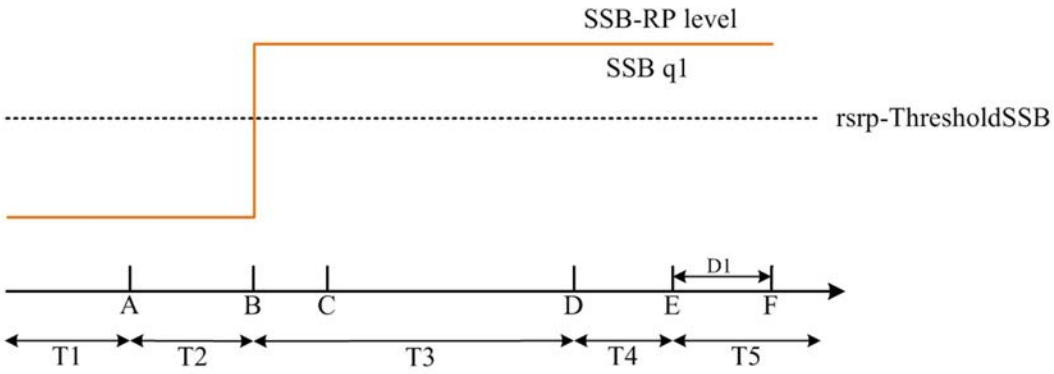


**Figure 5.5.5.1.4-2: SSB_RP level variation for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

### 5.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.1.4.1-1.

**Table 5.5.5.1.4.1-1: Supported test configurations for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 5.5.5.1-1 | LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.1-2 | LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.1-3 | LTE FDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.1-4 | LTE TDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.1.4.1-2.

**Table 5.5.5.1.4.1-2: Initial conditions for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.1.4.1-3.
2. Message contents are defined in clause 5.5.5.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.5.1.4.1-3: General test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | 1-4 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-4 | | 1 | |
| Active PCell | | 1-4 | | Cell 2 | |
| RF Channel Number | | 1-4 | | 2 | |
| Duplex mode | | 1-4 | | TDD | |
| TDD Configuration | | 1-4 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1-4 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-4 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 | |
| DL initial BWP configuration | | 1-4 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-4 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-4 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-4 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | | 3-4 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | | 3-4 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | | 3-4 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-4 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-4 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-4 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-4 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | Table A.3.2-1 |
| | | 3-4 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-4 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-4 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-4 | | OFF | |
| SSB index assigned as BFD RS ($q_0$) | | 1-4 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | 1-4 | | 1 | |
| SSB index assigned as RLM-RS | | 1-4 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1-4 | | 1-0 | |
| | Number of Control OFDM symbols | 1-4 | | 2 | |
| | Aggregation level | 1-4 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 | |
| | DMRS precoder granularity | 1-4 | | REG bundle size | |
| | REG bundle size | 1-4 | | 6 | |
| Gap pattern ID | | 1-4 | | gp0 | |
| gapOffset | | 1-4 | ms | 0 | |

| | | | | |
|---|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | 1-4 | | absent | Value 0 is applied. (38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | 1-2 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| | 3-4 | | -106 Note 3 | |
| powerControlOffsetSS | 1-4 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1-4 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | 1-4 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-4 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | 1-4 | | periodic | |
| reportQuantity | 1-4 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1-4 | slot | 40 | |
| CSI reporting offset | 1-4 | slot | 4 | |
| T310 | 1-4 | ms | 1000 | |
| N310 | 1-4 | | 2 | |
| T1 | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-4 | s | 2.61 | |
| T3 | 1-4 | s | 1.64 | |
| T4 | 1-4 | s | 0 | |
| T5 | 1-4 | s | 1.01 | |
| D1 | 1-4 | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2. | | | | |

#### 5.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA Cell 1 and NR Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.1.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.1.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.1.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.1.5-1. T5 starts.
7. If the SS:
   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and
   b) does not detect preamble on a beam associated with candidate beam set $q_1$ before time point B; and
   c) detects preamble on a beam associated with candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.
8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.1.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition "Short_DCI" with the following exceptions:

**Table 5.5.5.1.4.3-1: Common Exception messages for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-8 with condition SSB BFD<br>Table H.3.1-10 with condition SSB<br>Table H.3.1-10A<br>e<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition BFD |

**Table 5.5.5.1.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.5.1.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 5.5.5.1.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.1.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| | 1 | | Test Configuration 3 & 4 |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 5.5.5.1.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n2 | | Test Configuration 1 & 2 |
| | n1 | | Test Configuration 3 & 4 |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

5.5.5.1.5 Test requirement

Tables 5.5.5.1.4.1-3 and 5.5.5.1.5-1 define the primary level settings including test tolerances for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX.

**Table 5.5.5.1.5-1: NR Cell specific test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1-4 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1-4 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of set q1 | Config 1-2 | dBm/ SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 3-4 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1-4 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.1.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

**Table 5.5.5.1.5-2: Void**

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 5.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

### 5.5.5.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards and supporting long DRX cycle.

### 5.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.2.

### 5.5.5.2.4 Test description

There is one E-UTRAN PCell and one NR PSCell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.2.4-2 shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery

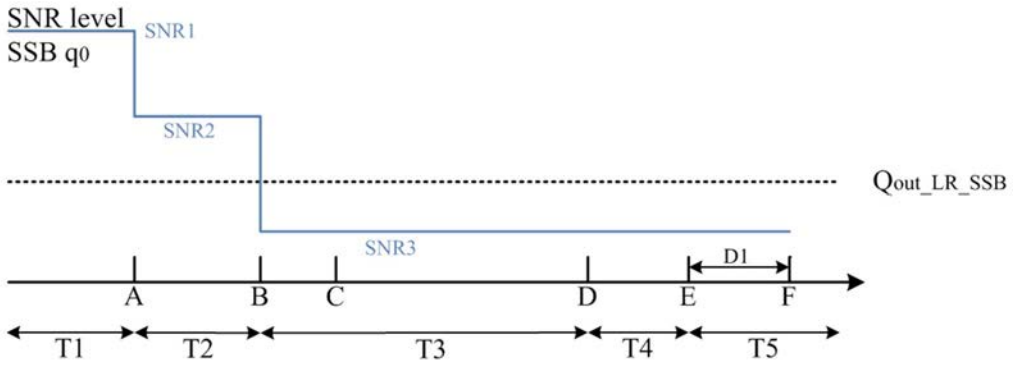


**Figure 5.5.5.2.4-1: SNR variation for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

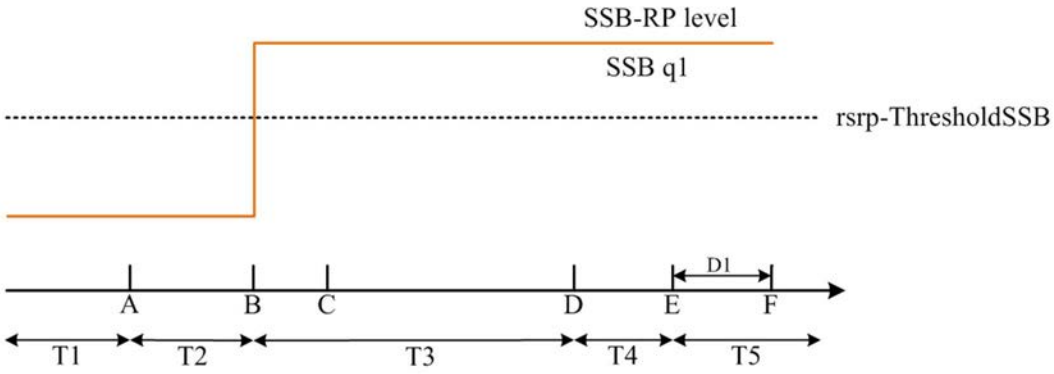


**Figure 5.5.5.2.4-2: SSB_RP level variation for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

### 5.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.2.4.1-1.

**Table 5.5.5.2.4.1-1: Supported test configurations for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 5.5.5.2-1 | LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.2-2 | LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.2-3 | LTE FDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.2-4 | LTE TDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.2.4.1-2.

**Table 5.5.5.2.4.1-2: Initial conditions for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| Parameter | Value | | Comment |
|---|---|---|---|
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.2.4.1-3. The DRX configuration for is according to Table 5.5.5.2.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 5.5.5.2.4.3.

3. There is one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.5.2.4.1-3: General test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | 1-4 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-4 | | 1 | |
| Active PCell | | 1-4 | | Cell 2 | |
| RF Channel Number | | 1-4 | | 2 | |
| Duplex mode | | 1-4 | | TDD | Table A.1.5-3 |
| TDD Configuration | | 1-4 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1-4 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-4 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 | |
| DL initial BWP configuration | | 1-4 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-4 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-4 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-4 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | | 3-4 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | | 3-4 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | | 3-4 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-4 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-4 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-4 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-4 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | Table A.3.2-1 |
| | | 3-4 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-4 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-4 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-4 | | DRX.3 | Table A.5-1 |
| SSB index assigned as BFD RS ($q_0$) | | 1-4 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | 1-4 | | 1 | |
| SSB index assigned as RLM-RS | | 1-4 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1-4 | | 1-0 | |
| | Number of Control OFDM symbols | 1-4 | | 2 | |
| | Aggregation level | 1-4 | CCE | 8 | |

| | | | | | |
|---|---|---|---|---|---|
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 | |
| | DMRS precoder granularity | 1-4 | | REG bundle size | |
| | REG bundle size | 1-4 | | 6 | |
| Gap pattern ID | | 1-4 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1-4 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| | | 3-4 | | -106 Note 2 | |
| powerControlOffsetSS | | 1-4 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-4 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-4 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-4 | | periodic | |
| reportQuantity | | 1-4 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-4 | slot | 40 | |
| CSI reporting offset | | 1-4 | slot | 4 | |
| T310 | | 1-4 | ms | 1000 | |
| N310 | | 1-4 | | 2 | |
| T1 | | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-4 | s | 3.37 | |
| T3 | | 1-4 | s | 2.8 | |
| T4 | | 1-4 | s | 0 | |
| T5 | | 1-4 | s | 0.61 | |
| D1 | | 1-4 | s | 0.57 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | | |

### 5.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.2.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.2.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.2.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.2.5-1. T5 starts.
7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.2.5-1.
9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” with the following exceptions:

**Table 5.5.5.2.4.3-1: Common Exception messages for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with condition SSB BFD<br>Table H.3.1-10 with condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.5.2.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 5.5.5.2.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 5.5.5.2.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.2.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| | 1 | | Test Configuration 3 & 4 |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 5.5.5.2.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n2 | | Test Configuration |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | 1 & 2 |
| | n1 | | Test Configuration 3 & 4 |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

5.5.5.2.5 Test requirement

Tables 5.5.5.2.4.1-3 and 5.5.5.2.5-1 define the primary level settings including test tolerances for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX.

**Table 5.5.5.2.5-1: NR Cell specific test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1-4 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1-4 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of set $q_1$ | Config 1-2 | dBm/ SCS kHz | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 3-4 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1-4 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.2.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 5.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

### 5.5.5.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 and forward supporting CSI-RS-based RLM and link recovery.

### 5.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.3.

### 5.5.5.3.4 Test description

There are two cells configured in this test: E-UTRAN PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 5.5.5.3.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

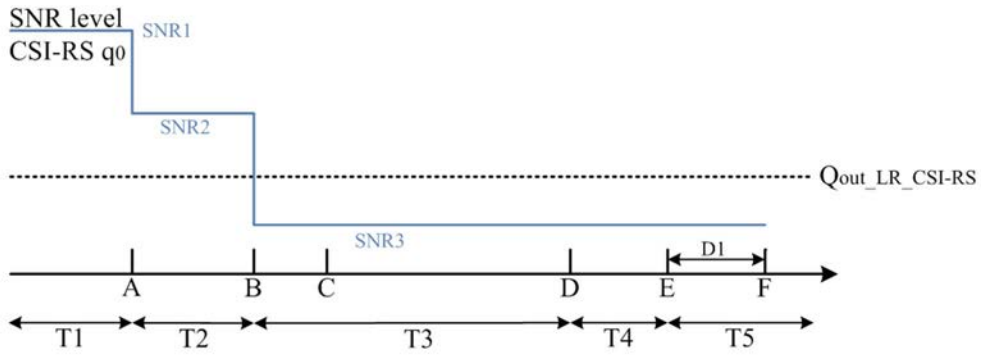


**Figure 5.5.5.3.4-1: SNR variation for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

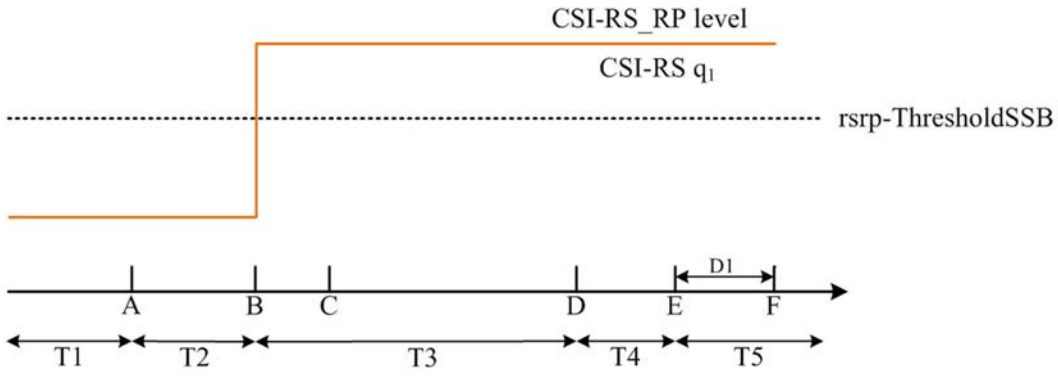


**Figure 5.5.5.3.4-2: CSI-RS_RP level variation for EN-DC FR2 CSI-RS based beam failure detection and link recovery in non-DRX**

### 5.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.3.4.1-1.

**Table 5.5.5.3.4.1-1: Supported test configurations for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 5.5.5.3-1 | LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.3-2 | LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.3.4.1-2.

**Table 5.5.5.3.4.1-2: Initial conditions for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| Parameter | Value | Comment |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 5.5.5.3.4.1-3.

2. Message contents are defined in clause 5.5.5.3.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.5.3.4.1-3: General test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | 1-2 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-2 | | 1 | |
| Active PCell | | 1-2 | | Cell 2 | |
| RF Channel Number | | 1-2 | | 2 | |
| Duplex mode | | 1-2 | | TDD | |
| TDD Configuration | | 1-2 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 | |
| DL initial BWP configuration | | 1-2 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | | 1-2 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-2 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1-2 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-2 | | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | OFF | |
| CSI-RS configuration for BFD/CBD/RLM | | 1-2 | | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1-2 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1-2 | | 1 | |
| CSI-RS index assigned as RLM-RS | | 1-2 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |

| | | | | |
|---|---|---|---|---|
| rsrp-ThresholdSSB | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-2 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | 1-2 | | periodic | |
| reportQuantity | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1-2 | slot | 40 | |
| CSI reporting offset | 1-2 | slot | 4 | |
| T310 | 1-2 | ms | 1000 | |
| N310 | 1-2 | | 2 | |
| T1 | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-2 | s | 1.17 | |
| T3 | 1-2 | s | 0.9 | |
| T4 | 1-2 | s | 0 | |
| T5 | 1-2 | s | 0.31 | |
| D1 | 1-2 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2. | | | | |

#### 5.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B;

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.3.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with condition CSI-RS BFD<br>Table H.3.1-10 with condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B |

**Table 5.5.5.3.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.5.3.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 5.5.5.3.4.3-4: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 5.5.5.3.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.3.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

5.5.5.3.5 Test requirement

Tables 5.5.5.3.4.1-3 and 5.5.5.3.5-1 define the primary level settings including test tolerances for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table 5.5.5.3.5-1: NR Cell specific test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| **Parameter** | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|
| | | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams[Note 10] | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS_RP of set $q_1$ | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1-2 | dBm/120 KHz | TBD | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Void
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.3.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.4 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 5.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the

evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 5.5.5.4.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 and forward supporting CSI-RS-based RLM and long DRX cycle and link recovery.

#### 5.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.4.

#### 5.5.5.4.4 Test description

There is one E-UTRAN PCell and one NR PSCell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 5.5.5.4.1-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

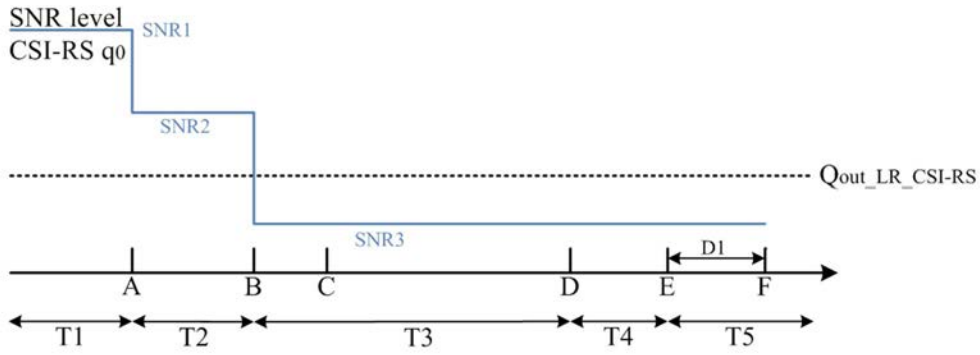


**Figure 5.5.5.4.4-1: SNR variation for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

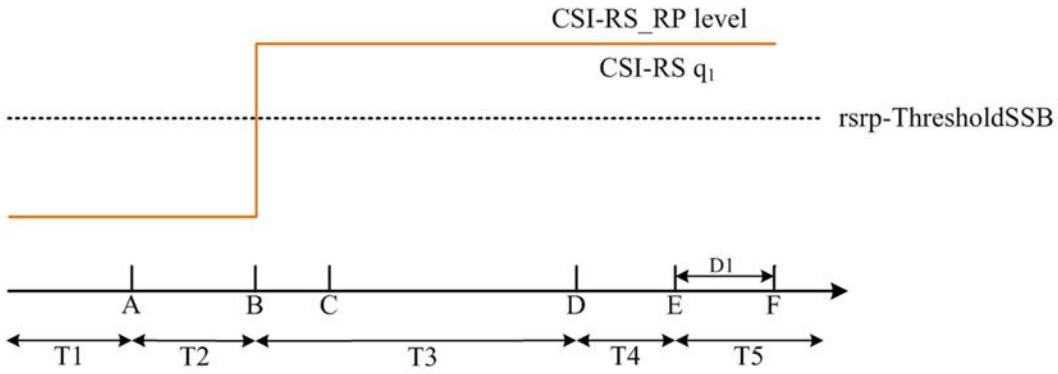


**Figure 5.5.5.4.4-2: CSI-RS_RP level variation for EN-DC FR2 CSI-RS based beam failure detection and link recovery in DRX**

#### 5.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.4.4.1-1.

**Table 5.5.5.4.4.1-1: Supported test configurations for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 5.5.5.4-1 | LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth |
| 5.5.5.4-2 | LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.4.4.1-2.

**Table 5.5.5.4.4.1-2: Initial conditions for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 5.5.5.4.4.1-3. The DRX configuration for is according to Table 5.5.5.4.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 5.5.5.4.4.3.

3. There is one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.5.4.4.1-3: General test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active E-UTRA PCell | 1-2 | | Cell 1 | |
| E-UTRA RF Channel Number | 1-2 | | 1 | |
| Active PCell | 1-2 | | Cell 2 | |
| RF Channel Number | 1-2 | | 2 | |
| Duplex mode | 1-2 | | TDD | |
| TDD Configuration | 1-2 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1-2 | kHz | 120 | |
| DL initial BWP configuration | 1-2 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | 1-2 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | 1-2 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | 1-2 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | 1-2 | | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | 1-2 | | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | 1-2 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | 1-2 | | OP.1 | Table A.2.1-1 |
| CP length | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | 1-2 | | TCI.State.0 | Table A.10.2-1 |

| | | | | | |
|---|---|---|---|---|---|
| CSI-RS for tracking | | 1-2 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1-2 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-2 | | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | DRX.3 | Table A.5-1 |
| CSI-RS configuration for BFD/CBD/RLM | | 1-2 | | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1-2 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1-2 | | 1 | |
| CSI-RS index assigned as RLM-RS | | 1-2 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 5.43 | |
| T3 | | 1-2 | s | 5.16 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 0.31 | |
| D1 | | 1-2 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2. | | | | | |

**Table 5.5.5.4.4.1-4: Void**

### 5.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.4.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.4.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.4.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.4.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with condition CSI-RS BFD<br>Table H.3.1-10 with condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.5.4.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |

| | | | |
|---|---|---|---|
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.5.4.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 5.5.5.4.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.4.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

### 5.5.5.4.5 Test requirement

Tables 5.5.5.4.4.1-3 and 5.5.5.4.5-1 define the primary level settings including test tolerances for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 5.5.5.4.5-1: NR Cell specific test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS_RP of set $q_1$ | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Void
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.4.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is incomplete. Following aspects are pending.

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

BFD RS configuration and test procedure require further analysis based on recent changes in TS 38.133.

TS 38.133 requirement regarding UE behavior check during T3 needs to be updated.

### 5.5.5.5.1 Test purpose

The purpose of this test is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

### 5.5.5.5.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards.

### 5.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.5.

### 5.5.5.5.4 Test description

There are two cells configured in this test. Cell 1 is the E-UTRAN PCell and Cell 2 is the PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.5.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB index 0 in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.5.4-2 shows the variation of the downlink L1-RSRP of the SSB index 1 used for link recovery.

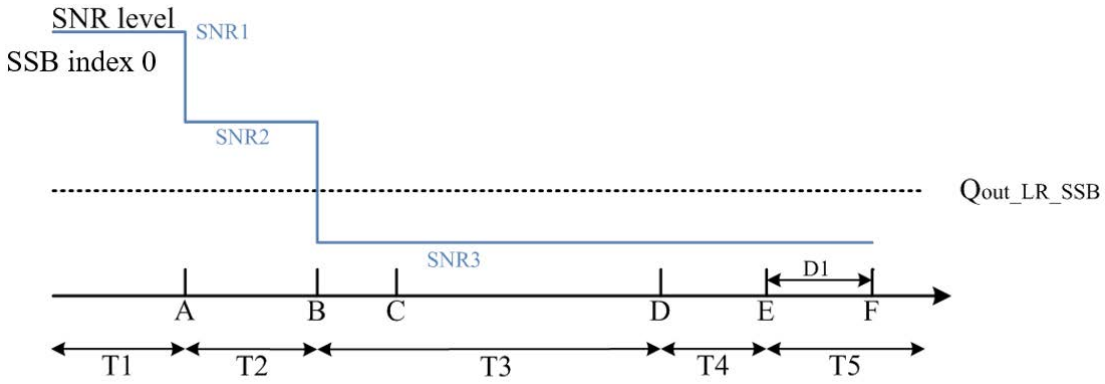


**Figure 5.5.5.5.4-1: SNR variation for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

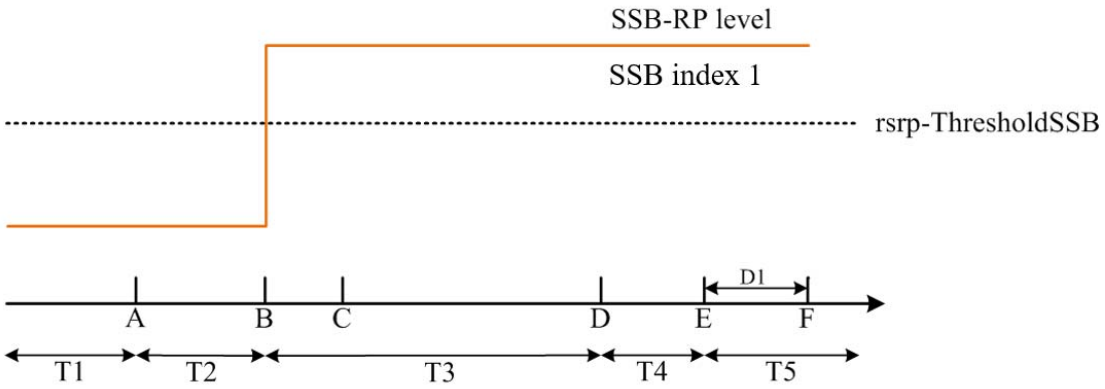


**Figure 5.5.5.5.4-2: SSB_RP level variation for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX**

### 5.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.5.4.1-1.

**Table 5.5.5.5.4.1-1: Supported test configurations for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 5.5.5.5-1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.5.5-2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.5.5-3 | LTE FDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.5.5.5-4 | LTE TDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.5.4.1-2.

**Table 5.5.5.5.4.1-2: Initial conditions for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.5.4.1-3.
2. Message contents are defined in clause 5.5.5.5.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.5.5.4.1-3: General test parameters for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | 1-4 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-4 | | 1 | |
| Active PCell | | 1-4 | | Cell 2 | |
| RF Channel Number | | 1-4 | | 2 | |
| Duplex mode | | 1-4 | | TDD | |
| TDD Configuration | | 1-4 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1-4 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-4 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 | |
| DL initial BWP configuration | | 1-4 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-4 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-4 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-4 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | | 3-4 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | | 3-4 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | | 3-4 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-4 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-4 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-4 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-4 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | Table A.3.2-1 |
| | | 3-4 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-4 | | SMTC.1 | Table A.4-1 |
| PRACH Configuration | | 1-4 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-4 | | OFF | |
| Beam failure detection transmission parameters | DCI format | 1-4 | | 1-0 | |
| | Number of Control OFDM symbols | 1-4 | | 2 | |
| | Aggregation level | 1-4 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 | |
| | DMRS precoder granularity | 1-4 | | REG bundle size | |
| | REG bundle size | 1-4 | | 6 | |
| Gap pattern ID | | 1-4 | | N/A | No measurement gap is configured |
| rlmInSyncOutOfSyncThreshold | | 1-4 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| | | 3-4 | | -106 Note 3 | |
| powerControlOffsetSS | | 1-4 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-4 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-4 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-4 | | periodic | |
| reportQuantity | | 1-4 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-4 | slot | 40 | |

| | | | | |
|---|---|---|---|---|
| CSI reporting offset | 1-4 | slot | 4 | |
| T310 | 1-4 | ms | 1000 | |
| N310 | 1-4 | | 2 | |
| T1 | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-4 | s | 2.6 | |
| T3 | 1-4 | s | 1.64 | |
| T4 | 1-4 | s | 0 | |
| T5 | 1-4 | s | 1.01 | |
| D1 | 1-4 | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2 | | | | |

#### 5.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.5.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D; and

   b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 5.5.5.5.4.3-1: Common Exception messages for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with condition SSB BFD<br>Table H.3.1-10 with condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B |

**Table 5.5.5.5.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.5.5.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 5.5.5.5.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |

| | | | |
|---|---|---|---|
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.5.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| | 1 | | Test Configuration 3 & 4 |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 5.5.5.5.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n2 | | Test Configuration 1 & 2 |
| | n1 | | Test Configuration 3 & 4 |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

5.5.5.5.5 Test requirement

Tables 5.5.5.5.4.1-3 and 5.5.5.5.5-1 define the primary level settings including test tolerances for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX.

**Table 5.5.5.5.5-1: NR Cell specific test parameters for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A. 9.1 | | | | |
| Assumption for UE beams[Note 10] | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SSB index assigned as BFD RS ($q_0$) | Config 1-4 | | 0 | 0 | Note 13 | | |
| SSB index assigned as CBD RS ($q_1$) | Config 1-4 | | 1 | 1 | 1 | 1 | 1 |
| SNR of SSB index 0 | Config 1-4 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR of SSB index 1 | Config 1-4 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of SSB index 1 | Config 1-2 | dBm/ SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 3-4 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1-4 | dBm/120K Hz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Void
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.5.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2.
Note 13: BFD RS ($q_0$) is configured as SSB index 0 at the start of T3, and it is reconfigured by RRC as SSB index 1 after the UE transmits the preamble on a beam associated with the candidate beam set $q_1$

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] clause 8.5.7.3:

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in TS 38.133 [6] clause 8.5.8.3:

The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

## 5.5.5.6 EN-DC FR2 CSI-RS-based BFD and LR for SCell in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

### 5.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

#### 5.5.5.6.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 16 onwards supporting SCell BFR.

#### 5.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.6.

#### 5.5.5.6.4 Test description

There are three cells configured in this test. Cell 1 is the E-UTRAN PCell, Cell 2 is the PSCell and Cell 3 is the SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.6.4-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure 5.5.5.6.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

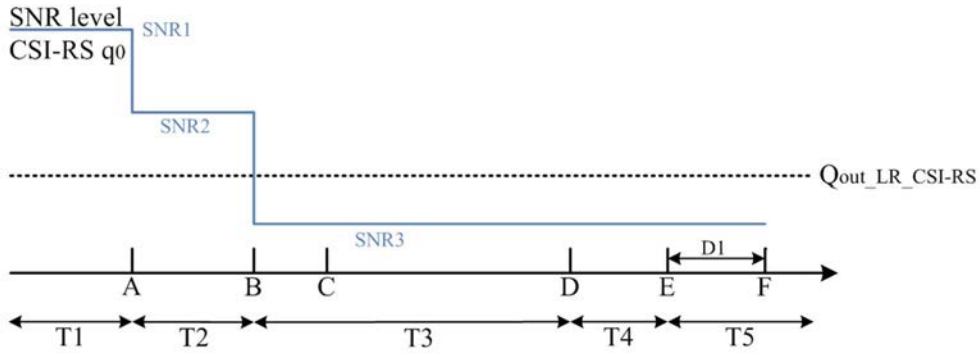


**Figure 5.5.5.6.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

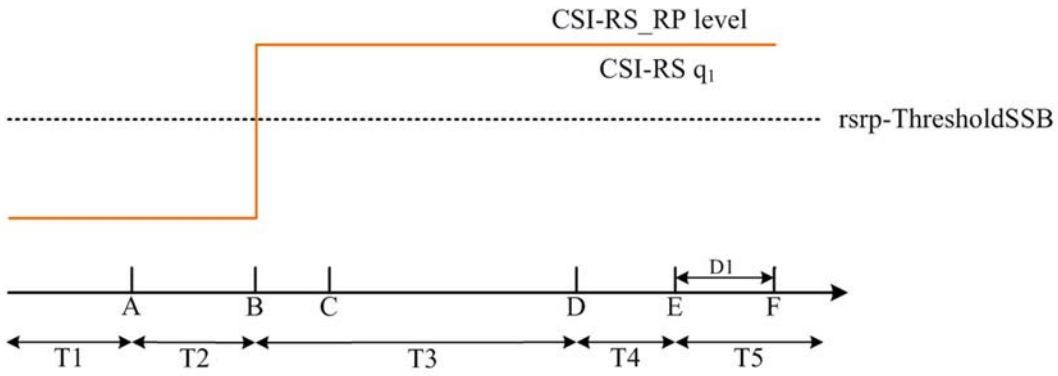


**Figure 5.5.5.6.4-2: CSI-RS_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

##### 5.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.6.4.1-1.

**Table 5.5.5.6.4.1-1: Supported test configurations for EN-DC FR2 SCell beam failure detection and link recovery testing in non-DRX**

| Configuration | Description |
|---|---|
| 5.5.5.6-1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.6-2 | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.6.4.1-2.

**Table 5.5.5.6.4.1-2: Initial conditions for EN-DC FR2 SCell beam failure detection and link recovery testing in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.6.4.1-3.
2. Message contents are defined in clause 5.5.5.6.4.3.
3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | 1-2 | | Cell 1 | |
| E-UTRA RF Channel Number | 1-2 | | 1 | |
| Active PCell | 1-2 | | Cell 2 | |
| RF Channel Number for PSCell | 1-2 | | 2 | |
| Active SCell | 1-2 | | Cell 3 | |
| RF Channel Number for SCell | 1-2 | | 3 | |
| Duplex mode | 1-2 | | TDD | |
| TDD Configuration | 1-2 | | TDDConf.3.1 | |
| $BW_{channel}$ | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1-2 | kHz | 120 | |
| DL initial BWP configuration | 1-2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | 1-2 | | DLBWP.1.1 | |
| UL initial BWP configuration | 1-2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | 1-2 | | ULBWP.1.1 | |
| PDSCH Reference Channel | 1-2 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | 1-2 | | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | 1-2 | | CCR.3.1 TDD | |
| OCNG parameters | 1-2 | | OP.1 | A.2.1 |
| CP length | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | 1-2 | | TCI.State.0 | |
| CSI-RS for tracking | 1-2 | | TRS.2.1 TDD | |
| SSB Configuration | 1-2 | | SSB.3 FR2 | A.3 |

| | | | | | |
|---|---|---|---|---|---|
| SMTC Configuration | | 1-2 | | SMTC.3 | A.4 |
| PRACH Configuration | | 1-2 | | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | OFF | |
| CSI-RS configuration for BFD/CBD in activated SCell | | 1-2 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS ($q_0$) in activated SCell | | 1-2 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) in activated SCell | | 1-2 | | 1 | |
| CSI-RS configuration for RLM in PSCell | | 1-2 | | CSI-RS.3.2 TDD | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| schedulingRequestID-BFR-SCell-r16 | | 1-2 | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1-2 | slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | 1-2 | slot | 4 | |
| PUCCH parameters for SR configuration for BFR on SCell | | 1-2 | | Table 8.3.3.1.2-1 in [28] | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 1.17 | |
| T3 | | 1-2 | s | 0.9 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 0.31 | |
| D1 | | 1-2 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | | |

#### 5.5.5.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.5.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).
4. Set the parameters of NR Cell 2 and Cell 3 according to T1 in Table 5.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.6.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.6.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.6.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.6.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.6.5-1.
11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.6.4.3-1: Common Exception messages for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-12 on Cell 3<br>Table H.3.1-13 on Cell 3 |

**Table 5.5.5.6.4.3-2: MAC-CellGroupConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId | | |
| } | | | |

**Table 5.5.5.6.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

5.5.5.6.5 Test requirement

Tables 5.5.5.6.4.1-3 and 5.5.5.6.5-1 define the primary level settings including test tolerances for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX.

**Table 5.5.5.6.5-1: NR Cell specific test parameters for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Cell2 | Cell3 Test 1 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.6.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. |
| Note 10: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

### 5.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

### 5.5.5.7.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 16 onwards supporting SCell BFR.

### 5.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.7.

### 5.5.5.7.4 Test description

There are three cells configured in this test. Cell 1 is the E-UTRAN PCell, Cell 2 is the PSCell and Cell 3 is the SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.7.4-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure 5.5.5.7.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

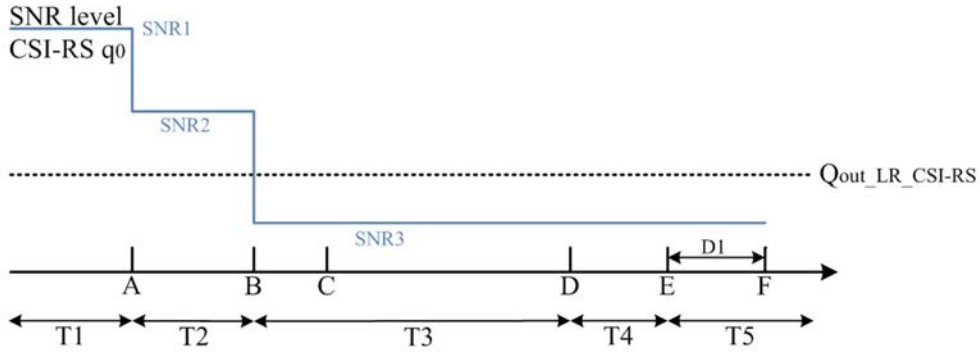


**Figure 5.5.5.7.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode**

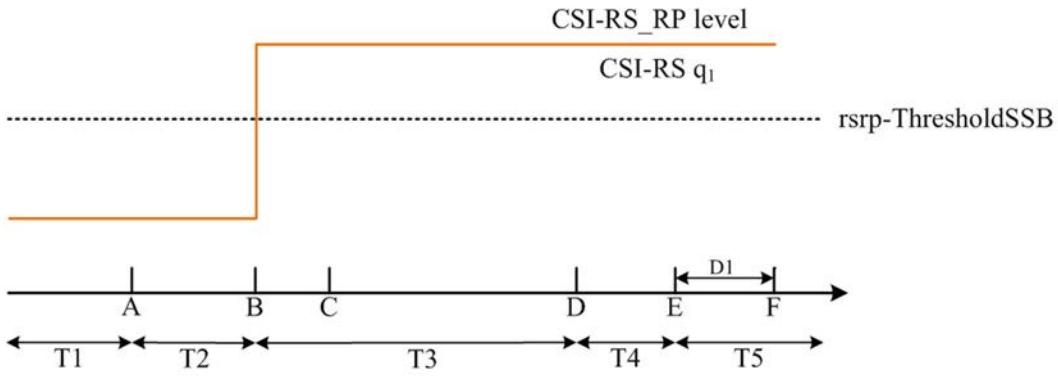


**Figure 5.5.5.7.4-2: CSI-RS_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode**

### 5.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.7.4.1-1.

**Table 5.5.5.7.4.1-1: Supported test configurations for EN-DC FR2 SCell beam failure detection and link recovery testing in DRX**

| Configuration | Description |
|---|---|
| 5.5.5.7-1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 5.5.5.7-2 | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.7.4.1-2.

**Table 5.5.5.7.4.1-2: Initial conditions for EN-DC FR2 SCell beam failure detection and link recovery testing in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.7.4.1-3.
2. Message contents are defined in clause 5.5.5.7.4.3.
3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | 1-2 | | Cell 1 | |
| E-UTRA RF Channel Number | 1-2 | | 1 | |
| Active PCell | 1-2 | | Cell 2 | |
| RF Channel Number for PSCell | 1-2 | | 2 | |
| Active SCell | 1-2 | | Cell 3 | |
| RF Channel Number for SCell | 1-2 | | 3 | |
| Duplex mode | 1-2 | | TDD | |
| TDD Configuration | 1-2 | | TDDConf.3.1 | |
| $BW_{channel}$ | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1-2 | kHz | 120 | |
| DL initial BWP configuration | 1-2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | 1-2 | | DLBWP.1.1 | |
| UL initial BWP configuration | 1-2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | 1-2 | | ULBWP.1.1 | |
| PDSCH Reference Channel | 1-2 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | 1-2 | | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | 1-2 | | CCR.3.1 TDD | |
| OCNG parameters | 1-2 | | OP.1 | A.2.1 |
| CP length | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | 1-2 | | TCI.State.0 | |
| CSI-RS for tracking | 1-2 | | TRS.2.1 TDD | |
| SSB Configuration | 1-2 | | SSB.3 FR2 | A.3 |
| SMTC Configuration | 1-2 | | SMTC.3 | A.4 |
| PRACH Configuration | 1-2 | | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | 1-2 | | DRX.3 | A.5 |
| CSI-RS configuration for BFD/CBD in activated SCell | 1-2 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS ($q_0$) in activated SCell | 1-2 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) in activated SCell | 1-2 | | 1 | |
| CSI-RS configuration for RLM in PSCell | 1-2 | | CSI-RS.3.2 TDD | A.1.4.2 |

| | | | | | |
|---|---|---|---|---|---|
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| schedulingRequestID-BFR-SCell-r16 | | 1-2 | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1-2 | slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | 1-2 | slot | 4 | |
| PUCCH parameters for SR configuration for BFR on SCell | | 1-2 | | Table 8.3.3.1.2-1 in [28] | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 5.43 | |
| T3 | | 1-2 | s | 5.16 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 0.31 | |
| D1 | | 1-2 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | | |

### 5.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.5.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 2 and Cell 3 according to T1 in Table 5.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.7.4.3-1: Common Exception messages for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-12 on Cell 3<br>Table H.3.1-13 on Cell 3<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.5.7.4.3-2: MAC-CellGroupConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId | | |
| } | | | |

**Table 5.5.5.7.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

5.5.5.7.5 Test requirement

Tables 5.5.5.7.4.1-3 and 5.5.5.7.5-1 define the primary level settings including test tolerances for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX.

**Table 5.5.5.7.5-1: NR Cell specific test parameters for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| **Parameter** | | **Unit** | **Cell2** | **Cell3 Test 1** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | | | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.7.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. |
| Note 10: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.8 EN-DC FR2 CSI-RS-based PSCell TRP specific Beam Failure Detection and Link Recovery in DRX mode

Editor's Note: This test case is incomplete in following aspects:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TS 38.522 applicability spec update is pending

### 5.5.5.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the TRP specific CSI-RS-based beam failure in the set (q0,0), (q0,1) configured for a serving PSCell and a cell with PCID different from the serving cell, and that the UE performs correct CSI-RS-based link recovery based on beam candidate set (q1,0) and (q1,1). The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell with *schedulingRequestID-BFR-r17* configured, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

### 5.5.5.8.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 17 onwards supporting PSCell BFR.

### 5.5.5.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.8.

### 5.5.5.8.4 Test description

There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell and cell 3 is the cell with different PCID in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.8.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set $q_0$ in the active PSCell to emulate CSI-RS based beam failure. Figure 5.5.5.8.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

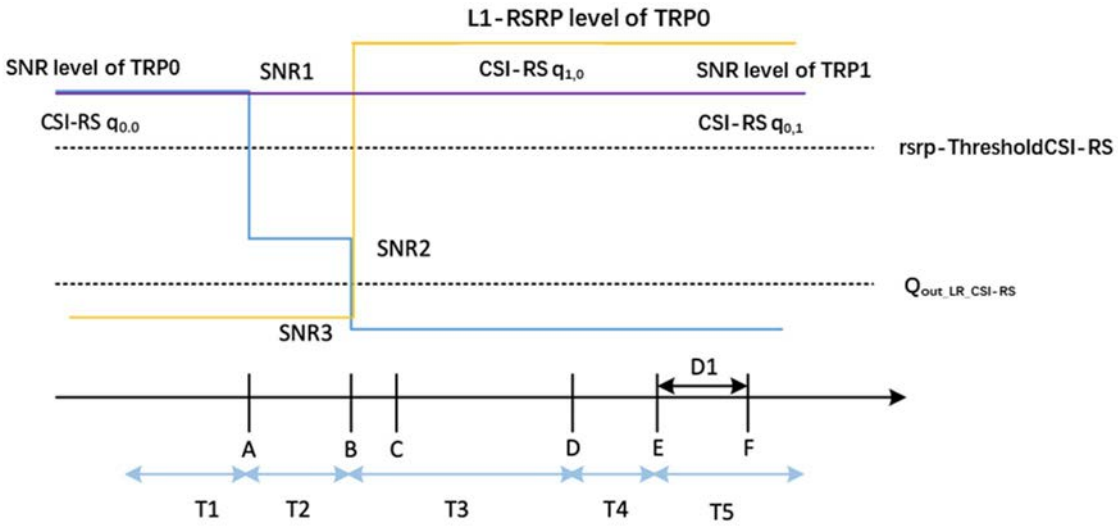


**Figure 5.5.5.8.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

### 5.5.5.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.8.4.1-1.

**Table 5.5.5.8.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.8.4.1-2.

**Table 5.5.5.8.4.1-2: Initial conditions for EN-DC FR2 PSCell beam failure detection and link recovery testing in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.8.4.1-3.
2. Message contents are defined in clause 5.5.5.8.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 5.5.5.8.4.1-3: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | Test 1 | |
| Active E-UTRA PCell | | 1-2 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-2 | | 1 | |
| Active PSCell | | 1-2 | | Cell 2 | |
| RF Channel Number | | 1-2 | | 2 | |
| Duplex mode | | 1-2 | | TDD | |
| TDD Configuration | | 1-2 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1-2 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 | |
| DL initial BWP configuration | | 1-2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | 1-2 | | DLBWP.1.1 | |
| UL initial BWP configuration | | 1-2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | 1-2 | | ULBWP.1.1 | |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | |
| OCNG parameters | | 1-2 | | OP.1 | A.2.1 |
| CP length | | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-2 | | TCI.State.0 | |
| CSI-RS for tracking | | 1-2 | | TRS.2.1 TDD | |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | A.3 |
| SMTC Configuration | | 1-2 | | SMTC.3 | A.4 |
| PRACH Configuration | | 1-2 | | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | DRX.3 | A.5 |
| CSI-RS configuration for TRP0 | | 1-2 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS configuration for TRP1 | | | | CSI-RS.3.6 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS ($q_{0,0}$) | | 1-2 | | CSI-RS#0 | |
| CSI-RS index assigned as CBD RS ($q_{1,0}$) | | 1-2 | | CSI-RS#1 | |
| CSI-RS index assigned as BFD RS ($q_{0,1}$) | | 1-2 | | CSI-RS#2 | |
| CSI-RS index assigned as CBD RS ($q_{1,1}$) | | 1-2 | | CSI-RS#3 | |
| CSI-RS index assigned as RLM-RS | | 1-2 | | 0,1,2,3 | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to | 1-2 | dB | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| | average SSS RE energy | | | | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| schedulingRequestID-BFR- r17 | | 1-2 | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on PSCell | | 1-2 | slot | 40 | 5ms |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdCSI-RS | | 1-2 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_CSI-RS}$ |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 10.81 | |
| T3 | | 1-2 | s | 10.28 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 0.57 | |
| D1 | | 1-2 | s | 0.53 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

### 5.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. Set the parameters of NR Cell 2 according to T1 in Table 5.5.5.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

4. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 5.5.5.8.5-1. T2 starts.

5. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 5.5.5.8.5-1. T3 starts.

6. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 5.5.5.8.5-1. T4 starts.

7. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 5.5.5.8.5-1. T5 starts.

8. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{10}$ and $q_{11}$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

9. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.8.5-1.

10. If the iteration fails, the SS shall first attempt to release and add the FR2 PSCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.8.4.3-1: Common Exception messages for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD<br>Table H.3.1-12A on Cell 2<br>Table H.3.1-13 on Cell 2 with condition SpCell<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.5.8.4.3-2: *MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |

| | | | |
|---|---|---|---|
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

**Table 5.5.5.8.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

### 5.5.5.8.5 Test requirement

Tables 5.5.5.8.4.1-3 and 5.5.5.8.5-1 define the primary level settings including test tolerances for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX.

Table 5.5.5.8.5-1: Cell specific test parameters for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX mode

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | | | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_{0,0}$ | Config 1-2 | dB | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_{1,0}$ | Config 1-2 | dB | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| SNR_CSI-RS of set $q_{0,1}$ | Config 1-2 | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| SNR_CSI-RS of set $q_{1,1}$ | Config 1-2 | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_{1,0}$ | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| CSI-RS_RP of set $q_{1,1}$ | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.5.9 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX mode for UE fulfilling relaxed measurement criterion

Editor's Note: This test case is incomplete in following aspects:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- RAN4 dependency: Test parameters have brackets.

### 5.5.5.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 clause 8.5.2.4 for UE fulfilling good serving cell quality criterion, if configured. *goodServingCellEvaluationBFD* [2] criterion is configured according to the parameters listed in Table 5.5.5.9.4.1-3.

### 5.5.5.9.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 17 onwards supporting long DRX cycle and supporting BFD relaxation criteria *bfd-Relaxation-r17*.

### 5.5.5.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.9.

### 5.5.5.9.4 Test description

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.9.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSBs in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.9.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

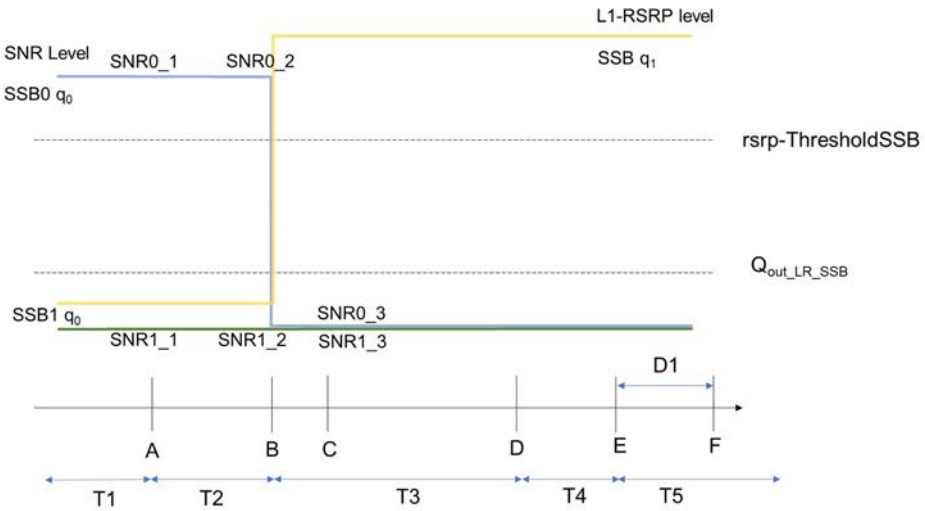


**Figure 5.5.5.9.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in DRX mode for UE fulfilling relaxed measurement criterion**

### 5.5.5.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.9.4.1-1.

**Table 5.5.5.9.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 4 | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.9.4.1-2.

**Table 5.5.5.9.4.1-2: Initial conditions for EN-DC FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.5.9.4.1-3.
2. Message contents are defined in clause 5.5.5.9.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table A.5.5.5.9.4.1-3: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | 1-4 | | Cell 1 | |
| E-UTRA RF Channel Number | | 1-4 | | 1 | |
| Active PCell | | 1-4 | | Cell 2 | |
| RF Channel Number | | 1-4 | | 2 | |
| Duplex mode | | 1-4 | | TDD | |
| TDD Configuration | | 1-4 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1-4 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-4 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 | |
| DL initial BWP configuration | | 1-4 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | 1-4 | | DLBWP.1.1 | |
| UL initial BWP configuration | | 1-4 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | 1-4 | | ULBWP.1.1 | |
| PDSCH Reference Channel | | 1-2 | | SR.3.2 TDD | |
| | | 3-4 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1-2 | | CR.3.1 TDD | |
| | | 3-4 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1-2 | | CCR.3.1 TDD | |
| | | 3-4 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-4 | | OP.1 | |
| CP length | | 1-4 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-4 | | TCI.State.0 | |
| CSI-RS for tracking | | 1-4 | | TRS.2.1 TDD | |
| SSB Configuration | | 1-2 | | SSB.1 FR2 | |
| | | 3-4 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-4 | | SMTC.3 | |
| PRACH Configuration | | 1-4 | | FR2 PRACH configuration 2 | A.7.2-1 |
| DRX configuration | | 1-4 | | DRX.3 | A.5-1 |
| SSB index assigned as BFD RS ($q_0$) | | 1-4 | | 0,1 | |
| SSB index assigned as CBD RS ($q_1$) | | 1-4 | | 2 | |
| SSB index assigned as RLM-RS | | 1-4 | | 0,2 | |
| Beam failure detection transmission parameters | DCI format | 1-4 | 1-0 | 1-0 | |
| | Number of Control OFDM symbols | 1-4 | | 2 | |
| | Aggregation level | 1-4 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 | |
| | DMRS precoder granularity | 1-4 | | REG bundle size | |
| | REG bundle size | 1-4 | | 6 | |
| Gap pattern ID | | 1-4 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1-4 | | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| | | 3-4 | | -92 | |
| powerControlOffsetSS | | 1-4 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 | | n1 | see TS 38.321 [12], clause 5.17 |

| | | | | |
|---|---|---|---|---|
| beamFailureDetectionTimer | 1-4 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-4 | | CSI-RS.3.1 TDD | |
| reportConfigType | 1-4 | | periodic | |
| reportQuantity | 1-4 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1-4 | slot | 40 | |
| CSI reporting offset | 1-4 | slot | 4 | |
| T310 | 1-4 | ms | 1000 | |
| N310 | 1-4 | | 1 | |
| T1 | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-4 | s | [3.37] | |
| T3 | 1-4 | s | [5.56] | |
| T4 | 1-4 | s | 0 | |
| T5 | 1-4 | s | 0.61 | |
| D1 | 1-4 | s | 0.57 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 5.5.5.9.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.5.9.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 5.5.5.9.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 5.5.5.9.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 5.5.5.9.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 5.5.5.9.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.9.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.5.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.5.9.4.3-1: Common Exception messages for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition SSB BFD<br>Table H.3.1-10 with condition SSB<br>Table H.3.1-10A<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.5.5.9.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.5.9.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n1 | | |
| } | | | |

**Table 5.5.5.9.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 1 entry | | |
| ControlResourceSet[1] | ControlResourceSet | entry 1, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 5.5.5.9.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| | 1 | | Test Configuration 3 & 4 |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

5.5.5.9.5 Test requirement

Tables 5.5.5.9.4.1-3 and 5.5.5.9.5-1 define the primary level settings including test tolerances for EN-DC FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode.

**Table 5.5.5.9.5-1: NR Cell specific test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB0 of set $q_0$ | Config 1-4 | dB | 14.70[Note 11] | 14.70[Note 11] | -12 | -12 | -12 |
| SNR_SSB1 of set $q_0$ | Config 1-4 | dB | -12 | -12 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1-4 | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| SSB_RP of set $q_1$ | Config 1-2 | dBm/ | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Config 3-4 | SCS | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1-4 | dBm/120 KHz | -104.7 | | | | |
| goodServingCellEvaluation | | dB | 4 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR for SSB0 in time periods T1, T2, T3, T4 and T5 is denoted as SNR0_1, SNR0_2 and SNR0_3 respectively in figure A.5.5.5.9.1-1. The SNR for SSB1 in time periods T1, T2, T3, T4 and T5 is denoted as SNR1_1, SNR1_2 and SNR1_3 respectively in figure A.5.5.5.9.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.6 Active BWP switch delay

### 5.5.6.1 DCI-based and time-based active BWP switch

#### 5.5.6.1.0 Minimum conformance requirements

FFS

#### 5.5.6.1.1 EN-DC FR2 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

#### 5.5.6.1.1.1 Test purpose

FFS

#### 5.5.6.1.1.2 Test applicability

FFS

#### 5.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.1.

#### 5.5.6.1.1.4 Test description

##### 5.5.6.1.1.4.1 Initial conditions

FFS

##### 5.5.6.1.1.4.2 Test procedure

FFS

##### 5.5.6.1.1.4.3 Message contents

FFS

#### 5.5.6.1.1.5 Test requirements

FFS

### 5.5.6.1.2 EN-DC FR2 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

*- Testability or LTE requirements in uncalibrated link is still FFS.*

#### 5.5.6.1.2.1 Test purpose

FFS

#### 5.5.6.1.2.2 Test applicability

FFS

#### 5.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.2.

#### 5.5.6.1.2.4 Test description

##### 5.5.6.1.2.4.1 Initial conditions

FFS

##### 5.5.6.1.2.4.2 Test procedure

FFS

##### 5.5.6.1.2.4.3 Message contents

FFS

#### 5.5.6.1.2.5 Test requirements

FFS

### 5.5.6.2 RRC-based active BWP switch

The requirements in this clause apply for a UE configured with more than one BWP on PSCell or any activated SCell in SCG in EN-DC. UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

#### 5.5.6.2.0 Minimum conformance requirements

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

- Active BWP switch or parameter change of its active BWPs for SpCell
- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCell

For RRC-based BWP switch, after the UE receives BWP switching request, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after the beginning of DL slot n + $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$NR\ Slot\ length$ is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

#### 5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 5.5.6.2.0.1. Supported test configurations are shown in Table 5.5.6.2.1.4.1-1.

#### 5.5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC and BWP adaptation of at least 2 BWPs.

#### 5.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.2.1.

#### 5.5.6.2.1.4 Test description

##### 5.5.6.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of TS 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.6.2.1.4.1-1.

**Table 5.5.6.2.1.4.1-1: DL BWP switch supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.6.2.1.4.1-2

**Table 5.5.6.2.1.4.1-2: Initial conditions for EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.6.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.5.6.2.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in Annex C.1.1, and the downlink signal levels as per Annex C.1.2.

3. The test parameters are given in Table 5.5.6.2.1.4.1-3 below.

**Table 5.5.6.2.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |

### 5.5.6.2.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the test, the UE shall be fully synchronized to PSCell. The UE shall be configured for parameters as mentioned in the Table 5.5.6.2.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and PSCell (Cell 2) throughout the test procedure to ensure that the UE will have ACK/NACK sending.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 5.5.6.2.1.5-1 and Table 5.5.6.2.1.4.3-2.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. Before the test starts UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).

6. Before the test starts UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).

7. Before the test starts UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.

8. Ensure all cells have constant signal levels throughout the test.

9. The test consists of 1 time period, with duration of T1.

10. Time period T1 starts when a *RRCConnectionReconfiguration* with updated bandwidth part configuration for active BWP-1, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part corresponding to the final condition of active BWP-1, according to Table 5.5.6.2.1.5-1 and Table 5.5.6.2.1.4.3-2.

11. If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot i+208+$k_1$ then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. After the SS receives the ACK/NACK in step 11, or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 3, step 10, step 12 or step 13 fails, switch off and on the UE and go to step 1.

14. Repeat steps 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.6.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 5.5.6.2.1.4.3-2: *RRCReconfiguration* (Step 3 and Step 10)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 5.5.6.2.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.6.2.1.4.3-3: *CellGroupConfig* (configured in Table 5.5.6.2.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| SpCellConfigDedicated | ServingCellConfig | Table 5.5.6.2.1.4.3-4 | |
| } | | | |
| } | | | |

**Table 5.5.6.2.1.4.3-4: *ServingCellConfig* (configured in Table 5.5.6.2.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |

| | | | |
|---|---|---|---|
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 5.5.6.2.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 5.5.6.2.1.4.3-6 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 5.5.6.2.1.4.3-5: *BWP-Downlink* (configured in Table 5.5.6.2.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 10 |
| } | | | |
| } | | | |

**Table 5.5.6.2.1.4.3-6: *BWP-Uplink* (configured in Table 5.5.6.2.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 10 |
| } | | | |
| } | | | |

#### 5.5.6.2.1.5 Test requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell from the first DL slot that occurs right after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}} + k_1$, where,

$T_{RRCprocessingDelay}$ = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{BWPSwitchDelayRRC}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 0.125 ms for SCS = 120 kHz.

$k_1$ is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives $\frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}} = 208$ slots.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 5.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | | | TDD |
| TDD configuration | | | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 |
| Initial DL BWP Configuration | | | DLBWP.0.2 |
| Initial UL BWP Configuration | | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| TCI State | | | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

**Table 5.5.6.2.1.5-2: OTA related test parameters for BWP switching test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | According to table A. 9 |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -112 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -103 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note3 | -85 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $\hat{E}_s/I_{ot}$ | | dB | 18 |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |

| | |
|---|---|
| NOTE 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| NOTE 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| NOTE 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |

## 5.5.6.3 Simultaneous DCI-based and timer-based active BWP switch on multiple CCs

### 5.5.6.3.0 Minimum conformance requirements

#### 5.5.6.3.0.1 Minimum conformance requirements for simultaneous DCI-based and timer-based active BWP switch on multiple CCs

##### 5.5.6.3.0.1.1 Minimum conformance requirements for simultaneous DCI-based active BWP switch on multiple CCs

[TS 38.133, Clause 8.6.2A.1]

The delay requirements for simultaneous DCI based BWP switch on multiple CCs in this clause apply only if the timing difference among the first symbol of slot carrying DCI for all CCs is received within the MRTD for inter-band CA as defined in clause 7.6.4 in TS 38.133 [6].

For DCI-based BWP switch on multiple CCs, after the UE receives BWP switching request, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where slot n is slot which UE receives the earliest BWP switching request among CCs on which UE is performing simultaneous DCI-based BWP switching.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths on any serving cell.

UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay} + Y$, which is defined as:

$$T_{MultipleBWPswitchDelay} = T_{BWPswitchDelay} + D*(N-1)$$

Where:

- $T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in Table 4.6.6.0.1.1-1 depending on UE capability *bwp-SwitchingDelay* (TS 38.331 [13]). $T_{BWPswitchDelay}$ shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, $T_{BWPswitchDelay}$ shall be based on the smallest SCS among all SCS values of all involved CCs.

- D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* (TS 38.306, [11]) for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* for switching between non-dormant and dormant BWPs.

- For UE which is capable of per-FR gap, and no BWP switch involves SCS change, N is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing, N is the number of CCs undergoing simultaneous BWP switch.

- Y=0, if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell.

  Y equals to the length of one slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change,

- if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 KHz.

**Table 4.6.6.0.1.1-1: BWP switch delay**

| $\mu$ | NR Slot length | BWP switch delay $T_{BWPswitchDelay}$ (slots) |
|---|---|---|

| | (ms) | Type 1[Note 1] | Type 2[Note 1] |
|---|---|---|---|
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered on multiple CCs simultaneously within or outside DRX active time, and one of the two BWPs on each CC in a BWP switching is a dormant BWP (TS 38.321, [12]), UE shall be able to complete active BWP switching within the time duration of

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay}+X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay} +X+Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- $T_{MultipleBWPswitchDelay}$ is defined above corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 KHz.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where DCI for dormancy indication is received.

The number of CCs, N, on which the UE can simultaneously switch BWPs while still meeting the requirements, if any, related to allocations on downlink, uplink, or transmission of HARQ-ACK, depends on the UE reported capabilities related to BWP switching, the network configuration and the BWP switch method.

#### 5.5.6.3.0.1.2 Minimum conformance requirements for simultaneous timer-based active BWP switch on multiple CCs

[TS 38.133, Clause 8.6.2B.1]

The delay requirements for simultaneous timer-based BWP switch on multiple CCs in this clause apply only if the timing difference among the beginning of the slot where timer-based BWP switching starts for all CCs is within the MRTD for inter-band CA as defined in clause 7.6.4 in TS 38.133 [6].

For timer-based BWP switch on multiple CCs, UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (in FR1) or DL half-subframe ((in FR2) immediately after the earliest BWP-inactivity timer *bwp-InactivityTimer* (TS 38.331 [13]) expiration occurs on multiple serving cells, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where $T_{MultipleBWPswitchDelay}$ is defined in 4.6.6.0.1.1.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{MultipleBWPswitchDelay}$ after *bwp-InactivityTimer* (TS 38.331 [13]) expires on the cell where timer-based BWP switch occurs.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

### 5.5.6.3.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC

Editor's Note: This test case is incomplete in following aspects:

- Test procedure is missing
- Message contents are missing

#### 5.5.6.3.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch on multiple CCs delay requirement defined in clause 8.6 in TS 38.133 [6].

#### 5.5.6.3.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2, and supporting bwp-SwitchingMultiCCs-r16, either type1-r16 or type2-r16, as well as the corresponding r15 BWP switch capabilities from legacy tests (support of at least 2 active BWPs).

#### 5.5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.6.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.3.1.

#### 5.5.6.3.1.4 Test description

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) and one NR SCell (Cell 3).

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and Cell 3 and the time duration of T2.

5.5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.6.3.1.4.1-1.

**Table 5.5.6.3.1.4.1-1: DL BWP switch supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.6.3.1.4.1-2.

**Table 5.5.6.3.1.4.1-2: Initial conditions for EN-DC PSCell FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.6.3.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 in TS 38.133 [6], cell-specific parameters of NR PSCell are specified in Table 5.5.6.3.1.5-1.

2. Message contents are defined in clause 5.5.6.3.1.4.3.

3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.6.3.1.4.1-3: General test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3 | Two NR radio channel is used for this test for PSCell and SCell |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell, PSCell and SCell |
| *bwp-InactivityTimer* | ms | 200 | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to Cell1 | µs | 3 | Synchronous EN-DC |

| | | | |
|---|---|---|---|
| Cell3 timing offset to Cell2 | µs | 0 | Synchronous Cells |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

5.5.6.3.1.4.2 Test procedure

TBD

5.5.6.3.1.4.3 Message contents

TBD

5.5.6.3.1.5 Test requirement

Table 5.5.6.3.1.5-1 defines the NR cell specific test parameters. Table 5.5.6.3.1.5-2 defines OTA related test parameters.

**5.5.6.3.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Frequency Range | | FR2 | FR2 |
| Duplex mode | | TDD | TDD |
| TDD configuration | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | 1, 2 | 1, 2 |
| Initial DL BWP Configuration | | DLBWP.0.2 Note 2 | DLBWP.0.2 Note 2 |
| Active DL BWP-1 Configuration | | DLBWP.1.1 Note 2 | DLBWP.1.1 Note 2 |
| Active DL BWP-2 Configuration | | DLBWP.1.3 Note 2 | DLBWP.1.3 Note 2 |
| Initial UL BWP Configuration | | ULBWP.0.2 Note 2 | ULBWP.0.2 Note 2 |
| Active UL BWP-1 Configuration | | ULBWP.1.1 Note 2 | ULBWP.1.1 Note 2 |
| Active UL BWP-2 Configuration | | ULBWP.1.3 Note 2 | ULBWP.1.3 Note 2 |
| PDSCH Reference measurement channel | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 |
| SSB Configuration | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 | SMTC.1 |
| TCI State | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | | TRS.2.1 TDD | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Propagation Condition | | AWGN | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

**Table 5.5.6.3.1.5-2: OTA related test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.3.15.1 in TS 38.133 [6] | Setup 1 according to clause A.3.15.1 in TS 38.133 [6] |
| Assumption for UE beams Note 6 | | Fine | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 | -112 |
| $N_{oc}$ Note 1 | dBm/SCS | -103 | -103 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone. |
| Note 6: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation |

During T1, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ($i+T_{MultipleBWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell and SCell from the first UL slot that occurs after the beginning of DL slot ($j+T_{MultipleBWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

Depending on UE capability *bwp-SwitchingDelay* and *bwp-SwitchingMultiCCs-r16* in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay}$ defined in TS 38.133 clause 8.6.2A and 8.6.2B.

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot ($i+Y1$), ($j+Y2$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## 5.5.6.4 SCell dormancy switch

### 5.5.6.4.0 Minimum conformance requirements

#### 5.5.6.4.0.1 Minimum conformance requirements for interruptions due to SCell dormancy switch

[TS 38.133, Clause 8.2.1.2.15.1]

When one SCell in SCG is switched from dormancy to non-dormancy or from non-dormancy to dormancy (TS 38.321 [12]) when UE is in DRX active time,

- the UE is allowed an interruption on active serving cell in SCG as defined in clause 8.2.1.2.7 in TS 38 133, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP.

- The starting time of interruption shall be within the dormancy switching delay as defined in clause 8.6.2 in TS 38 133.

When multiple SCells in SCG are switched from dormancy to non-dormancy or vice versa when the UE is in DRX active time, the interruption requirement described above applies for each BWP switch.

#### 5.5.6.4.0.2 Minimum conformance requirements for interruptions due to CQI measurements during SCell dormancy

[TS 38.133, Clause 8.2.1.2.15.2]

When one or more SCells are in dormancy, the UE is for the purpose of CQI measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements on dormant SCells shall not exceed 0.5%.

#### 5.5.6.4.0.3 Minimum conformance requirements for interruptions due to RRM measurements during SCell dormancy

[TS 38.133, Clause 8.2.1.2.15.3]

When one or more SCells are in dormancy, the UE is for the purpose of RRM measurements on the dormant SCell(s) allowed to cause interruptions to non-dormant serving cell(s).

The rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from RRM measurements on dormant SCells shall not exceed 1.0%.

#### 5.5.6.4.0.4 Minimum conformance requirements for DCI and timer-based BWP switch delay on a single CC

[TS 38.133, Clause 8.6.2]

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n, where

- Y=0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.

- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, $T_{BWPswitchDelay}$ + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 KHz.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* (TS 38.331 [13]) expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* (TS 38.331 [13]) expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* (TS 38.331 [13]), UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 5.5.6.4.0.4-1.

**Table 5.5.6.4.0.4-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP (TS 38.321 [12]), UE shall be able to complete active BWP switching within the time duration of

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or
- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X + Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{BWPswitchDelay}$ is defined in Table 5.5.6.4.0.4-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 KHz.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of $T_{dormantBWPswitchDelay}$ which starts from the beginning of DL slot n.

#### 5.5.6.4.0.5 Minimum conformance requirements for simultaneous DCI based BWP switch delay on multiple CCs

[TS 38.133, Clause 8.6.2A.1]

The delay requirements for simultaneous DCI based BWP switch on multiple CCs in this clause apply only if the timing difference among the first symbol of slot carrying DCI for all CCs is received within the MRTD for inter-band CA as defined in clause 7.6.4 in TS 38.133 [6].

For DCI-based BWP switch on multiple CCs, after the UE receives BWP switching request, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where slot n is slot which UE receives the earliest BWP switching request among CCs on which UE is performing simultaneous DCI-based BWP switching.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths on any serving cell.

UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay} + Y$, which is defined as:

$$T_{MultipleBWPswitchDelay} = T_{BWPswitchDelay} + D*(N-1)$$

Where:

- $T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* [13]. $T_{BWPswitchDelay}$ shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, $T_{BWPswitchDelay}$ shall be based on the smallest SCS among all SCS values of all involved CCs.

- D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* (TS 38.306 [11]) for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* for switching between non-dormant and dormant BWPs.

- For UE which is capable of per-FR gap, and no BWP switch involves SCS change, N is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing, N is the number of CCs undergoing simultaneous BWP switch.

- Y=0, if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell.

  Y equals to the length of one slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change,

- if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 KHz.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered on multiple CCs simultaneously within or outside DRX active time, and one of the two BWPs on each CC in a BWP switching is a dormant BWP (TS 38.321 [12]), UE shall be able to complete active BWP switching within the time duration of

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay}+X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay} +X+Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- $T_{MultipleBWPswitchDelay}$ is defined above corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 KHz.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where DCI for dormancy indication is received.

The number of CCs, N, on which the UE can simultaneously switch BWPs while still meeting the requirements, if any, related to allocations on downlink, uplink, or transmission of HARQ-ACK, depends on the UE reported capabilities related to BWP switching, the network configuration and the BWP switch method.

#### 5.5.6.4.0.6 Minimum conformance requirements for interruptions due to NR SCell dormancy switch

[TS36.133, Clause 7.32.2.14.1]

When one NR SCell in SGC is switched from dormancy to non-dormancy or from non-dormancy to dormancy (TS 38.321 [12]) when UE is in DRX active time in SCG,

- the UE is allowed an interruption on any active serving cell in MCG as defined in clause 7.32.2.7 in TS 36.133, except that the interruption is allowed regardless of which parameters change between the dormant BWP and the non-dormant BWP.

- If the UE is not capable of per-FR gap, or if the dormancy switching involves SCS changing, the interruption is allowed to active serving cell in MCG regardless of the frequency range of the NR SCell on which the dormancy switching occurs. If the UE is capable of per-FR gap and the dormancy switching does not involve SCS changing, UE is allowed to cause interruption to active serving cells in MCG provided that the NR SCell on which the dormancy switching occurs belongs to FR1.

- The starting time of interruption is only allowed within the dormancy switching delay as defined in clause 8.6.2 in TS 38.133 [6].

When more than one NR SCells in SGC are switched from dormancy to non-dormancy or from non-dormancy to dormancy [12] simultaneously when UE is in DRX active time in SCG, the interruption requirements described above apply for dormancy switch on each SCell in SCG.

#### 5.5.6.4.0.7 Minimum conformance requirements for interruptions due to CSI and RRM measurements during SCell dormancy

[TS36.133, Clause 7.32.2.14.2]

When one or more NR SCells in SCG are in dormancy, the UE is allowed to cause interruptions on active E-UTRA serving cells due to CSI and RRM measurements on the NR SCell(s) in dormancy.

The rate of ACK/NACK feedback loss on any active E-UTRA serving cell resulting from CSI and RRM measurements on NR SCells in dormancy shall not exceed 0.5% and 1.0%, respectively.

#### 5.5.6.4.1 E-UTRAN – NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time

Editor's Note: This test case is incomplete in following aspects:

- Test procedure is missing
- Message contents are missing

##### 5.5.6.4.1.1 Test purpose

The purpose of this test is to verify

1. the interruption due to RRM and CSI measurement during SCell dormancy on SpCell is within the limits specified in clause 8.2.1.2.15.2 and 8.2.1.2.15.3 in TS 38.133 [6] for NR victim cell, and
2. the SCell dormancy switch delay is within the requirement defined in clause 8.6.2 in TS 38.133 [6], and the SCell dormancy switch interruption is within the limits defined in clause 8.2.1.2.15.1 in TS 38.133 [6] for NR victim cell.

##### 5.5.6.4.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2, and supporting scellDormancyWithinActiveTime-r16, along with supporting at least 2 active BWPs.

##### 5.5.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.6.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.4.1.

##### 5.5.6.4.1.4 Test description

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3)

The tests consist of three consecutive time periods T1, T2, and T3, respectively. All cells have constant signal levels throughout the test. The UE is continuously scheduled in PCell and PSCell throughout the test.

###### 5.5.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.6.4.1.4.1-1.

**Table 5.5.6.4.1.4.1-1: Dormancy switch supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: A UE which fulfils the requirements in test case in clause 5.5.6.4.2 can skip the test cases in current clause 5.5.6.4.1.<br>Note 3: NR configuration is the same for PSCell and SCells. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.6.4.1.4.1-2.

**Table 5.5.6.4.1.4.1-2: Initial conditions for EN-DC PSCell FR2**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.6.4.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.6.4.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 in TS 38.133 [6], cell-specific parameters of NR PSCell are specified in Table 5.5.6.4.1.5-1.

2. Message contents are defined in clause 5.5.6.4.1.4.3.

3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.6.4.1.4.1-3: General test parameters for Dormancy switch in synchronous EN-DC**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Subtest 1 | Subtest 2 | |
| E-UTRA RF Channel Number | | 1 | | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3 | | Two NR radio channel is used for this test |
| Active PCell | | Cell 1 | | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | | SCell on RF channel number 3. |
| CP length | | Normal | | |
| DRX | | OFF | | |
| Measurement gap pattern Id | | OFF | | |
| *bwp-InactivityTimer* | ms | 500 | | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | µs | 3 | | Synchronous EN-DC |
| Cell3 timing offset to cell2 | µs | 0 | | Synchronous cells |
| Triggering DCI format | | DCI 1_1 | | Triggering DCI format for triggering during active time |
| OFDM symbol range in slot for transmission of DCI with dormancy indication | | 0 – 2 | 3 – 11 | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot. |
| T1 | s | 0.2 | | |
| T2 | s | 5 | | |
| T3 | s | 0.2 | | |

### 5.5.6.4.1.4.2 Test procedure

TBD

### 5.5.6.4.1.4.3 Message contents

TBD

## 5.5.6.4.1.5 Test requirement

Table 5.5.6.4.1.5-1 defines the NR cell specific test parameters. Table 5.5.6.4.1.5-2 defines OTA related test parameters.

**5.5.6.4.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Subtest 1 | | Subtest 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Frequency Range | | FR2 | | FR2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 | | 100 MHz: $N_{RB,c}$ = 66 | |
| Active BWP ID | | 0 | 0 | 0 | 0 |
| Initial DL BWP Configuration | | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 |
| Active DL BWP-0 Configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| Active DL BWP-1 Configuration | | NA | DLBWP.1.2 | NA | DLBWP.1.2 |
| Initial UL BWP Configuration | | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 |
| Active UL BWP-0 Configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| Active UL BWP-1 Configuration | | NA | ULBWP.1.2 | NA | ULBWP.1.2 |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters | | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET parameters | | CCR.3.1 TDD | | CCR.3.2 TDD | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 | | OP.1 | |
| SSB Configuration | | SSB.1 FR2 | | SSB.1 FR2 | |
| SMTC Configuration | | SMTC.1 | | SMTC.1 | |
| TCI State | | TCI.State.0 | | TCI.State.0 | |
| TRS Configuration | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| CSI-RS for CSI reporting | | CSI-RS.3.1 TDD | | CSI-RS.3.1 TDD | |
| CSI reporting periodicity | slots | 640 | | 640 | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | | 640 | |
| Antenna Configuration | | 1x2 | | 1x2 | |
| Propagation Condition | | AWGN | | AWGN | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3.

**Table 5.5.6.4.1.5-2: OTA related test parameters for Dormancy switch in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.3.15 in TS 38.133 [6] | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 | -112 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone. |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone. |

During T1, any interruption on PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 5.5.6.4.0.1for NR victim cell.

During T2, interruptions on PSCell due to CSI and RRM measurements on dormant SCell shall be within the interruption rate requirements specified in 5.5.6.4.0.1for NR victim cell.

During T3, any interruption on PSCell due to dormancy switching of SCell shall be within the requirement specified in clause 5.5.6.4.0.1for NR victim cell. Monitoring of PDCCH for SCell in PSCell shall be resumed within the dormancy switching time specified in TS 38.133 [6] clause 8.6.2A.

For an event to be considered to be correct, all requirements above have to be fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

### 5.5.6.5.0 Minimum conformance requirements

#### 5.5.6.5.0.1 Minimum conformance requirements for E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC

[TS 38.133, Clause 8.6.3A]

The requirements in this clause only apply to the case when the same type of BWP switch (RRC based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

The requirements in this clause shall apply:

- Active BWP switching or parameter change of its active BWPs for SpCell

- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCells

Requirements in this clause apply only if RRC based BWP switching on multiple CCs for NR-CA is triggered by a single RRC command.

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWPs, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}*(N-1)}{NR\ slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ and $T_{BWPswitchDelayRRC}$ are defined in clause 8.6.3 in TS 38.133 [6], and

$D_{RRC} = 0$ for UE which is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [TS 38.331, 13]. $D_{RRC} = D$ for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [TS 38.331, 13], where D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability [TS 38.306, 11].

N is the number of CCs within the NR-CA configured for performing simultaneous BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (N-1)$ on the cells where RRC-based BWP switch occurs.

### 5.5.6.5.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete in following aspects:

- Message contents need more work

#### 5.5.6.5.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for simultaneous RRC-based BWP switch on multiple CCs defined in clause 8.6.3A in TS 38.133 [6].

#### 5.5.6.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, incremental delay for DCI and timer based active BWP switching on multiple CCs simultaneously and 2DL CA.

#### 5.5.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.5.1.

#### 5.5.6.5.1.4 Test description

##### 5.5.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell, NR PSCell and NR SCell are shown in Table 5.5.6.5.1.4.1-1.

**Table 5.5.6.5.1.4.1-1: DL BWP switch supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.6.5.1.4.1-2.

**Table 5.5.6.5.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 5.5.6.5.1.4.1-3.
2. Message contents are defined in clause 5.5.6.5.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

   - UE has dedicated bandwidth part BWP-1 in its RRC configuration for PSCell (Cell 2) and SCell (Cell 3)

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell (Cell 2) and SCell (Cell 3).

**Table 5.5.6.5.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3 | Two NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1 |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2 |
| Active SCell | | Cell 3 | SCell on RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to Cell 1 | µs | 3 | Synchronous EN-DC |
| Cell3 timing offset to Cell 2 | µs | 0 | Synchronous Cells |
| T1 | s | 0.2 | |

### 5.5.6.5.1.4.2 Test procedure

The test consists of 1 time period with duration of T1. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 3 is added as the SCell and activated.

2. Set the parameters according to Tables 5.5.6.5.1.4.1-3, Table 5.5.6.5.1.5-1 and Table 5.5.6.5.1.5-3. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* on NR Cell 2 and NR Cell 3. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 5.5.6.5.1.5-1 and Table 5.5.6.5.1.5-3 for NR Cell 2 and NR Cell 3, respectively.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell and SCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 5.5.6.5.1.5-1 and Table 5.5.6.5.1.5-3.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the RRC message reconfiguring PSCell and SCell BWP, then it reconfigures its bandwidth part with the updated bandwidth part configuration.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1$); and

   b) the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot ($i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1$),

   then count a success for the test, otherwise count a fail for the test.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 8 or step 9 fails, switch off and on the UE and go to step 1.

10. Repeat steps 3-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.6.5.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 5.5.6.5.1.4.3-2: *RRCReconfiguration* (Test procedure, step 3 and step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 5.5.6.5.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.6.5.1.4.3-3: *CellGroupConfig* (Table 5.5.6.5.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |

| | | | |
|---|---|---|---|
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| SpCellConfigDedicated | ServingCellConfig | Table 5.5.6.5.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell | | |
| sCellConfigDedicated | ServingCellConfig | Table 5.5.6.5.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.6.5.1.4.3-4: *ServingCellConfig* (Table 5.5.6.5.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1<br>Table 5.5.6.5.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1<br>Table 5.5.6.5.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.6.5.1.4.3-5: *BWP-Downlink* (Table 5.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

**Table 5.5.6.5.1.4.3-6: BWP-Uplink (Table 5.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

5.5.6.5.1.5 Test requirements

Tables 5.5.6.5.1.4.1-3, 5.5.6.5.1.5-1 and 5.5.6.5.1.5-3 define the primary level settings including test tolerances.

**Table 5.5.6.5.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | FR2 |
| Duplex mode | | | TDD | TDD |
| TDD configuration | | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 | 1 |
| Initial DL BWP Configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Initial UL BWP Configuration | | | ULBWP.0.2 | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | | DLBWP.1.3 | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | | ULBWP.1.3 | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | | DLBWP.1.1 | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SSB Configuration | | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |

| | | | |
|---|---|---|---|
| TCI State | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | | TRS.2.1 TDD | TRS.2.1 TDD |
| Antenna Configuration | | 1x2 | 1x2 |
| Propagation Condition | | AWGN | AWGN |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Table 5.5.6.5.1.5-2: Void

**Table 5.5.6.5.1.5-3: OTA related test parameters for BWP switching test case**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to table A.3.15 | Setup 1 according to table A.3.15 |
| Assumption for UE beams Note 5 | | Fine | Fine |
| $N_{oc}$ Note1 | dBm/15kHz | -112 | -112 |
| $N_{oc}$ Note1 | dBm/SCS | -103 | -103 |
| SS-RSRP Note2 | dBm/SCS Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 5: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

During T1, the UE shall be ready for the reception of uplink grant for PSCell and SCell in the beginning of the DL slot right after slot $(i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length})$.

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.7 PSCell addition and release delay

### 5.5.7.0 Minimum conformance requirements

Same as in clause 4.5.7.0.

### 5.5.7.1 Addition and Release Delay of NR PSCell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.5.7.1.1 Test purpose

The purpose of this test is to verify the NR PSCell addition and release delays under EN-DC when the PSCell is unknown by the UE at the time of addition. This test will verify the requirements in clause 7.31.2 in TS 38.133 [6].

#### 5.5.7.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 which supports EN-DC.

#### 5.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.7.1.

#### 5.5.7.1.4 Test description

##### 5.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.7.1.4.1-1.

**Table 5.5.7.1.4.1-1: Test configurations**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 5.5.7.1-1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 5.5.7.1-2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.7.1.4.1-2.

**Table 5.5.7.1.4.1-2: General Test Parameters for PSCell Addition and Release**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP | dBm | -118 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| | Time to Trigger | s | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| PRACH configuration on cell2 | | | FR2 configuration 2 | Captured in A.3.8.3.2 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE adds the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | | s | 1 | During this time the UE releases the PSCell. |

**Table 5.5.7.1.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.5.7.1.4.3.

2. There are two cells on two different carriers in the test. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC.

### 5.5.7.1.4.2 Test procedure

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 5.5.7.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration message* with event B1 configured.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. T2 starts from the instant when the SS sends the last TTI containing the RRC message, the SS shall set T2 parameters according to Table 5.5.7.1.5-1 as appropriate.
6. The UE shall transmit a MeasurementReport message triggered by Event B1 for Cell 2 no later than TBD from the start of T2.
7. The UE shall send a PRACH to PSCell during T2. The UE shall send PRACH no later than TBD from the start of T2, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 12.
8. T3 starts when UE has sent the PRCH. During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step TBD.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T4 starts from the instant when the SS sends the last TTI containing the RRC message.
10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
11. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
12. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
13. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 15, otherwise switches off the UE.
14. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
15. Repeat step 2-14 until a test verdict has been achieved.

#### 5.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.7.1.4.3-1: Common Exception messages for PSCell Addition and Release**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 for step 3<br>Table H.3.4-1 for step 6.<br>Table H.3.4-4 with condition INTER-RAT NR and EVENT B1 |

### 5.5.7.1.5 Test requirement

Table 5.5.7.1.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 5.5.7.1.5-1: Cell specific test parameters**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA Channel Number | | 1,2 | 1 | | | |
| NR Channel Number | | 1,2 | 2 | | | |

| | | | |
|---|---|---|---|
| Duplex Mode | | 1,2 | TDD |
| TDD configuration | | 1,2 | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 1,2 | 100: NRB,c = 66 |
| Data RBs allocated | | 1,2 | 48 |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | | 1 | TRS.2.1 TDD |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 |
| PDSCH Reference measurement channel | | 1,2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.7 TDD |
| OCNG Patterns | | 1,2 | OP.3 |
| SSB configuration | | 1,2 | SSB.2 FR2 |
| SMTC configuration | | 1,2 | SMTC.2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 |
| TRS Configuration | | 1,2 | TRS.2.1 TDD |
| CSI-RS configuration for CSI reporting | | 1,2 | CSI-RS.3.1 TDD |
| reportConfigType | | 1,2 | periodic |
| reportQuantity | | 1,2 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2 | 40 |
| CSI reporting offset | slot | 1,2 | 4 |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Propagation condition | | 1,2 | No external noise (Note 1) |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [37]. | | | |

**Table 5.5.7.1.5-2: NR OTA Cell specific test parameters**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | Setup 2a according to clause A.3.15.2.1 | | | |
| Assumption for UE beams[Note 6] | | Rough | | | |
| $\hat{E}s$ [Note2] | dBm/SCS | -∞ | -81 | | |
| SSB_RP[Note2, Note 4] | dBm/SCS | -∞ | -81 | | |
| $\hat{E}_s/I_{ot}$ BB [Note 2, Note 7] | dB | -∞ | 4.88 | | |
| Io[Note 2, Note 4] | dBm/95.04 MHz | N/A | -56.41 | | |

Note 1: Void
Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Information about types of UE beam is given in TS.38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

The UE shall transmit the PRACH to PSCell at latest 582 ms into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct.

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

## 5.5.8 Active TCI state switch delay

### 5.5.8.0 Minimum conformance requirements

#### 5.5.8.0.1 Minimum conformance requirements for MAC-CE based active TCI state switch

[TS 38.133, clause 8.10.2]

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remain detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state ≥ -3dB

Otherwise, the TCI state is unknown.

[TS 38.133, clause 8.10.3]

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ $T_{HARQ}$ +(3ms +$TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$)) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ $T_{HARQ}$ +(3ms +$TO_k$*($T_{first\text{-}SSB}$)) / *NR slot length*.

Where,

$T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.321 [12];

$T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;

$T_{SSB\text{-}proc}$ = 2ms;

$TO_k$ = 1 if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ $T_{HARQ}$ +(3 ms + $T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$+ $T_{SSB\text{-}proc}$)) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ $T_{HARQ}$ +(3 ms+ $T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$)) / *NR slot length*.

Where

$T_{L1\text{-}RSRP}$ is the time for L1-RSRP measurement for Rx beam refinement, defined as

- $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
  - with the assumption of M=1
  - with $T_{Report} = 0$
- $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with $T_{Report} = 0$
- $T_{L1\text{-}RSRP_Measurement_Period_SSB} = 0$ for SSB in FR2 and $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS} = 0$ for CSI-RS in FR2, provided that the TCI state switching involves QCL-TypeA, QCL-TypeB or QCL-TypeC only.

$TO_{uk} = 1$ for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD

$TO_{uk} = 1$ when TCI state switching involves other QCL types

$T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

$T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

During MAC-CE based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

#### 5.5.8.0.2 Minimum conformance requirements for RRC based active TCI state switch

[TS 38.133, clause 8.10.2]

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remain detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state $\geq$ -3dB

Otherwise, the TCI state is unknown.

[TS 38.133, clause 8.10.5]

If the target TCI state is known, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot $n+ T_{RRC_processing} +TO_k*(T_{first\text{-}SSB} + T_{SSB\text{-}proc})$ / *NR slot length*. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].
- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB\text{-}proc}$ and $TO_k$ are defined in clause 8.10.3.

If the target TCI state is unknown, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ $T_{RRC_processing}$ +$T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$) / *NR slot length*. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].
- $T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing time at the UE for other QCL types;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{L1\text{-}RSRP}$, $TO_{uk}$ and $T_{SSB\text{-}proc}$ are defined in TS 38.133 clause 8.10.3.

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When $T_{HARQ} > T_{RRC_processing}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

## 5.5.8.1 EN-DC FR2 MAC-CE based active TCI state switch

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: Test parameters have brackets and TBDs.

### 5.5.8.1.1 Test purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10.3.

### 5.5.8.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

### 5.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.8.1.

#### 5.5.8.1.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 5.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.8.1.4.1-1.

**Table 5.5.8.1.4.1-1: Supported test configurations for EN-DC FR2 MAC-CE based active TCI state switch**

| Config | Description |
|---|---|
| 5.5.8.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.8.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.8.1.4.1-2.

**Table 5.5.8.1.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.8.1.4.1-3.
2. Message contents are defined in clause 5.5.8.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.8.1.4.1-3: General test parameters for EN-DC FR2 MAC-CE based active TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | [0.2] | |
| T2 | s | [0.2] | |

##### 5.5.8.1.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and PSCell. The UE shall be configured with 2 different TCI states for PSCell: PDCCH TCI-state 0 (QCL'd to SSB0) and TCI-state 1 (QCL'd to SSB1), in Cell 2 before starting the test. TCI state-0 is indicated as the active PDCCH TCI-state

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.8.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts. During T1 only SSB to which PDCCH TCI-state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.8.1.5-1. T2 starts. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 until slot $n+T_{HARQ}+24+8\times T_{first\text{-}SSB}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 1 after slot $n+T_{HARQ}+40+8\times T_{first\text{-}SSB}$

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI-state 0.
9. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.8.1.4.3-1: Common Exception messages for EN-DC FR2 MAC-CE based active TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

5.5.8.1.5 Test requirement

Tables 5.5.8.1.4.1-3, 5.5.8.1.5-1 and 5.5.8.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 MAC-CE based active TCI state switch.

**Table 5.5.8.1.5-1: NR Cell specific test parameters for EN-DC FR2 MAC-CE based active TCI state switch**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TC. State.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (NOTE 2) |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | |

**Table 5.5.8.1.5-2: OTA related test parameter for EN-DC FR2 MAC-CE based active TCI state switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | [-92.1] | | | |
| $N_{oc}$ Note 1 | dBm/SCS | [-83.1] | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -54.94 | -54.94 | -54.94 | -54.94 |

| | |
|---|---|
| NOTE 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| NOTE 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| NOTE 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| NOTE 5: | As observed with 0dBi gain antenna at the center of the quiet zone. |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall be able to continue to receive on TCI state 0 until $n+T_{HARQ}+(3ms+T_{first\text{-}SSB})$ / NR slot length, where

- $T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 0 until $n+T_{HARQ}+24+8\times T_{first\text{-}SSB}$

After receiving MAC-CE command in slot n, UE shall be able to receive PDCCH with TCI state 1 no later than at slot $n+T_{HARQ}+(3ms+T_{first\text{-}SSB} + T_{SSB\text{-}proc})$ / NR slot length., where

- $T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;
- $T_{SSB\text{-}proc}$ = 2 ms;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 1 no later than $n+T_{HARQ}+40+8\times T_{first\text{-}SSB}$

## 5.5.8.2 EN-DC FR2 RRC based active TCI state switch

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.
- Connection diagram is TBD.
- TT analysis is missing.
- RAN4 dependency: Test parameters have brackets and TBDs.

### 5.5.8.2.1 Test purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10.3.

### 5.5.8.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

### 5.5.8.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.8.2.

#### 5.5.8.2.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 5.5.8.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.8.2.4.1-1.

**Table 5.5.8.2.4.1-1: Supported test configurations for EN-DC FR2 RRC based active TCI state switch**

| Config | Description |
|---|---|
| 5.5.8.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.8.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.8.2.4.1-2.

**Table 5.5.8.2.4.1-2: Initial conditions for EN-DC FR2 RRC based active TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.8.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.8.2.4.1-3.
2. Message contents are defined in clause 5.5.8.2.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.8.2.4.1-3: General test parameters for EN-DC FR2 RRC based active TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | [0.2] | |
| T2 | s | [0.2] | |

#### 5.5.8.2.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and PSCell. The UE shall be configured with 2 different TCI states for PSCell: PDCCH TCI-state 0 (QCL'd to SSB0) and TCI-state 1 (QCL'd to SSB1), in Cell 2 before starting the test. TCI state-0 is indicated as the active PDCCH TCI-state

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.8.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts. During T1 only SSB to which PDCCH TCI-state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.8.2.5-1. T2 starts. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends an *RRCReconfiguration* message to indicate switch to TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. The UE transmits an *RRCReconfigurationComplete* message.
8. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 1 after slot $n+176+8\times T_{first\text{-}SSB}$ the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
9. When T2 expires the SS sends an *RRCReconfiguration* message to indicate switch to TCI-state 0.
10. The UE transmits an *RRCReconfigurationComplete* message.
11. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 continue to step 13. Otherwise continue to step 12.
12. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
13. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.8.2.4.3-1: Common Exception messages for EN-DC FR2 RRC based active TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

### 5.5.8.2.5 Test requirement

Tables 5.5.8.2.4.1-3, 5.5.8.2.5-1 and 5.5.8.2.5-2 define the primary level settings including test tolerances for EN-DC FR2 RRC based active TCI state switch.

**Table 5.5.8.2.5-1: NR Cell specific test parameters for EN-DC FR2 RRC based active TCI state switch**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |

| Parameter | Unit | Cell 2 |
|---|---|---|
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (NOTE 2) |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | |

**Table 5.5.8.2.5-2: OTA related test parameter for EN-DC FR2 RRC based active TCI state switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | [-92.1] | | | |
| $N_{oc}$ Note 1 | dBm/SCS | [-83.1] | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -54.94 | -54.94 | -54.94 | -54.94 |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone. | | | | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to receive PDCCH with TCI state 1 no later than at slot n+ ($T_{RRC_processing}$ + $T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$) / NR slot length, where

- $T_{RRC_processing}$ =20 ms is the RRC processing delay as specified in TS 38.331 [13];

- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to TCI state 1;

- $T_{SSB-proc}$ = 2 ms;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 1 no later than slot n+176+8$\times T_{first-SSB}$.

## 5.5.9 Uplink spatial relation switch delay

### 5.5.9.0 Minimum conformance requirements

#### 5.5.9.0.1 Minimum conformance requirements for MAC-CE based uplink spatial relation switch delay

[TS 38.133, Clause 8.12.3]

If the target spatial relation associated to DL RS is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation in the slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ 1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1 where $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213.

If the target spatial relation associated to DL RS is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation in the slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $T_{L1-RSRP}$+1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213,
- $T_{L1-RSRP}$ is the time for Rx beam refinement in FR2, defined as
  - $T_{L1-RSPR_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
    - with the assumption of M=1
    - with $T_{Report}$ = 0
  - $T_{L1-RSRP_Measurement_Period_CSI-RS}$ for CSI-RS as specified in clause 9.5.4.2
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of M=1 for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with $_{T}$Report = 0

The UE shall be able to transmit with the old UL spatial relation until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

When the UL spatial relation info switch for PUCCH changes both the associated DL RS and *pucch-PathlossReferenceRS* with the same MAC-CE activation, and if both the DL RS and *pucch-PathlossReferenceRS* are known as specified in clause 8.12.2 and 8.14.2 respectively, the UE shall be able to transmit PUCCH with the target UL spatial relation after the delay specified in clause 8.14.3. If either the associated DL RS or *pucch-PathlossReferenceRS* are unknown, a longer switching delay is allowed. The UE is not required to transmit PUCCH with the target UL spatial relation until the DL RS and pathloss reference RS switch are completed.

#### 5.5.9.0.2 Minimum conformance requirements for RRC based uplink spatial relation switch delay

[TS 38.133, Clause 8.12.5]

If the target spatial relation associated to DL RS is known, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot n+ $T_{RRC_processing}$ */NR slot length* +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in 36.331 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS 38.331.

If the target spatial relation associated to DL RS is unknown, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot n+ $T_{RRC_processing}$ */NR slot length* + $T_{L1\text{-}RSRP}$ +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in 36.331 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS 38.331.
- $T_{L1\text{-}RSRP}$ is defined in clause 8.12.3.

## 5.5.9.1 MAC-CE based uplink spatial relation switch

### 5.5.9.1.1 E-UTRAN - NR PSCell FR2 uplink spatial relation switch for a known spatial relation

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

#### 5.5.9.1.1.1 Test purpose

The purpose of this test is to verify the uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 5.5.9.1.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2.

#### 5.5.9.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.9.1.

#### 5.5.9.1.1.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 5.5.9.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.9.1.1.4.1-1.

**Table 5.5.9.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 5.5.9.1.1-1 | LTE FDD; NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.9.1.1-2 | LTE TDD; NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.9.1.1.4.1-2.

**Table 5.5.9.1.1.4.1-2: Initial conditions for EN-DC PSCell FR2 uplink spatial relation switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.9.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.9.1.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.2-1 in TS 38.133 [6].

2. Message contents are defined in clause 5.5.9.1.1.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.9.1.1.4.1-3: General test parameters for spatial relation switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 5.5.9.1.1.4.2 Test procedure

During the test PDCCH indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have continuous ACK/NACK sending by PUCCH.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and NR PSCell. The UE shall be configured with 2 different spatial relations for PSCell: PUCCH spatial relation 0 (QCL'd to SSB0) and spatial relation 1 (QCL'd to SSB1), in Cell 2 before starting the test. Spatial relation 0 is indicated as the active PUCCH spatial relation.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.9.1.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which PUCCH spatial relation 0 is QCL'd is transmitted.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.9.1.1.5-2. T2 starts. At the beginning of T2, the SSB1 corresponding to spatial relation 1 starts transmitting.

4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.

5. The UE transmits an *RRCReconfigurationComplete* message.

6. The SS sends a MAC-CE to indicate switch to spatial relation 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.

7. If the SS:

   a) Receives ACK/NACK on each UL transmission occasion scheduled on spatial relation 0 until slot *n* + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$, and

   b) Receives ACK/NACK on each UL transmission occasion scheduled on spatial relation 1 on and after slot *n* + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$ + 1.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a MAC-CE to indicate switch to spatial relation 0.

9. Wait 1s for the UE to switch to spatial relation 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on spatial relation 0, continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.9.1.1.4.3 Message contents

TBD

### 5.5.9.1.1.5 Test requirement

Table 5.5.9.1.1.5-1 and 5.5.9.1.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 5.5.9.1.1.5-1: NR Cell specific test parameters for spatial relation switch**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| Spatial Relation 0 | | PUCCH. SRI.0 |
| Spatial Relation 1 | | PUCCH. SRI.1 |

| | | |
|---|---|---|
| TRS Configuration | | TRS.2.1 TDD |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 5.5.9.1.1.5-2: OTA related test parameters for uplink spatial relation switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| Noc Note 1 | dBm/15 kHz | -92.1 | | | |
| Noc Note 1 | dBm/SCS | -83.1 | | | |
| Ês/Noc | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6] and does not limit UE implementation or test system implementation. | | | | | |

During T2, UE shall send L1-RSRP report with results for SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to transmit PUCCH on spatial relation 0 till $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$;
- be able to start transmitting PUCCH on spatial relation 1 from slot $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$ + 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 5.5.9.2 RRC based uplink spatial relation switch

### 5.5.9.2.1 E-UTRAN - NR PSCell FR2 spatial relation switch associated with a known DL-RS

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

#### 5.5.9.2.1.1 Test purpose

The purpose of this test is to verify the RRC based uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12.5 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 5.5.9.2.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2.

#### 5.5.9.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.9.2.

#### 5.5.9.2.1.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 5.5.9.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.9.2.1.4.1-1.

**Table 5.5.9.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 5.5.9.2.1-1 | LTE FDD; NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.9.2.1-2 | LTE TDD; NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.9.2.1.4.1-2.

**Table 5.5.9.2.1.4.1-2: Initial conditions for EN-DC PSCell FR2 uplink spatial relation switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.9.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.9.2.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.2-1 in TS 38.133 [6].
2. Message contents are defined in clause 5.5.9.2.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.9.2.1.4.1-3: General test parameters for spatial relation switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

#### 5.5.9.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and NR PSCell. The UE shall be configured with 1 SRS-SpatialRelation0 associated with SSB0. UE is indicated SRS-SpatialRelation0 as the active SRS spatial relation.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.9.2.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which SRS-SpatialRelation0 associated is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.9.2.1.5-2. T2 starts. At the beginning of T2, the SSB1 corresponding to SRS-SpatialRelation1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a RRC to indicate switch to periodic SRS with target SRS-SpatialRelation1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:

   a) Receives periodic SRS with target spatial relation (SRS-SpatialRelation0) on PSCell until n + $T_{RRC_processing}$/NR slot length, and

   b) Receives periodic SRS with target spatial relation (SRS-SpatialRelation1) on PSCell on and after n + $T_{RRC_processing}$/NR slot length + 1.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a RRC to indicate switch to SRS-SpatialRelation0.
9. Wait 1s for the UE to switch to SRS-SpatialRelation0. If the SS receives SRS with target spatial relation (SRS-SpatialRelation0), continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.9.2.1.4.3 Message contents

TBD

5.5.9.2.1.5 Test requirement

Table 5.5.9.2.1.5-1 and 5.5.9.2.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 5.5.9.2.1.5-1: NR Cell specific test parameters for spatial relation switch**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| SRS-SpatialRelation0 | | SRS.SRI0 |
| SRS-SpatialRelation1 | | SRS.SRI1 |
| TRS Configuration | | TRS.2.1 TDD |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 160 |
| timeRestrictionForChannelMeasurements | | configured |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 5.5.9.2.1.5-2: OTA related test parameters for uplink spatial relation switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | Rough | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the center of the quiet zone. |
| Note 5: | As observed with 0dBi gain antenna at the center of the quiet zone. |
| Note 6: | Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation |

During T2, UE shall send L1-RSRP report with SSB1 to which SRS-SpatialRelation1 is associated.

After receiving RRC command in slot n, UE shall be able to transmit target periodic SRS with SRS-SpatialRelation1 on PSCell in the slot n + $T_{RRC_processing}$/*NR slot length* + 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 5.5.10 UE specific CBW change

### 5.5.10.0 Minimum conformance requirements

#### 5.5.10.0.1 Minimum conformance requirements for UE specific CBW change

[TS 38.133, Clause 8.13]

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in clause 11.2 in TS 36.331 [29] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [13], and

$T_{CBWchangeDelayRRC} = 6ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

### 5.5.10.1 UE specific CBW change on FR2 NR PSCell

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing
- TT analysis is missing

#### 5.5.10.1.1 Test purpose

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13 in TS 38.133 [6].

#### 5.5.10.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2. The requirements in this test apply for a UE which receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

#### 5.5.10.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.10.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.10.1.

#### 5.5.10.1.4 Test description

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table 5.5.10.1.4.1-3. All cells have constant signal levels throughout the test. The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

During T1 the SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The SS verifies the UE specific CBW switching delay in PSCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received (RRC Reconfiguration Complete message).

##### 5.5.10.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.10.1.4.1-1.

**Table 5.5.10.1.4.1-1: UE specific CBW change supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.10.1.4.1-2.

**Table 5.5.10.1.4.1-2: Initial conditions for EN-DC PSCell FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.10.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.10.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 in TS 38.133 [6], cell-specific parameters of NR PSCell are specified in Table 5.5.10.1.5-1.

2. Message contents are defined in clause 5.5.10.1.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.10.1.4.1-3: General test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | [0.2] | |

### 5.5.10.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC). UE has been configured via RRC-configuration (*SCS-SpecificCarrier* in TS 38.331 [13]) with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP in PSCell. Set the parameters according to Tables 4.5.9.1.4.1-3 and 4.5.9.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 2.

3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

4. T1 starts from the beginning of slot *i*, where slot *i* is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5. The UE shall reconfigure its CBW with the updated CBW of final condition (CBW-2).

6. The SS verifies the UE specific CBW change time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

7. If the UE starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot ($i+ \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$) then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. If it is successful, continue to step 10. Otherwise continue to step 9.

9. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

10. Repeat steps 2-9 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.5.10.1.4.3 Message contents

TBD

## 5.5.10.1.5 Test requirement

Table 5.5.10.1.5-1 defines the NR cell specific test parameters. Table 5.5.10.1.5-2 defines OTA related test parameters, not including test tolerances yet.

Editor's note: will be updated after TT analysis.

**5.5.10.1.5-1: NR Cell specific test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | | | TDD |
| TDD configuration | | | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 |
| Initial DL BWP Configuration | | | DLBWP.0.2 |
| Initial UL BWP Configuration | | | ULBWP.0.2 |
| Active DL BWP Configuration | | | DLBWP.1.3 |
| Active UL BWP Configuration | | | DLBWP.1.3 |
| Initial Condition | Active DL CBW-1 Configuration | | DLCBW.1.1 |
| | Active UL CBW-1 Configuration | | ULCBW.1.1 |
| Final Condition | Active DL CBW-2 Configuration | | DLCBW.1.2 |
| | Active UL CBW-2 Configuration | | ULCBW.1.2 |
| PDSCH Reference measurement channel | | | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| TCI State | | | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 5.5.10.1.5-2: OTA related test parameters for UE specific CBW change test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 according to table A.3.15 in TS 38.133 [6] |
| Assumption for UE beams[Note 5] | | | Fine |
| $N_{oc}$ [Note1] | NR_TDD_FR2_A | dBm/15kHz | -112 + TT |

| | | | |
|---|---|---|---|
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -103 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note3 | -85 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $\hat{E}_s / I_{ot}$ | | dB | 18 + TT |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.

Note 5: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6]., and does not limit UE implementation or test system implementation.

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot $(i+\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length})$.

All of the above test requirements shall be fulfilled in order for the observed PSCell UE specific CBW change switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.11 Unified TCI state switch delay

### 5.5.11.0 Minimum conformance requirements

#### 5.5.11.0.1 Minimum conformance requirements for MAC-CE based downlink TCI state switch delay for unified TCI

[TS 38.133, clause 8.15.2]

The downlink TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target downlink TCI state to the completion of active downlink TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target downlink TCI state or QCLed to the target downlink TCI state

  - Downlink TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement

- The UE has sent at least 1 L1-RSRP report for the target downlink TCI state before the downlink TCI state switch command
- The target downlink TCI state remains detectable during the downlink TCI state switching period
- The SSB associated with the downlink TCI state remain detectable during the downlink TCI switching period
  - SNR of the downlink TCI state ≥ -3dB
  - The SSB can be associated with either the serving cell PCI or a PCI different from serving cell PCI.

Otherwise, the downlink TCI state is unknown.

[TS 38.133, clause 8.15.3]

The requirements in this clause shall apply for DL TCI state switch using separate DL TCI state or joint TCI state of unified TCI state switch framework.

In case that source RS in DL TCI state or joint TCI state is associated with a PCI different from that of the serving cell, the requirements in this clause shall apply if the cell with different PCI satisfies the known cell condition defined in 8.15.1. If the known cell condition is not met, longer delay may be expected.

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$) / *NR slot length*. The UE shall be able to receive UE-dedicated PDCCH/PDSCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$ where $T_{HARQ}$ (in slot) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];

- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB\text{-}proc}$ = 2 ms;
- $TO_k$ = 1 if target TCI state is not in the active TCI state list for PDSCH/PDCCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ +$3N_{slot}^{subframe,\mu}$ + ($T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$+ $T_{SSB\text{-}proc}$)) / *NR slot length*. The UE shall be able to receive UE-dedicated PDCCH/PDSCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

Where

- $T_{L1\text{-}RSRP}$ = 0 in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
- $T_{L1\text{-}RSPR_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
  - with the assumption of M=1
  - with $T_{Report}$ = 0
- $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2
  - CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell
  - configured with higher layer parameter *repetition* set to ON
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with $T_{Report}$ = 0

- $TO_{uk}$ = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD

- $TO_{uk}$ = 1 when TCI state switching involves other QCL types only

- $T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

#### 5.5.11.0.2 Minimum conformance requirements for MAC-CE based uplink TCI state switch delay for unified TCI

[TS 38.133, clause 8.16.2]

The uplink TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target uplink TCI state to the completion of active uplink TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target uplink TCI state or QCLed to the target uplink TCI state

  - Uplink TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement

  - The UE has sent at least 1 L1-RSRP report for the target uplink TCI state before the uplink TCI state switch command

  - The RS configured in target uplink TCI state remains detectable during the uplink TCI state switching period

    - SNR of the RS configured in target uplink TCI state ≥ -3dB

  - The target uplink TCI state remains detectable during the uplink TCI state switching period

  - The SSB associated with the uplink TCI state remain detectable during the uplink TCI switching period

    - SNR of the uplink TCI state ≥ -3dB

    - The SSB can be associated with either the serving cell PCI or a PCI different from serving cell PCI.

Otherwise, the uplink TCI state is unknown.

[TS 38.133, clause 8.16.3]

The requirements in this clause shall apply for UL TCI state switch using separate UL TCI state or joint TCI state of unified TCI state switch framework.

In case that source RS in UL TCI state or joint TCI state is associated with a PCI different from that of the serving cell, the requirements in this clause shall apply if the cell with different PCI satisfies the known cell condition defined in 8.16.1. If the known cell condition is not met, longer delay may be expected.

In case of joint TCI state switch, UE is not expected to transmit on UL based on the target TCI state before UE completes the DL and UL TCI state switch.

For separate UL TCI state switch or joint TCI state switch for PUCCH or PUSCH, or semi-persistent/aperiodic/periodic SRS, when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1, upon receiving PDSCH carrying MAC-CE activation command in slot n on serving cell,

- If target TCI state is known,

- The UE shall be able to transmit uplink signal with the target TCI state in the slot $n+T_{HARQ} + 3N_{slot}^{subframe,\mu} + NM^* (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms) / \textit{NR slot length}$.

- If target TCI state is unknown,

- The UE shall be able to transmit uplink signal with the target TCI state in the slot $n+T_{HARQ} + 3N_{slot}^{subframe,\mu} + (T_{L1\text{-}RSRP} + T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*.

- The UE shall be able to transmit with the old UL TCI state until slot $n+ T_{HARQ} + 3N_{slot}^{subframe,\mu}$.

Where,

- $T_{HARQ}$ (in slot) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8].
- NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise.
- PL-RS is maintained provided:
  - the target PL-RS is associated with or included in the UL or joint TCI states in the active TCI list for PUSCH/PUCCH/SRS transmissions
  - There are no more than 4 different RS activated as PL-RS per serving cell among all active UL TCI states (UL or joint TCI state) for PUSCH/PUCCH/SRS transmissions
- The target pathloss reference signal remains detectable during TCI state switching period
- SNR of the target pathloss reference signal≥-3dB
- The associated SSBs with the target pathloss reference signal remain detectable during the TCI state switching period.
- SNR of the associated SSB ≥-3dB
- $T_{first_target\text{-}PL\text{-}RS}$ is time to first pathloss RS transmission after L1-RSRP measurement when target TCI state is unknown.
- $T_{first_target\text{-}PL\text{-}RS}$ is time to first pathloss RS transmission after MAC CE command is decoded by the UE for known TCI State.
- $T_{target_PL\text{-}RS}$ is the periodicity of the target pathloss reference signal which would be SSB or NZP CSI-RS when PL-RS is associated with serving cell
- $T_{target_PL\text{-}RS}$ is the periodicity of the target pathloss reference signal which would be SSB when PL-RS is associated with PCI different from serving cell
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
  - $T_{L1\text{-}RSPR_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
    - with the assumption of M=1
    - with $T_{Report} = 0$
  - $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2
    - CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of M=1 for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with $T_{Report} = 0$

Editor note: when PL-RS is SSB in FR2, the delay requirement is FFS.

The requirements specified in this clause are applicable if no more than 4 different RSs are activated as PL-RS per serving cell among all active UL (or joint) TCI states.

## 5.5.11.1 EN-DC FR2 MAC-CE based active joint TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.11.1.1 Test purpose

The purpose of this test is to verify the MAC-CE based joint TCI state switch delay requirement defined in TS 38.133 [6] clause 8.15.3 and 8.16.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

### 5.5.11.1.2 Test applicability

This test applies to all types of UE supporting E-UTRA and EN-DC from release 17 onwards and supporting unified TCI state operation.

### 5.5.11.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.11.0.1 and 5.5.11.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.11.1.

### 5.5.11.1.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

#### 5.5.11.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.11.1.4.1-1.

**Table 5.5.11.1.4.1-1: Supported test configurations for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Config | Description |
|---|---|
| 5.5.11.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.11.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.11.1.4.1-2.

**Table 5.5.11.1.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 36.508 [25] clause 4.3.1 for E-UTRA and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.11.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.11.1.4.1-3.
2. Message contents are defined in clause 5.5.11.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.11.1.4.1-3: General test parameters for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel No. | | Channel 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel No. | | Channel 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| L1-RSRP reporting period | | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of RS for L1-RSRP reporting | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 5.5.11.1.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and NR PSCell. The UE shall be configured with 2 different DLorJoint states for PSCell: Joint TCI state 0 (QCL'd to SSB0) and Joint TCI state 1 (QCL'd to SSB1), in Cell 2 before starting the test. Joint TCI state 0 is indicated as the active joint TCI-state

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.11.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which Joint TCI state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.11.1.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to Joint TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to Joint TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 0 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 1 after slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a MAC-CE to indicate switch to Joint TCI state 0.
9. Wait 1s for the UE to switch Joint TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.11.1.4.3-1: Common Exception messages for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 5.5.11.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | joint | | |
| uplink-PowerControlToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF Uplink-powerControl-r17 { | 1 entry | | |
| uplink-powerControl-r17[1] SEQUENCE { | | Entry 1 | |
| ul-powercontrolId-r17 | 1 | | |
| p0AlphaSetforPUSCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforPUCCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforSRS-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| } | | | |
| } | | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

**Table 5.5.11.1.4.3-3: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| pathlossReferenceRSToAddModList-r17 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | 1 entry | | |
| PathlossReferenceRS-r17 [1] SEQUENCE { | | Entry 1 | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| referenceSignal-r17 CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | Resource #4 in TRS.2.1 | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| } | | | |
| } | | | |
| pathlossReferenceRSToReleaseList-r17 | Not present | | |
| } | | | |

**Table 5.5.11.1.4.3-4: *PDSCH-Config***

| Derivation Path: TS 38.508-1 [14], table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-Field-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-RetxDCI-1-2-r17 | Not present | | |
| pucch-sSCellDynDCI-1-2-r17 | Not present | | |
| dl-OrJointTCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| dl-OrJointTCI-StateToAddModList-r17 SEQUENCE (SIZE (1..maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State [1] | TCI-state_1 | Entry 1 DLorJoint TCI.State.2 | |
| TCI-State [2] | TCI-state_2 | Entry 2 DLorJoint TCI.State.3 | |
| } | | | |
| dl-OrJointTCI-StateToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |
| beamAppTime-r17 | Not present | | |
| dummy | Not present | | |
| dmrs-FD-OCC-DisabledForRank1-PDSCH-r17 | Not present | | |
| minimumSchedulingOffsetK0-r17 | Not present | | |
| harq-ProcessNumberSizeDCI-1-2-v1700 | Not present | | |
| harq-ProcessNumberSizeDCI-1-1-r17 | Not present | | |
| mcs-Table-r17 | Not present | | |
| mcs-TableDCI-1-2-r17 | Not present | | |
| xOverheadMulticast-r17 | Not present | | |
| priorityIndicatorDCI-4-2-r17 | Not present | | |
| sizeDCI-4-2-r17 | Not present | | |
| } | | | |

**Table 5.5.11.1.4.3-5: *TCI-State_1* (Table 5.5.11.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 0 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | 0 | TRS.2.1 TDD Resource #4 | |
| ul-powerControl-r17 | 1 | | |
| } | | | |

**Table 5.5.11.1.4.3-6: *TCI-State_2* (Table 5.5.11.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 1 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | 0 | TRS.2.1 TDD Resource #4 | |
| ul-powerControl-r17 | 1 | | |
| } | | | |

### 5.5.11.1.5 Test requirement

Tables 5.5.11.1.4.1-3, 5.5.11.1.5-1 and 5.5.11.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 MAC-CE based active TCI state switch.

**Table 5.5.11.1.5-1: NR Cell specific test parameters for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |

| | | |
|---|---|---|
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| Joint TCI State 0 | | DLorJoint TCI.State.2 |
| Joint TCI State 1 | | DLorJoint TCI.State.3 |
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.2<br>TRS 2.2 TDD for DLorJoint TCI.State.3 |
| Pathloss RS Configuration | | Resource #4 in TRS.2.1 TDD for DLorJoint TCI.State.2 and for DLorJoint TCI.State.3 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 5.5.11.1.5-2: OTA related test parameter for EN-DC FR2 MAC-CE based active joint TCI state switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB#0 | | SSB#1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough for SSB reception | | | |
| Noc Note 1 | dBm/15 kHz | -95.1 | | | |
| Noc Note 1 | dBm/SCS | -86.1 | | | |
| Ês/Noc | dB | 3.4 | 3.4 | -Infinity | 3.4 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.7 | -82.7 | -Infinity | -82.7 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -56.47 | -56.47 | -61.5 | -56.47 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0dBi gain antenna at the center of the quiet zone. |
| Note 6: | Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation. |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall

- be able to continue to receive and transmit with Joint TCI state 0 until $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$,

- be able to start receiving and transmitting with Joint TCI state 1 after slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.11.2 EN-DC FR2 MAC-CE based active uplink TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.11.2.1 Test purpose

The purpose of this test is to verify the MAC-CE based uplink TCI state switch delay requirement defined in TS 38.133 [6] clause 8.16.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

### 5.5.11.2.2 Test applicability

This test applies to all types of UE supporting E-UTRA and EN-DC from release 17 onwards and supporting unified TCI state operation.

### 5.5.11.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.11.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.11.2.

### 5.5.11.2.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

#### 5.5.11.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.11.2.4.1-1.

**Table 5.5.11.2.4.1-1: Supported test configurations for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Config | Description |
|---|---|
| 5.5.11.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.11.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.11.2.4.1-2.

**Table 5.5.11.2.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 36.508 [25] clause 4.3.1 for E-UTRA and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.11.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.11.2.4.1-3.
2. Message contents are defined in clause 5.5.11.2.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.11.2.4.1-3: General test parameters for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel No. | | Channel 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel No. | | Channel 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| L1-RSRP reporting period | | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 5.5.11.2.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and NR PSCell. The UE shall be configured with 2 different uplink TCI states for PSCell: uplink TCI state 0 (associated to SSB0) and uplink TCI state 1 (associated to SSB1), in Cell 2 before starting the test. Uplink TCI state 0 is indicated as the active uplink TCI-state.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.11.2.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which Uplink TCI state 0 is associated is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.11.2.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to uplink TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to uplink TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on Uplink TCI state 0 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on Uplink TCI state 1 after slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$ + ($T_{first_target\text{-}PL\text{-}RS}$ + 4*$T_{target_PL\text{-}RS}$ + 2ms) / *NR slot length*

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to uplink TCI state 0.
9. Wait 1s for the UE to switch to uplink TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.5.11.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.11.2.4.3-1: Common Exception messages for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 5.5.11.2.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | separate | | |
| uplink-PowerControlToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF Uplink-powerControl-r17 { | 1 entry | | |
| uplink-powerControl-r17[1] SEQUENCE { | | | |
| ul-powercontrolId-r17 | 1 | Entry 1 | |
| p0AlphaSetforPUSCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforPUCCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforSRS-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| } | | | |
| } | | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.11.2.4.3-3: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| ul-TCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| ul-TCI-ToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF TCI-UL-State-r17 { | 2 entries | | |
| TCI-UL-State-r17 [1] SEQUENCE { | | Entry 1<br>UL TCI.State.2 | |
| tci-UL-StateId-r17 | 0 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal-r17 CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| TCI-UL-State-r17 [2] SEQUENCE { | | Entry 1<br>UL TCI.State.3 | |
| tci-UL-StateId-r17 | 1 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |

| | | | |
|---|---|---|---|
| }<br>} | | | |
| ul-TCI-ToReleaseList-r17 | Not present | | |
| }<br>} | | | |
| ul-powerControl-r17 | Not present | | |
| pucch-ConfigurationListMulticast1-r17 | Not present | | |
| pucch-ConfigurationListMulticast2-r17 | Not present | | |
| pathlossReferenceRSToAddModList-r17 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | 1 entry | | |
| PathlossReferenceRS-r17 [1] SEQUENCE { | | Entry 1 | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| referenceSignal-r17 CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | Resource #4 in TRS.2.1 | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| }<br>} | | | |
| pathlossReferenceRSToReleaseList-r17 | Not present | | |
| } | | | |

### 5.5.11.2.5 Test requirement

Tables 5.5.11.2.4.1-3, 5.5.11.2.5-1 and 5.5.11.2.5-2 define the primary level settings including test tolerances for EN-DC FR2 MAC-CE based active TCI state switch.

**Table 5.5.11.2.5-1: NR Cell specific test parameters for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI state | | DLorJoint TCI.State.0 |
| PL-RS Configuration (CSI-RS#1) | | Resource #4 in TRS.2.1 TDD for UL TCI.State.2<br>Resource #4 in TRS.2.2 TDD for UL TCI.State.3 |
| Uplink TCI State 0 | | UL TCI.State.2 |
| Uplink TCI State 1 | | UL TCI.State.3 |
| TRS Configuration | | TRS.2.1 TDD |
| reportQuantity for SSB | | ssb-Index-RSRP-Index-r17 |
| reportConfigType for SSB | | periodic |
| reportQuantity for CSI-RS | | cri-RSRP-Index-r17 |
| reportConfigType for CSI-RS | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |

| | | |
|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 5.5.11.2.5-2: OTA related test parameter for EN-DC FR2 MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | SSB#0 | | SSB#1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough for SSB reception | | | |
| Noc Note 1 | dBm/15 kHz | -95.1 | | | |
| Noc Note 1 | dBm/SCS | -86.1 | | | |
| Ês/Noc | dB | 3.4 | 3.4 | -Infinity | 3.4 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.7 | -82.7 | -Infinity | -82.7 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -56.47 | -56.47 | -61.5 | -56.47 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>Note 6: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall

- be able to continue to receive and transmit PUCCH on uplink TCI state 0 until $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$,

- be able to start transmitting PUCCH on uplink TCI state 1 from slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.11.3 EN-DC FR2 MAC-CE based active downlink TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.5.11.3.1 Test purpose

The purpose of this test is to verify the MAC-CE based downlink TCI state switch delay requirement defined in TS 38.133 [6] clause 8.15.3.

#### 5.5.11.3.2 Test applicability

This test applies to all types of UE supporting E-UTRA and EN-DC from release 17 onwards and supporting unified TCI state operation.

#### 5.5.11.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.11.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.11.3.

#### 5.5.11.3.4 Test description

There are two cells configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 5.5.11.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.11.3.4.1-1.

**Table 5.5.11.3.4.1-1: Supported test configurations for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Config | Description |
|---|---|
| 5.5.11.3-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.5.11.3-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.11.3.4.1-2.

**Table 5.5.11.3.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 36.508 [25] clause 4.3.1 for E-UTRA and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.11.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 5.5.11.3.4.1-3.
2. Message contents are defined in clause 5.5.11.3.4.3.
3. There are one E-UTRAN cell, one NR PSCell and one NR cell with additional PCI different from serving cell (Cell 3) specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.5.11.3.4.1-3: General test parameters for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| E-UTRA RF Channel No. | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel No. | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Cell with additional PCI | | Cell 3 | Cell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | µs | 0 | |
| L1-RSRP reporting period | | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

#### 5.5.11.3.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and cell with additional PCI (Cell 3) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell, NR PSCell and cell with additional PCI. The UE is configured with L1-RSRP measurements on cell with additional PCI (Cell 3). The UE shall be configured with 2 different downlink TCI states for PSCell: TCI state 0 (QCL'd to TRS resource set 1, TCI state of which is QCLed to SSB0 of Cell 2) and downlink TCI state 1 (QCL'd to TRS resource set 3, TCI state of which is QCLed to SSB1 of Cell 3), in Cell 2 before starting the test. TCI state 0 is indicated as the active downlink TCI-state.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 2 according to T1 in Table 5.5.11.3.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which PDCCH-TCI state0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.11.3.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to downlink TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to downlink TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 of cell 2 and SSB1 of cell 3.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 0 until slot $n+T_{HARQ}+3$ms, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 1 after slot $n+T_{HARQ}+3$ ms + $(T_{first\text{-}SSB} + T_{SSB\text{-}proc})$

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to downlink TCI state 0.
9. Wait 1s for the UE to switch to downlink TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 0 continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.5.11.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.11.3.4.3-1: Common Exception messages for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 5.5.11.3.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | separate | | |
| uplink-PowerControlToAddModList-r17 | Not present | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.11.3.4.3-3: *PDSCH-Config***

| Derivation Path: TS 38.508-1 [14], table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-Field-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-RetxDCI-1-2-r17 | Not present | | |
| pucch-sSCellDynDCI-1-2-r17 | Not present | | |
| dl-OrJointTCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| dl-OrJointTCI-StateToAddModList-r17 SEQUENCE (SIZE (1..maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State [1] | TCI-state_1 | Entry 1 DLorJoint TCI.State.2 | |
| TCI-State [2] | TCI-state_2 | Entry 2 DLorJoint TCI.State.3 | |
| } | | | |
| dl-OrJointTCI-StateToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| beamAppTime-r17 | Not present | | |
| dummy | Not present | | |
| dmrs-FD-OCC-DisabledForRank1-PDSCH-r17 | Not present | | |
| minimumSchedulingOffsetK0-r17 | Not present | | |
| harq-ProcessNumberSizeDCI-1-2-v1700 | Not present | | |
| harq-ProcessNumberSizeDCI-1-1-r17 | Not present | | |
| mcs-Table-r17 | Not present | | |
| mcs-TableDCI-1-2-r17 | Not present | | |
| xOverheadMulticast-r17 | Not present | | |
| priorityIndicatorDCI-4-2-r17 | Not present | | |
| sizeDCI-4-2-r17 | Not present | | |
| } | | | |

**Table 5.5.11.3.4.3-4: *TCI-State_1* (Table 5.5.11.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 0 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| ul-powerControl-r17 | Not present | | |
| } | | | |

**Table 5.5.11.3.4.3-5: *TCI-State_2* (Table 5.5.11.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 1 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| ul-powerControl-r17 | Not present | | |
| } | | | |

5.5.11.3.5 Test requirement

Tables 5.5.11.3.4.1-3, 5.5.11.3.5-1 and 5.5.11.3.5-2 define the primary level settings including test tolerances for EN-DC FR2 MAC-CE based active TCI state switch.

**Table 5.5.11.3.5-1: NR Cell specific test parameters for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI State 0 | | DLorJoint TCI.State.0 |
| DL TCI State 1 | | DLorJoint TCI.State.1 |
| UL TCI State 0 | | UL TCI.State.0 |
| UL TCI State 1 | | UL TCI.State.1 |
| Pathloss RS Configuration | | Resource #4 in TRS.2.1 TDD |
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.0<br>TRS.2.2 TDD for DLorJoint TCI.State.1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | |

**Table 5.5.11.3.5-2: OTA related test parameter for EN-DC FR2 MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| $\hat{E}_S$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B_RP Note 2 | dBm/SCS | -80.6 | -80.6 | - Infinity | -80.6 |
| $\hat{E}_s/I_{oc}$ BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |

| | | | | | |
|---|---|---|---|---|---|
| Io[Note2] | dBm/95.04 MHz [Note4] | -56.0 | -56.0 | - Infinity | -56.0 |

Note 1: Void
Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall

- be able to continue to receive on DL TCI state 0 till n+ $T_{HARQ}$ +$3N_{slot}^{subframe,\mu}$,
- be able to start receiving on DL TCI state 1 after n+ $T_{HARQ}$ +(5 ms + $T_{first\text{-}SSB}$) / *NR slot length*

The rate of correct events observed during repeated tests shall be at least 90%.

## 5.5.12 PSCell activation and deactivation delay

### 5.5.12.0 Minimum conformance requirements

#### 5.5.12.0.1 Minimum conformance requirements for PSCell activation and deactivation delay

[TS 36.133, clause 7.38]

The requirements in this clause shall apply for the UE configured with one deactivated SCG in EN-DC, and when PSCell in one SCG is being activated.

The delay within which the UE shall be able to activate the deactivated SCG depends upon the specified conditions.

Upon receiving SCG activation command in slot *n*, the UE shall be capable to transmit PRACH preamble or PUCCH towards PSCell no later than in slot n + $\frac{T_{activation_time}}{NR\ slot\ length}$ ,

where:

$T_{activation_time} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. When PSCell is activated from deactivated state, if any PSCell parameter is modified, $T_{processing}$ = [20ms]. Otherwise, $T_{processing}$ = [5 or 10ms].

$T_{search}$ is the time for AGC settling and PSS/SSS detection.

For RACH based PSCell activation, if the target cell is a known NR FR1 or FR2 PSCell, $T_{search}$ = 0 ms. If the target cell is an unknown FR1 PSCell and Es/Iot ≥ -2 dB, $T_{search}$ = 3* $T_{rs}$ ms. If the target cell is an unknown FR2 PSCell and Es/Iot ≥ -2 dB, then $T_{search}$ = 24* $T_{rs}$ ms.

For RACH-less based PSCell activation, if RLM and BFD are configured and no failure is detected, $T_{search}$ = 0 ms if the target cell is a known FR2 PSCell. There are no requirements if PSCell is unknown.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target PSCell. $T_{\Delta}$ = 1*Trs ms.

$T_{IU}$: When RACH based PSCell activation is configured, it is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{IU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

When RACH-less based PSCell activation is configured, it is the uncertainty in acquiring the first PUSCH transmission occasion [or SR on PUCCH].

Trs is the SMTC periodicity of the PSCell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the SCG activation command:
  - the UE has sent a valid measurement report for the PSCell being activated and
  - One of the SSBs measured from the PSCell being activated remains detectable according to the cell identification conditions specified in clause 9.3.
- One of the SSBs measured from PSCell being activated also remains detectable during the PSCell activation delay $T_{config_PSCell}$ according to the cell identification conditions specified in clause 9.3.

otherwise, it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [13].

The requirements in this clause shall apply for a UE which is configured with at least PCell and PSCell.

Upon receiving SCG deactivation command in subframe n, the UE shall accomplish the deactivation actions specified in TS 38.331 [13] no later than in slot $n + \frac{T_{RRC_delay}}{\text{NR slot length}}$:

where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [13].

FFS: MAC CE based SCG deactivation delay requirements.

The normative reference for this requirement is TS 36.133 [23] clause 7.38.2 and 7.38.3.

## 5.5.12.1 EN-DC FR2 PSCell activation and deactivation delay

Editor's Note: This test case is incomplete in following aspects:

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 5.5.12.1.1 Test purpose

This test is to verify that the NR PSCell activation and deactivation delay under EN-DC are within the requirements, for the case when UE configured with one deactivated SCG and when PSCell in one SCG is being activated where the PSCell is known by the UE at the time of activation.

### 5.5.12.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting activation and deactivation on SCG.

#### 5.5.12.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.12.0.1.

The normative reference for this requirement is TS 36.133 [23] 7.38 and TS 38.133 [6] clause A.5.5.12.1.

#### 5.5.12.1.4 Test description

##### 5.5.12.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.12.1.4.1-1.

**Table 5.5.12.1.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.12.1.4.1-2 and Table 5.5.12.1.4.1-3.

**Table 5.5.12.1.4.1-2: Initial conditions for PSCell activation and deactivation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.1.1.2-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.12.1.4.1-3: General Test Parameters for PSCell activation and deactivation**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Deactivated cell | | Cell2 | SCell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Deactivated cell | | Cell2 | PSCell deactivated on RF channel number 2. |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Scheduling request resource periodicity | | | 20ms | At the starting of period T3, UE sends a SR on PUCCH for PSCell |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE adds the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | | s | 1 | During this time the UE releases the PSCell. |

1. Message contents are defined in clause 5.5.12.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR2 cells. Cell 2 is the deactivated PSCell.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.5.12.1.4.2 Test procedure

Same as in 4.5.10.1.4.2 with the following exception:

2. Set the parameters according to T1 in Tables 5.5.12.1.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add and deactivate NR cell (PSCell), with the message content exceptions defined in clause 5.5.12.1.4.3.

#### 5.5.12.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3 with following exceptions:

**Table 5.5.12.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-19 in TS 38.508-1 [14] with condition RLM_BFD_PSCell<br>Table 4.6.3-167 in TS 38.508-1 [14] with condition SCG_Activate<br>Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition SSB.2 FR2 and SMTC.2 |

**Table 5.5.12.1.4.3-2: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| schedulingRequestResourceId | SchedulingRequestResourceId | | |
| schedulingRequestID | SchedulingRequestId | | |
| periodicityAndOffset CHOICE { | | | |
| sl80 | 9 | With SCS = kHz120 results in repetition every 10 ms | SCS120 |
| } | | | |
| } | | | |

#### 5.5.12.1.5 Test requirement

Table 5.5.12.1.5-1 and Table 5.5.12.1.5-2 defines the primary level settings including test tolerances for all tests.

**Table 5.5.12.1.5-1: Cell Specific Parameters for PSCell activation and deactivation**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA Channel Number | | 1,2 | 1 | | | |
| NR Channel Number | | 1,2 | 2 | | | |
| Duplex Mode | | 1,2 | TDD | | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: NRB,c = 66 | | | |
| Data RBs allocated | | 1,2 | 48 | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | | | |

| | | | |
|---|---|---|---|
| TRS Configuration | | 1 | TRS.2.1 TDD |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 |
| PDSCH Reference measurement channel | | 1,2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.7 TDD |
| OCNG Patterns | | 1,2 | OP.3 |
| SSB configuration | | 1,2 | SSB.2 FR2 |
| SMTC configuration | | 1,2 | SMTC.2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 |
| TRS Configuration | | 1,2 | TRS.2.1 TDD |
| CSI-RS configuration for CSI reporting | | 1,2 | CSI-RS.3.1 TDD |
| reportConfigType | | 1,2 | periodic |
| reportQuantity | | 1,2 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2 | 40 |
| CSI reporting offset | slot | 1,2 | 4 |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Propagation condition | | 1,2 | No external noise (Note 1) |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | | |

**Table 5.5.12.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | Setup 2a according to clause A.3.15.2.1 | | | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s/N_{oc}$ Ês Note2 | dBm/SCS | -81 | | | |
| SSB_RP Note2, Note 4 | dBm/SCS | -81 | | | |
| $\hat{E}_s/I_{ot}$ BB Note 2, Note 7 | dB | 4.88 | | | |
| Io Note 2, Note 4 | dBm/95.04 MHz | -56.41 | | | |
| Note 1: Void<br>Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: Void<br>Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | |

The UE performs RACH-less based PSCell activation. UE shall transmit the SR on PUCCH for PSCell at latest 65 ms[Note1] into T2.

The UE shall send at least one PUSCH on PSCell during T3.

The UE shall stop transmit PUSCH for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell activation delay and PSCell deactivation delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.38 in TS 36.133 [23]:

$T_{activation_time} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

Where:

$T_{RRC_delay}$ = 20ms

$T_{processing}$ = 5ms

$T_{search}$ = 0 ms

$T_{\Delta}$ = 20ms

$T_{IU}$= max 20 ms

## 5.5.13 Conditional PSCell addition and release delay

### 5.5.13.1 EN-DC FR2 Addition and Release Delay of NR PSCell

Editor's Note: This test case is incomplete in following aspects:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

#### 5.5.13.1.1 Test purpose

The purpose of this test is to verify that the conditional NR PSCell addition and release delays under EN-DC are within the requirements.

#### 5.5.13.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 17 onwards and supporting Conditional PSCell addition.

#### 5.5.13.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.11.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.9A.

#### 5.5.13.1.4 Test description

##### 5.5.13.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.13.1.4.1-1.

**Table 5.5.13.1.4.1-1: Supported test configurations for FR2 PSCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

| | |
|---|---|
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.5.13.1.4.1-2.

**Table 5.5.13.1.4.1-2: Initial conditions for EN-DC FR2 Addition and Release Delay of NR PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.13.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 5.5.13.1.4.1-3: General Test Parameters for Conditional PSCell Addition and Release**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP | dBm | -118 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| | Time to Trigger | s | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Gap pattern ID | | | gp0 | |
| PRACH configuration on cell2 | | | FR2 configuration 2 | Captured in A.3.8.3.2 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | <7 | During this time the UE adds the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | | s | 1 | During this time the UE releases the PSCell. |

1. The test parameters are given in Table 5.5.13.1.4.1-3.

2. Message contents are defined in clause 5.5.13.1.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.2-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

#### 5.5.13.1.4.2 Test procedure

The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC.

During T1 only Cell 1 is known to the UE. NR shall configure a condition implying PSCell addition (Cell 2) during T1, at a time earlier than $T_{RRC_delay}$ before the beginning of T2.

Starting T2, Cell 2 becomes detectable. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T3. The test system shall observe the periodic reporting of CSI for PSCell during T3.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 5.5.13.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with condition CPA according to TS 36.508 [25] Table 4.6.1-8 including RRCConnectionReconfiguration* message and associated execution condition. The RRCConnectionReconfiguration* message contains PSCell configuration in RRCReconfiguration**. And measurement gap pattern #0 is configured for the UE.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 expiring.

5. T2 starts. The execution condition of PSCell (Cell2) becomes satisfied, the UE applies *RRCConnectionReconfiguration** message and releases measurement gap corresponding to PSCell (Cell2) and sends an *RRCConnectionReconfigurationComplete** message with condition MCG_and_SCG and CPA, including NR *RRCReconfigurationComplete*** message for the selected candidate PSCell.

6. The UE shall send PRACH to PSCell no later than $T_{config_PSCell_Addition_Conditional}$ from the start of T2, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 11.

7 During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 11.

8. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2).

9. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. T4 starts.

10. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T4, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

11. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.

12. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 14, otherwise switches off the UE.

13. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

14. Repeat step 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.13.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.5.13.1.4.3-1: Common Exception messages for EN-DC FR2 Addition and Release Delay of NR PSCell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | 3<br>Table H.3.4-5 with condition Pattern#0 for step 3<br>Table H.3.4-4 with condition GAPLESS for step 7<br>Table H.3.4-6 with condition SMTC.2 and SSB.2 FR2 |

**Table 5.5.13.1.4.3-2: RRCConnectionReconfiguration (step 3)**

| Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Table 5.5.13.1.4.3--3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 5.5.13.1.4.3-3: MeasConfig-DEFAULT**

| Derivation Path: Table H.3.4-4 with Condition INTER-RAT NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig-DEFAULT ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT SEQUENCE { | | | |
| condReconfigurationTriggerNR-r17 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventB1-NR-r17 SEQUENCE { | | | |
| b1-ThresholdNR-r17 CHOICE { | | | |
| nr-RSRP-r15 | 39 | | |
| } | | | |
| hysteresis-r17 | 0 | | |
| timeToTrigger-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.5.13.1.5 Test requirement

Table 5.5.13.1.5-1 and Table 5.5.13.1.5-2 define the primary level settings including test tolerances.

**Table 5.5.13.1.5-1: Cell Specific Parameters for Conditional PSCell Addition and Release**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA Channel Number | | 1,2 | 1 | | | |
| NR Channel Number | | 1,2 | 2 | | | |
| Duplex Mode | | 1,2 | TDD | | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | 1,2 | 48 | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | | | |
| TRS Configuration | | 1 | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | |
| PDSCH Reference measurement channel | | 1,2 | SR.3.3 TDD | | | |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD | | | |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.7 TDD | | | |
| OCNG Patterns | | 1,2 | OP.3 | | | |
| SSB configuration | | 1,2 | SSB.2 FR2 | | | |
| SMTC configuration | | 1,2 | SMTC.2 | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | | |
| TRS Configuration | | 1,2 | TRS.2.1 TDD | | | |
| CSI-RS configuration for CSI reporting | | 1,2 | CSI-RS.3.1 TDD | | | |
| reportConfigType | | 1,2 | periodic | | | |
| reportQuantity | | 1,2 | cri-RI-PMI-CQI | | | |
| CSI reporting periodicity | slot | 1,2 | 40 | | | |
| CSI reporting offset | slot | 1,2 | 4 | | | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| Propagation condition | | 1,2 | No external noise (Note 1) | | | |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | | | | | |

**Table 5.5.13.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | Setup 2a according to clause A.3.15.2.1 | | | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s$ Note2 | dBm/SCS | -∞ | -81 | | |
| SSB_RP Note2, Note 4 | dBm/SCS | -∞ | -81 | | |
| $\hat{E}_s / I_{ot}$ BB Note 2, Note 7 | dB | -∞ | 4.88 | | |

| | | | |
|---|---|---|---|
| Io Note 2, Note 4 | dBm/95.04 MHz | N/A | -56.41 |

Note 1: Void
Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

$T_{RRC_delay} + T_{Event_DU}$ occurs during T1 as the PSCell addition condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall transmit the PRACH to PSCell (Cell 2) less than $T_{config_PSCell_Addition_Conditional}$ Note1 into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay during T2 can be expressed as follows:

$$T_{config_PSCell_Addition_Conditional} = T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2\ ms$$

Where:

$T_{measure}$ = 6720ms for power class 1 or 4160 for power class 2/3/4

$T_{UE_preparation}$ = 10ms

$T_{processing}$ = 40ms

$T_{\Delta}$ = 20ms

$T_{PSCell_DU}$ = 1*10+10 = 20 ms

# 5.6 Measurement procedures

## 5.6.1 Intra-frequency measurements

### 5.6.1.0 Minimum conformance requirements

#### 5.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.2]

The requirements in Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding band,
- SS-RSRQ related side conditions given in Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding band.

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133-f60, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in Table 5.6.1.0.1-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in Table 5.6.1.0.1-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

-according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

-if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the

assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{pss/sss_sync_w/o_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync}$=40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24

$M_{meas_period_w/o_gaps}$ : For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ =24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$

For FR2, if *SSB-ToMeasure* is configured, when all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully non-overlapping with the SSB symbols indicated by *SSB-ToMeasure* and 1 symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, $K_{layer1_measurement}$= 1, otherwise $K_{layer1_measurement}$=1.5. If *SSB-ToMeasure* is not configured, when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, $K_{layer1_measurement}$= 1.5, otherwise $K_{layer1_measurement}$=1.

If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 5.6.1.0.1-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 5.6.1.0.1-1: Time period for PSS/SSS detection, (Frequency range 2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[TS 38.133, clause 9.2.5.2]

The measurement period for intra-frequency measurements without gaps is as shown in Table 5.6.1.0.1-2. If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 5.6.1.0.1-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 5.6.1.0.1-2: Measurement period for intrafrequency measurements without gaps(Frequency FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, ceil($M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |

| | |
|---|---|
| DRX cycle>320ms | ceil($M_{meas_period_w/o_gaps}$ x$K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.4.3, 9.2.5.1, 9.2.5.2.

### 5.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133, clause 9.2.2]

The requirements in Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding band,
- SS-RSRQ related side conditions given in Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding band.

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in Table 5.6.1.0.2-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in Table 5.6.1.0.2-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 5.6.1.0.2-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 5.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range 2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133, clause 9.2.6.3]

The measurement period for FR2 intra-frequency measurements with gaps is as shown in Table 5.6.1.0.2-2.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 5.6.1.0.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 5.6.1.0.2-2: Measurement period for intrafrequency measurements with gaps(Frequency range 2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.4.3, 9.2.6.2, 9.2.6.3.

### 5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

-Test frequency f ≤ 40.8 GHz

-UE PC1 PC3

This test case is incomplete for UE power classes other than PC1 and PC3

This test case is incomplete for test frequencies > 40.8 GHz

#### 5.6.1.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

#### 5.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC.

#### 5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.1.

#### 5.6.1.1.4 Test description

##### 5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.1.4.1-1.

**Table 5.6.1.1.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting without gap under non-DRX**

| Configuration | Description |
|---|---|
| 5.6.1.1-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.1-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.1-3 | LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.1-4 | LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.1.4.1-2.

**Table 5.6.1.1.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting without gap under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | TBD | | |

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.1.4.1-3 below.

2. Message contents are defined in clause 5.6.1.1.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6.

Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

**Table 5.6.1.1.4.1-3: General test parameters for EN-DC FR2 intra-frequency event triggered reporting tests without gap under non-DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1~4 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) | |
| Neighbour cell | | 1~4 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1<br>2: Cell 2 and Cell 3 | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration | | 1~4 | SMTC.1 | |
| A3-Offset | dB | 1~4 | -11 | |
| CP length | | 1~4 | Normal | |
| Hysteresis | dB | 1~4 | 0 | |
| Time To Trigger | s | 1~4 | 0 | |
| Filter coefficient | | 1~4 | 0 | L3 filtering is not used |
| DRX | | 1~4 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1~4 | 3 µs | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | | 1~4 | 3 µs | Synchronous cells |
| T1 | s | 1~4 | 5 | |
| T2 | s | 1~4 | 5 | |

### 5.6.1.1.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1442 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit

RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.1.1.4.3-1: Common Exception messages EN-DC FR2 intra-frequency event triggered reporting tests without gap under non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.4-1<br>Table H.3.4-2 |

**Table 5.6.1.1.4.3-2: MeasObjectNR (Step 3, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in TS 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 | | 5.6.1.1-1, 5.6.1.1-2 |
| | SubcarrierSpacing specified in TS 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2 | | 5.6.1.1-3, 5.6.1.1-4 |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure CHOICE { | | | |
| setup CHOICE { | | | |
| longBitmap | 11000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | SSB#0 and SSB#1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 3 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.6.1.1.5 Test requirement

Tables 5.6.1.1.4.1-3, 5.6.1.1.5-1 and 5.6.1.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test without gap under non-DRX.

**Table 5.6.1.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap under non-DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1,2 | 24 | | 24 | |
| | | 3,4 | 48 | | 48 | |
| Initial BWP configuration | | 1~4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1~4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1~4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1~4 | SSB | | SSB | |
| PDSCH RMC configuration | | 1,2 | SR.3.2 TDD | | N/A | |
| | | 3,4 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | | N/A | |
| | | 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | N/A | |
| | | 3,4 | CCR.3.7 TDD | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns | | 1~4 | OP.5 | | N/A | |
| TRS configuration | | 1~4 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | 1~4 | TCI.State.2 | | N/A | |
| cellIndividualOffset | dB | 1~4 | N/A | | 16 | |
| SSB configuration | | 1, 2 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 3, 4 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition | | 1~4 | No external noise (NOTE 1) | | | |
| NOTE 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | | | |

**Table 5.6.1.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap under non-DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1~4 | Setup 3 defined in A.9.3 | | | |
| | | | AoA1 | | AoA2 | |
| Assumption for UE beams[Note 4] | | 1~4 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1, 2 | -89 | | -89 | |
| | | 3, 4 | -86 | | -86 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1~4 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | -89 |
| | | 3, 4 | -86 | -86 | -Infinity | -86 |
| *Io* | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 3,4 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | 1~4 | Defined in Figure 5.6.1.1.5-1 | Time multiplexing of the downlink transmissions from each AoA | | 1~4 | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.<br>Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1440 ms from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1442 ms in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

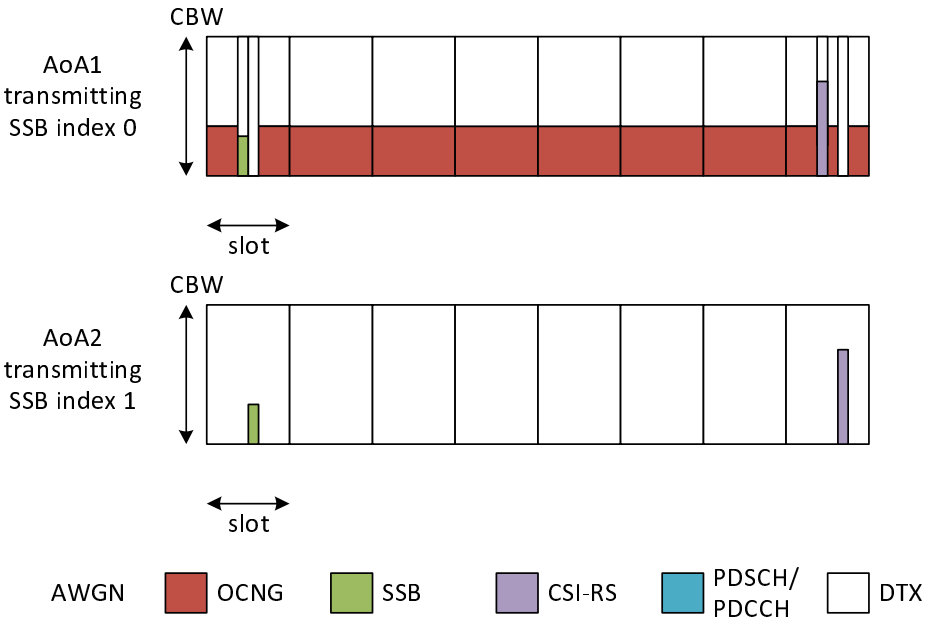


**Figure 5.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1,2 example)**

## 5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for test frequencies > 40.8 GHz5.6.1.2.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap in DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

### 5.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC and long DRX cycle.

### 5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.2.

### 5.6.1.2.4 Test description

#### 5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.2.4.1-1.

**Table 5.6.1.2.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting without gap in DRX**

| Configuration | Description |
|---|---|
| 5.6.1.2-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.2-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.2-3 | LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.2-4 | LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.2.4.1-2.

**Table 5.6.1.2.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting without gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.3 | |
| Exceptions to connection diagram | TBD | | |

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.2.4.1-3 below.

2. Message contents are defined in clause 5.6.1.2.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

**Table 5.6.1.2.4.1-3: General test parameters for EN-DC FR2 intra-frequency event triggered reporting tests without gap in DRX**

| Parameter | Unit | Config | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1~4 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) | | |
| Neighbour cell | | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration | | 1~4 | SMTC.1 | | |
| A3-Offset | dB | 1~4 | -7 (Note1) | | |
| CP length | | 1~4 | Normal | | |
| Hysteresis | dB | 1~4 | 0 | | |
| Time To Trigger | s | 1~4 | 0 | | |
| Filter coefficient | | 1~4 | 0 | | L3 filtering is not used |
| DRX | | 1~4 | DRX.1 | DRX. 7 | DRX related parameters are defined in Table 5.6.1.2.5-2 |
| Time offset between Cell 1 and Cell 2 | | 1~4 | 3 µs | | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | | 1~4 | 3 µs | | Synchronous cells |
| T1 | s | 1~4 | 5 | | |
| T2 | s | 1~4 | 10 | 52 | |
| NOTE: Test tolerance of -1dB applied | | | | | |

### 5.6.1.2.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.2.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 and Y ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 7202 for UE supporting power class 1,

- 4322 for UE supporting power class 2, 3 or 4.

And Y is

- 51202 for UE supporting power class 1,
- 30722 for UE supporting power class 2, 3 or 4.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.1.2.4.1-3 as appropriate.

#### 5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.1.2.4.3-1: Common Exception messages EN-DC FR2 intra-frequency event triggered reporting tests without gap in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR<br>Table H.3.1-4 with A3-offset = -7dB<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.7-1 with Condition DRX.1 for Test 1<br>Table H.3.7-1 with Condition DRX. 7 for Test 2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 5.6.1.2-1 and 5.6.1.2-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 5.6.1.2-3 and 5.6.1.2-4 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

### 5.6.1.2.5 Test requirement

Tables 5.6.1.2.4.1-3, 5.6.1.2.5-1 and 5.6.1.2.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test without gap in DRX.

**Table 5.6.1.2.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap in DRX**

| Parameter | Unit | Config | Cell 2 | Cell 3 |
|---|---|---|---|---|

| | | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|
| TDD configuration | | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1~4 | 66 | | 66 | |
| Initial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1~4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1~4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1~4 | SSB | | SSB | |
| PDSCH RMC configuration | | 1,2 | SR.3.2 TDD | | N/A | |
| | | 3,4 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | | N/A | |
| | | 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | N/A | |
| | | 3,4 | CCR.3.7 TDD | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns | | 1~4 | OP.1 | | OP.1 | |
| PDSCH/PDCCH TCI state | | 1~4 | TCI.State.2 | | N/A | |
| CSI-RS for tracking | | 1~4 | TRS.2.1 TDD | | N/A | |
| SSB configuration | | 1, 2 | SSB.3 FR2 | | SSB.3 FR2 | |
| | | 3, 4 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition | | 1~4 | AWGN | | AWGN | |

**Table 5.6.1.2.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap in DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1~4 | Setup 1 defined in A.9.1 | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1~4 | -101.5 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -92.5 | | | |
| | | 3, 4 | -89.5 | | | |
| SSB_RP | dBm/SCS | 1, 2 | -88.47 | -88.47 | -Infinity | -88.47 |
| | | 3, 4 | -85.46 | -85.46 | -Infinity | -85.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 | 4 | -Infinity | 4 |
| $Io$ | dBm/95.04MHz | 1~4 | -58.03 | -55.68 | See Cell 2 columns | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

NOTE 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- X = 7202 for UE supporting power class1,
- X = 4322 for UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- X = 51202 for UE supporting power class 1,
- X = 30722 for UE supporting power class 2, 3 or 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 4322 ms for Test 1 and 30722 ms for Test 2 in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 5.6.1.3 EN-DC FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC1, PC3

This test case is incomplete for UE power classes other than PC1 and PC3

This test case is incomplete for test frequencies > 40.8 GHz

#### 5.6.1.3.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search with gap in non-DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

#### 5.6.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC. This test applies to UE that support CSI-RS based RLM and BWP operation without bandwidth restriction.

#### 5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.3.

#### 5.6.1.3.4 Test description

##### 5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.3.4.1-1.

**Table 5.6.1.3.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting with gap in non-DRX**

| Configuration | Description |
|---|---|
| 5.6.1.3-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.3-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.3-3 | LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.3-4 | LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.3.4.1-2.

**Table 5.6.1.3.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | TBD | | |

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.3.4.1-3 below.

2. Message contents are defined in clause 5.6.1.3.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

**Table 5.6.1.3.4.1-3: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1~4 | E-UTRAN PCell (Cell 1) PSCell (Cell 2) | |
| Neighbour cell | | 1~4 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1 2: Cell 2 and Cell 3 | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type | | 1~4 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1~4 | 40 | |
| Measurement gap length | ms | 1~4 | 6 | |
| Measurement gap offset | ms | 1~4 | 39 | |
| SMTC configuration | | 1~4 | SMTC.1 | |
| CSI-RS parameters | | 1~4 | CSI-RS.3.2 TDD **resource #0** | |
| A3-Offset | dB | 1~4 | -11 | |
| CP length | | 1~4 | Normal | |
| Hysteresis | dB | 1~4 | 0 | |
| Time To Trigger | s | 1~4 | 0 | |
| Filter coefficient | | 1~4 | 0 | L3 filtering is not used |
| DRX | | 1~4 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1~4 | 3 μs | Synchronous EN-DC |

| | | | | |
|---|---|---|---|---|
| Time offset between Cell 2 and Cell 3 | | 1~4 | 3 μs | Synchronous cells |
| T1 | s | 1~4 | 5 | |
| T2 | s | 1~4 | 5 | |

#### 5.6.1.3.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.3.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.1.3.4.3-1: Common Exception messages EN-DC FR2 intra-frequency event triggered reporting tests with gap in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset =-11dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 |

**Table 5.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in TS 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 | | 5.6.1.3-1, 5.6.1.3-2 |
| | SubcarrierSpacing specified in TS 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2 | | 5.6.1.3-3, 5.6.1.3-4 |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure CHOICE { | | | |
| setup CHOICE { | | | |
| longBitmap | 11000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | SSB#0 and SSB#1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 3 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.6.1.3.5 Test requirement

Tables 5.6.1.3.4.1-3, 5.6.1.3.5-1 and 5.6.1.3.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test with gap under non-DRX.

**Table 5.6.1.3.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1,2 | 24 | | 24 | |
| | | 3,4 | 48 | | 48 | |
| Initial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1,2 | DLBWP.1.2 | | DLBWP.1.1 | |
| | | 3,4 | DLBWP.1.7 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1,2 | ULBWP.1.2 | | ULBWP.1.1 | |
| | | 3,4 | ULBWP.1.7 | | ULBWP.1.1 | |
| RLM-RS | | 1~4 | CSI-RS | | SSB | |
| PDSCH RMC configuration | | 1,2 | SR.3.2 TDD | | N/A | |
| | | 3,4 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | | N/A | |
| | | 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | N/A | |
| | | 3,4 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1~4 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | 1~4 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns | | 1~4 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1~4 | N/A | | 16 | |
| SSB | | 1, 2 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 3, 4 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition | | 1~4 | No external noise (NOTE 1) | | | |
| NOTE 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | | | |

**Table 5.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1~4 | Setup 3 defined in A.9.3 | | | |
| | | | **AoA1** | | **AoA2** | |
| Assumption for UE beams[Note 4] | | 1~4 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1,2 | -89 | | -89 | |
| | | 3,4 | -86 | | -86 | |
| $\hat{E}_s/I_{ot}$ BB [Note 5] | dB | 1~4 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | -89 |
| | | 3, 4 | -86 | -86 | -Infinity | -86 |
| *Io* | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 3,4 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | 1~4 | Defined in Figure 5.6.1.3.5-1 | Time multiplexing of the downlink transmissions from each AoA | | Time multiplexing of the downlink transmissions from each AoA | |

| | |
|---|---|
| NOTE 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| NOTE 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. |
| Note 5: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1.92s from the beginning of time period T2

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1922 ms in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

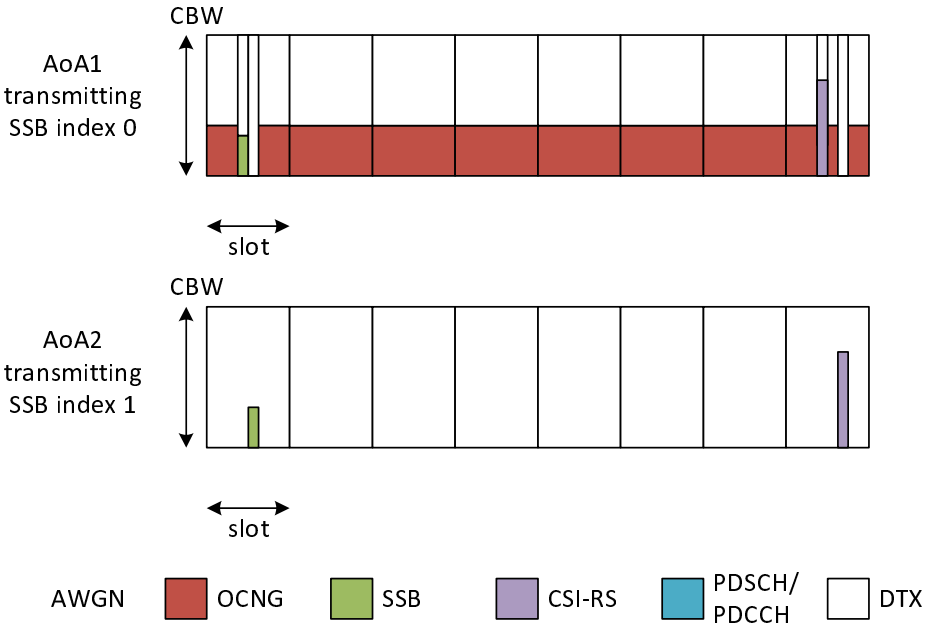


**Figure 5.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1,2 example)**

## 5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.6.1.4.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search with gap in DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

#### 5.6.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC, This test applies to UE that support CSI-RS based RLM, BWP operation without bandwidth restriction and long DRX cycle.

#### 5.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.4.

#### 5.6.1.4.4 Test description

##### 5.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.4.4.1-1.

**Table 5.6.1.4.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting with gap in DRX**

| Configuration | Description |
|---|---|
| 5.6.1.4-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.4-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.4-3 | LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.1.4-4 | LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.4.4.1-2.

**Table 5.6.1.4.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting with gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | TBD | | |

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.4.4.1-3 below.

2. Message contents are defined in clause 5.6.1.4.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

**Table 5.6.1.4.4.1-3: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter | Unit | Config | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1~4 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) | | |
| Neighbour cell | | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type | | 1~4 | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1~4 | 40 | | |
| Measurement gap length | ms | 1~4 | 6 | | |
| Measurement gap offset | ms | 1~4 | 39 | | |
| SMTC configuration | | 1~4 | SMTC.1 | | |
| CSI-RS parameters | | 1~4 | CSI-RS.3.2 TDD **resource #0** | | |
| A3-Offset | dB | 1~4 | -7(Note1) | | |
| CP length | | 1~4 | Normal | | |
| Hysteresis | dB | 1~4 | 0 | | |
| Time To Trigger | s | 1~4 | 0 | | |
| Filter coefficient | | 1~4 | 0 | | L3 filtering is not used |
| DRX | | 1~4 | DRX.1 | DRX. 7 | DRX related parameters are defined in Table 5.6.1.4.5-2 |
| Time offset between Cell 1 and Cell 2 | | 1~4 | 3μs | | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | | 1~4 | 3μs | | Synchronous cells |
| T1 | s | 1~4 | 5 | | |
| T2 | s | 1~4 | 10 | 52 | |
| Note1 : Test tolerance of -1dB applied | | | | | |

### 5.6.1.4.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.4.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 and Y ms for Test 2, then the number of successful tests is increased by one. If the UE fails to

report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

- X = 7202, Y = 51202 for UE supporting power class 1,
- X = 4322, Y = 30722 for UE supporting power class 2, 3, or 4

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.1.2.4.1-3 as appropriate.

#### 5.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.1.4.4.3-1: Common Exception messages EN-DC FR2 intra-frequency event triggered reporting tests with gap in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR<br>Table H.3.1-4 with A3-offset = -7dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.7-1 with Condition DRX.1 and Gap for test 1<br>Table H.3.7-1 with Condition DRX. 7 and Gap for test 2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 5.6.1.4-1 and 5.6.1.4-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 5.6.1.4-3 and 5.6.1.4-4 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

#### 5.6.1.4.5 Test requirement

Tables 5.6.1.4.4.1-3, 5.6.1.4.5-1 and 5.6.1.4.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test with gap in DRX.

**Table 5.6.1.4.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter | Unit | Config | Cell 2 | Cell 3 |
|---|---|---|---|---|

| | | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|
| TDD configuration | | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1~4 | 66 | | 66 | |
| Initial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1,2 | DLBWP.1.2 | | DLBWP.1.1 | |
| | | 3,4 | DLBWP.1.7 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1,2 | ULBWP.1.2 | | ULBWP.1.1 | |
| | | 3,4 | ULBWP.1.7 | | ULBWP.1.1 | |
| RLM-RS | | 1~4 | CSI-RS | | SSB | |
| PDSCH RMC configuration | | 1,2 | SR.3.2 TDD | | N/A | |
| | | 3,4 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | | N/A | |
| | | 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | N/A | |
| | | 3,4 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1~4 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | 1~4 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns | | 1~4 | OP.1 | | OP.1 | |
| SSB | | 1, 2 | SSB.3 FR2 | | SSB.3 FR2 | |
| | | 3, 4 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition | | 1~4 | AWGN | | AWGN | |

**Table 5.6.1.4.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1~4 | Setup 1 defined in A.3.9.1 | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1~4 | -101.5 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -92.5 | | | |
| | | 3, 4 | -89.5 | | | |
| SSB_RP | dBm/SCS | 1, 2 | -88.47 | -88.47 | -Infinity | -88.47 |
| | | 3, 4 | -85.46 | -85.46 | -Infinity | -85.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 | 4 | -Infinity | 4 |
| $Io$ | dBm/95.04MHz | 1, 2 | -58.03 | -55.68 | See Cell 2 columns | |

| | |
|---|---|
| NOTE 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| NOTE 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| NOTE 3: | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| NOTE 4: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. |
| NOTE 5: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- X = 7202 for UE supporting power class1,
- X = 4322 for UE supporting power class 2, 3 or 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- X = 51202 for UE supporting power class 1,
- X = 30722 for UE supporting power class 2, 3 or 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 4322 ms for Test 1 and 30722 ms for Test 2 in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 5.6.2 Inter-frequency measurements

### 5.6.2.0 Minimum conformance requirements for Inter-frequency measurements

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding band.

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter frequency

cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in Table 9.3.4-1 and table 9.3.4-2.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in Table 9.3.4-3 and table 9.3.4-4.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in Table 9.3.5-1 and table 9.3.5-2.

$M_{pss/sss_sync_inter}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_inter}$ = 64 samples. For a UE supporting FR2 power class 2, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_inter}$ = 40 samples.

$M_{SSB_index_inter}$: For a UE supporting power FR2 class 1, $M_{SSB_index_inter}$ = 40 samples. For a vehicle mounted UE supporting power class 2, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting power class 3, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting power class 4, $M_{meas_period_inter}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =64 samples. For a UE supporting FR2 power class 2, $M_{meas_period_inter}$=40 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 40 samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

**Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range 2)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $Max(600ms, M_{pss/sss_sync_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(600ms, (1.5 \times M_{pss/sss_sync_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $M_{pss/sss_sync_inter} \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 9.3.4-4: Time period for time index detection (Frequency range 2)**

| Condition NOTE1,2 | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | $Max(200ms, M_{SSB_index_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(200ms, (1.5 \times M_{SSB_index_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $M_{SSB_index_inter} \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in Table 9.3.5-1 and 9.3.5-2:

**Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | $Max(400ms, M_{meas_period_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(400ms, (1.5 \times M_{meas_period_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $M_{meas_period_inter} \times DRX\ cycle \times CSSF_{inter}$ |

| | |
|---|---|
| NOTE 1: | DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 |
| NOTE 2: | In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. Both $T_{identify_inter_without_index}$ and $T_{identify_inter_with_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

### 5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Test 1 is applicable.

#### 5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.1.

#### 5.6.2.1.4 Test description

##### 5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.1.4.1-1.

**Table 5.6.2.1.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.6.2.1-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.1-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 5.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | 13 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | 39 | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | | As specified in clause A.3.2 |
| offsetMO | dB | Config 1,2 | 16 | | Applied to NR Cell 3 measurement object |
| A3-Offset | dB | Config 1,2 | -11 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 5.2 for PC1; 3.5 for other PC | 5.2 for PC1; 3.5 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

1. Message contents are defined in clause 5.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

#### 5.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 3 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 10 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.2.1.4.1-2 as appropriate.

#### 5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 5.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests in non-DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ for Test 1. For Test 2, additionally with condition GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 2<br>Table H.3.4-4 with Condition gapUE Test 1<br>Table H.3.4-5 with Condition Pattern #0 for Test 1<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 5.6.2.1.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

#### 5.6.2.1.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2 | Setup 3 as specified in clause A.9 | | | |
| | | | AoA1 | | AoA2 | |
| Assumption for UE beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns | | Config 1,2 | OP.1 | | OP.1 | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state | | Config 1,2 | TCI.State.2 | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel | | Config 1,2 | CCR.3.1 TDD | | - | |
| SMTC configuration | | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2 | -87 | -87 | -Infinity | -87 |
| SSB-RP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot\ BB}$ Note 8 | dB | Config 1,2 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1,2 | No external noise (NOTE 9) | | No external noise (NOTE 9) | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation.
NOTE 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
NOTE 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

## 5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 5.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Tests 1 and 2 are applicable.

### 5.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.2.

### 5.6.2.2.4 Test description

#### 5.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.2.4.1-1.

**Table 5.6.2.2.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.6.2.2-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.2-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 5.6.2.2.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | | | Two FR1 NR carrier frequencies are used. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | | 13 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | | 39 | | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | | | | As specified in clause A.3 |
| A3-Offset | dB | Config 1,2 | -12 | | | | Value modified by TT |
| Hysteresis | dB | Config 1,2 | 0 | | | | |
| CP length | | Config 1,2 | Normal | | | | |
| TimeToTrigger | s | Config 1,2 | 0 | | | | |
| Filter coefficient | | Config 1,2 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2 | 3 µs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3µs | | | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | | | |
| T2 | s | Config 1,2 | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.2.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 5.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.2.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.2.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.2.4.1-2 as appropriate.

#### 5.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.2.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests without SSB time index detection in DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ. For Test 3 and Test 4, with condition GAP NEEDED additionally.<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with A3-offset = -12dB<br>Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 3 and Test 4<br>Table H.3.4-4 with Condition gapUE Test 1 and Test 2<br>Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

### 5.6.2.2.5 Test requirement

Table 5.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2 | Setup 1 as specified in clause A.9 | | | |
| Assumption for UE beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2 | ULBWP.0.1 | | | |
| Dedicated DL BWP | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 | | Config 1,2 | OP.1 | | OP.1 | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state | | Config 1,2 | TCI.State.2 | | NA | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel | | Config 1,2 | CCR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11 | | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

### 5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 5.6.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Test 1 is applicable.

#### 5.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.3.

#### 5.6.2.3.4 Test description

##### 5.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.3.4.1-1.

**Table 5.6.2.3.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.6.2.3-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.3-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 5.6.2.3.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |

| | | | | | |
|---|---|---|---|---|---|
| Neighbour cell | | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | 13 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | 39 | |
| SMTC-SSB parameters | | Config 1,2 | SSB. 3 FR2 | | As specified in clause A.3 |
| offsetMO | dB | Config 1,2 | 16 | | Applied to NR Cell 3 measurement object |
| A3-Offset | dB | Config 1,2 | -11 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 7 for PC1; 4.5 for other PC | 7 for PC1; 4.5 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.3.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.3.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.
3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.2.3.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.3.4.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.3.4.1-1 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 3 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 10 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.2.3.4.1-2 as appropriate.

### 5.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.3.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests without SSB time index detection in non-DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ. For Test 2, additionally with condition GAP NEEDED.<br>Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with condition SSB Index and A3-offset = -11dB<br>Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 2<br>Table H.3.4-4 with condition gapUE for Test 1<br>Table H.3.4-5 with condition Pattern #0 for Test 1<br>Table H.3.1-7 with condition SSB Index and INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 5.6.2.3.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

5.6.2.3.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.3.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2 | Setup 3 as specified in clause A.3.9 | | | |
| | | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 7 | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2 | DLBWP.1.1 | | NA | |
| Initial UL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Dedicated UL BWP | | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel | | Config 1,2 | CCR.3.1 TDD | | - | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state | | Config 1,2 | TCI.State.2 | | NA | |
| SMTC configuration | | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB-RP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $\hat{E}_s/I_{ot}$ BB Note8 | dB | Config 1,2 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1,2 | No external noise (NOTE 9) | | No external noise (NOTE 9) | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
NOTE 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

### 5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 5.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 5.6.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Test 3 and Test 4 applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Tests 1 and 2 are applicable.

#### 5.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.4.

#### 5.6.2.4.4 Test description

##### 5.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.4.4.1-1.

**Table 5.6.2.4.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.6.2.4-1 | LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.4-2 | LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 5.6.2.4.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | | 13 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | | 39 | | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | | | | As specified in clause A.3 |
| A3-Offset | dB | Config 1,2 | -12 | | | | Value modified by TT |
| Hysteresis | dB | Config 1,2 | 0 | | | | |
| CP length | | Config 1,2 | Normal | | | | |
| TimeToTrigger | s | Config 1,2 | 0 | | | | |
| Filter coefficient | | Config 1,2 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | | | |
| T2 | s | Config 1,2 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.4.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 5.6.2.4.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.4.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.4.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.4.4.1-2 as appropriate.

#### 5.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.4.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests with SSB time index detection in DRX test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ. For Test 3 and Test 4, additionally with condition GAP NEEDED<br>Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with condition SSB Index and A3-offset = -12dB<br>Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 3 and Test 4<br>Table H.3.4-4 with condition gapUE for Test 1 and Test 2<br>Table H.3.4-5 with condition Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with condition SSB Index and INTER-FREQ<br>Table H.3.7-1 with condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3<br>Table H.3.7-1 with condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

#### 5.6.2.4.5 Test requirement

Table 5.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.4.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

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|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE 1: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 2: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

## 5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- NR FR1 - FR2 OTA testability is still FFS.

### 5.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 5.6.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Test 1 is applicable.

### 5.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.5.

### 5.6.2.5.4 Test description

#### 5.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.5.4.1-2. Test environment parameters are given in Table 5.6.2.5.4.1-3.

**Table 5.6.2.5.4.1-1 EN-DC FR1-FR2 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 5.6.2.5-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.5-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.5-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| 5.6.2.5-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | |
| 5.6.2.5-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.5-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | | |

**Table 5.6.2.5.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | | Value | Comment |
|---|---|---|---|---|

| | | Test configuration | Test 1 | Test 2 | |
|---|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | 13 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 39 | 39 | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3 |
| | | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3 |
| | | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3,4,5,6 | SSB.3 FR2 | | As specified in clause A.3 |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 µs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3µs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 5.2 for PC1; 3.5 for other PC | 5.2 for PC1; 3.5 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.5.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

3. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 5.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.5.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

#### 5.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ. For Test 2, additionally with condition GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with A4-threshold = -105<br>Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 2<br>Table H.3.4-4 with Condition gapUE Test 1<br>Table H.3.4-5 with Condition Pattern #0 for Test 1<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 5.6.2.5.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | 6 dB | | |
| } | | | |

5.6.2.5.5 Test requirement

Table 5.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2,3,4,5,6 | NA | | Setup 1 | |
| Assumption for UE beams[Note 7] | | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | TDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | Config 1,4 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | Config 2,5 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.2 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| | | Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2,3,4,5,6 | Link only, see clause A.6A | | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,3,4,5,6 | | | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1,2,3,4,5,6 | | | -Infinity | 14.69 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | | | -Infinity | -58.01 |
| Propagation Condition | | Config 1,2,3,4,5,6 | | | No external noise (NOTE 9) | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void.
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.
NOTE 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

## 5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- NR FR1 - FR2 OTA testability is still FFS.

### 5.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements.

### 5.6.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Tests 1 and 2 are applicable.

### 5.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.6.

### 5.6.2.6.4 Test description

#### 5.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.6.4.1-2. Test environment parameters are given in Table 5.6.2.6.4.1-3.

**Table 5.6.2.6.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 5.6.2.6-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.6-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.6-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| 5.6.2.6-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | |
| 5.6.2.6-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.6-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | | |

**Table 5.6.2.6.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | 13 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 39 | | 39 | | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1,4 | SSB.1 FR1 | | | | As specified in clause A.3 |
| | | Config 2,5 | SSB.1 FR1 | | | | As specified in clause A.3 |
| | | Config 3,6 | SSB.2 FR1 | | | | As specified in clause A.3 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3,4,5,6 | SSB.3 FR2 | | | | As specified in clause A.3 |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | | |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | DRX.1 | DRX.2 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 µs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3µs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | | |
| T2 | s | Config 1,2,3,4,5,6 | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.6.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

1. Message contents are defined in clause 4.6.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

3. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 5.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.6.4-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.6.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.6.4-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.6.4-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),

or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.6.4-2 as appropriate.

#### 5.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ. For Test 3 and 4, additionally with condition GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with A4-threshold = -105<br>Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 3 and Test 4<br>Table H.3.4-4 with Condition gapUE Test 1 and Test 2<br>Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3<br>Table H.3.7-1 with Condition DRX.2 for Test 2 and Test 4<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 5.6.2.6.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | 6 dB | | |
| } | | | |

#### 5.6.2.6.5 Test requirement

Table 5.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2,3,4,5,6 | NA | | Setup 1 as specified in clause A.9 | |
| Assumption for UE beams[Note 7] | | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | TDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | Config 1,4 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | Config 2,5 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.2 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| | | Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | | NA Link only, see clause A.6A | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2,4,5 | | | -95.7 | |
| | | Config 3,6 | | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,4,5 | | | -Infinity | -86.7 |
| | | Config 3,6 | | | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1,2,3,4,5,6 | | | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1,2,3,4,5,6 | | | -Infinity | 9 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | | | - | - |
| | dBm/38.16MHz | Config 3,6 | | | - | - |
| | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | | | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2,3,4,5,6 | | | AWGN | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| NOTE 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |
| NOTE 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | | | |
| NOTE 6: As observed with 0 dBi gain antenna at the centre of the quiet zone | | | | | | |
| NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

### 5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- NR FR1 - FR2 OTA testability is still FFS.

#### 5.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements with SSB time index detection.

#### 5.6.2.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Test 1 is applicable.

#### 5.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.7.

### 5.6.2.7.4 Test description

#### 5.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.7.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.7.4.1-2. Test environment parameters are given in Table 5.6.2.7.4.1-3.

**Table 5.6.2.7.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 5.6.2.7-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.7-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.7-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| 5.6.2.7-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | |
| 5.6.2.7-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.7-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | | |

**Table 5.6.2.7.4-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | 13 | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 39 | 39 | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3 |
| | | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3 |
| | | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3,4,5,6 | SSB.3 FR2 | | As specified in clause A.3 |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | | DRX is not used |

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 7 for PC1; 4.5 for other PC | 7 for PC1; 4.5 for other PC | PC1 – power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.7.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

3. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 5.6.2.7.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.7.4-2 The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.7.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.7.41.-2 as appropriate.

#### 5.6.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.7.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions and INTER-FREQ. For Test 2, additionally with condition GAP NEEDED<br>Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with condition SSB Index and A4-threshold = -105<br>Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 2<br>Table H.3.4-4 with condition gapUE for Test 1<br>Table H.3.4-5 with condition Pattern #0 for Test 1<br>Table H.3.1-7 with condition SSB Index and INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.1-4 A4 threshold = -105 |

**Table 5.6.2.7.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | 6 dB | | |
| } | | | |

5.6.2.7.5 Test requirement

Table 5.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.7.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2,3,4,5,6 | NA | | Setup 1 | |
| Assumption for UE beams Note 7 | | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | TDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | Config 1,4 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | Config 2,5 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.2 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| | | Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2,3,4,5,6 | | | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,3,4,5,6 | | | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1,2,3,4,5,6 | Link only, see clause A.6A | | -Infinity | 14.69 |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $Io^{Note3}$ | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | | | -Infinity | -58.01 |
| Propagation Condition | | Config 1,2,3,4,5,6 | | | No external noise (NOTE 9) | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void<br>NOTE 3: SS-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: Void<br>NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone<br>NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation<br>NOTE 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.<br>NOTE 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | | | |

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

## 5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's note: This test case is incomplete. The following aspects are either missing or TBD:

- NR FR1 - FR2 OTA testability is still FFS.

### 5.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements with SSB time index detection.

### 5.6.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Tests 1 and 2 are applicable.

### 5.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.

5.6.2.8.5.6.2.8.4 Test description

5.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.8.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.8.4.1-2. Test environment parameters are given in Table 5.6.2.8.4.1-3.

**Table 5.6.2.8.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 5.6.2.8-1 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 5.6.2.8-2 | LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.8-3 | LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| 5.6.2.8-4 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | |
| 5.6.2.8-5 | LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 5.6.2.8-6 | LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | | |

**Table A.5.6.2.8.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | 13 | | As specified in TS 38.133 clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 39 | | 39 | | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1,4 | SSB.1 FR1 | | | | As specified in clause A.3 |
| | | Config 2,5 | SSB.1 FR1 | | | | As specified in clause A.3 |
| | | Config 3,6 | SSB.2 FR1 | | | | As specified in clause A.3 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3,4,5,6 | SSB.3 FR2 | | | | As specified in clause A.3 |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | | |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | DRX.1 | DRX.2 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | | |
| T2 | s | Config 1,2,3,4,5,6 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 5.6.2.8.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.2.8.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD.

3. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 5.6.2.8.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.8.4-2 The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts,

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.8.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.8.4.1-2 as appropriate.

#### 5.6.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.2.8.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ. For Test 3 and 4, additionally with condition GAP NEEDED<br>Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with condition SSB Index and A4-threshold = -105<br>Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 3 and Test 4<br>Table H.3.4-4 with condition gapUE for Test 1 and Test 2<br>Table H.3.4-5 with condition Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with condition SSB Index and INTER-FREQ<br>Table H.3.7-1 with condition DRX.1 for Test 1 and Test 3<br>Table H.3.7-1 with condition DRX.2 for Test 2 and Test 4<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

**Table 5.6.2.5.8.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | 6 dB | | |
| } | | | |

5.6.2.8.5 Test requirement

Table 5.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.2.8.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2,3,4,5,6 | NA | | Setup 1 as specified in clause A.9 | |
| Assumption for UE beams[Note 7] | | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | FDD | | TDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 FDD | | - | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | Config 1,4 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | Config 2,5 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | Config 3,6 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| TDD configuration | | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| SMTC configuration | | Config 1,4 | SMTC.2 | | SMTC.2 | |
| | | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| | | Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | NA Link only, see clause A.6A | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2,4,5 | | | -95.7 | |
| | | Config 3,6 | | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,4,5 | | | -Infinity | -86.7 |
| | | Config 3,6 | | | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | | | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | | | -Infinity | 9 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | | | - | - |
| | dBm/38.16MHz | Config 3,6 | | | - | - |
| | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | | | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2,3,4,5,6 | | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

## 5.6.3 L1-RSRP measurement for beam reporting

### 5.6.3.0 Minimum conformance requirements

#### 5.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 9.5.4.1-2 for FR2, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- N= 8.

For FR2,

- $P=\frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- $P=\frac{1}{1-\frac{T_{SSB}}{MRGP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is $\frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$
- $P=\frac{1}{1-\frac{T_{SSB}}{\min(T_{SMTCperiod},MGRP)}}$, when SSB is partially overlapped with measurement gap ($T_{SSB}$ <MGRP) and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is $\frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor}$ = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{sharing\ factor}$ = 3, otherwise.

Where:

- $T_{SSB}$ = ssb-periodicityServingCell
- $T_{SMTCperiod}$ = the configured SMTC period

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 9.5.4.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5\ K\ *M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| NOTE 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: K = 1 when $T_{SSB}$ ≤ 40 ms and RRM enhancements for high speed are configured; otherwise K = 1.5. | |

**Table 9.5.4.1-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR2**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(1.5*M*P*N)*T_{DRX}$ |
| NOTE: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

### 5.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS}$ < MGRP)
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- $P=P_{sharing\ factor}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS}$ < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P=\frac{P_{sharing\ factor}}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the CSI-RS configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured
- $P_{sharing\ factor}$ = 3, otherwise.

Where:

$T_{SMTCperiod}$ = the configured SMTC period.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

NOTE: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 9.5.4.2-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for FR2**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, ceil(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, ceil(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $ceil(M*P*N)*T_{DRX}$ |
| NOTE 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

## 5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 5.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 5.6.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.1.

### 5.6.3.1.4 Test description

#### 5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.1.4.1-2. Test environment parameters are given in Table 5.6.3.1.4.1-3.

**Table 5.6.3.1.4.1-1: EN-DC SSB based L1-RSRP measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.3.1.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~4 | | 66 |
| PDSCH Reference measurement channel | 1,2 | | SR.3.2 TDD |
| | 3,4 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 | | CR.3.1 TDD |
| | 3,4 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.3.1 TDD |
| | 3,4 | | CCR.3.7 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~4 | | SMTC.1 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 |
| DRX configuration | 1~4 | | Off |
| reportConfigType | 1~4 | | periodic |
| reportQuantity | 1~4 | | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 320 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 2 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.3.1.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 5.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.6.3.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.6.3.1.4.1-2. SSB#1 shall be muted during this step.

2. Set the parameters according to T1 in Table 5.6.3.1.5-1.

3. T1 starts. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 5.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 1720ms for UE supporting power class 1 in configuration 1 and 2, no later than 1700 ms for UE supporting power class 1 in configuration 3 and 4 , no later than 1240 ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1220 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.1.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.3.1.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Set the parameters according to T1 in Table 5.6.3.1.5-1. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 3-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.3.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.4-1 |

**Table 5.6.3.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

5.6.3.1.5 Test requirement

Table 5.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.3.1.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | | | |
| Assumption for UE beams Note 4 | 1~4 | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1,2 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 3,4 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 3,4 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2, 3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.1.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4 and the corresponding relative accuracy requirements in Table 5.6.3.1.5-4 for all test configurations.

**Table 5.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

**Table 5.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

**Table 5.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 5.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

#### 5.6.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle.

#### 5.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.2.

#### 5.6.3.2.4 Test description

##### 5.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.2.4.1-2. Test environment parameters are given in Table 5.6.3.2.4.1-3.

**Table 5.6.3.2.4.1-1: EN-DC SSB based L1-RSRP measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.3.2.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~4 | | 66 |
| PDSCH Reference measurement channel | 1,2 | | SR.3.2 TDD |
| | 3,4 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 | | CR.3.1 TDD |
| | 3,4 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.3.1 TDD |
| | 3,4 | | CCR.3.7 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~4 | | SMTC.1 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 |
| DRX configuration | 1~4 | | DRX.3 |
| reportConfigType | 1~4 | | periodic |
| reportQuantity | 1~4 | | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 320 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 3 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |

| Parameter | Config | Unit | Value |
|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.3.2.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.3.2.4.2 Test procedure

Same as in 5.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 2920ms for UE supporting power class 1 in configuration 1 and 2, no later than 2900ms for UE supporting power class 1 in configuration 3 and 4 , no later than 1960ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1940 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 5.6.3.2.4.3 Message contents

Same message content as in subclause 5.6.3.1.4.3 with the following exception:

**Table 5.6.3.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

### 5.6.3.2.5 Test requirement

Table 5.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.3.2.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | | | |
| Assumption for UE beams Note 4 | 1~4 | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1,2 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 3,4 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 3,4 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4 and the corresponding relative accuracy requirements in Table 5.6.3.2.5-4 for all test configurations.

**Table 5.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

**Table 5.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

**Table 5.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 5.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

### 5.6.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

### 5.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.3.

### 5.6.3.3.4 Test description

#### 5.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.3.4.1-2. Test environment parameters are given in Table 5.6.3.3.4.1-3.

**Table 5.6.3.3.4.1-1: EN-DC FR2 CSI-RS based L1-RSRP measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.3.3.4.1-2: General test parameters for EN-D FR2 C CSI-RS based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.7 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| CSI-RS configuration | 1~2 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | Off |
| reportConfigType | 1~2 | | aperiodic |
| reportQuantity | 1~2 | | cri-RSRP |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 8 |
| Propagation condition | 1~2 | | AWGN |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.3.3.4.1-3: Test Environment parameters for EN-DC FR2 CSI-RS L1-RSRP measurement**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.3.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 5.6.3.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 9 from the reception of DCI trigger. If the report is received at slot 9 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 5.6.3.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 5.6.3.3.5-33 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.3.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and APERIODIC<br>Table H.3.4-1 |

**Table 5.6.3.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

**Table 5.6.3.3.4.3-3: Physical layer parameters for DCI format 1_1**

| Derivation Path: TS 38.508-1 [14], Table 7.2.2.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| PDSCH-to-HARQ_feedback timing indicator | For 120KHz SCS:<br><br>K1 = N/A if mod(i,5) = 2<br>- PDSCH not scheduled (K1=2 and K1=12 are the possible settings to fall into a different UL slot than CSI Report. But K1=12 is not defined in RRC and K1=12 > PdschNumHarq Process=8. For K1=2, according to TS 38.214 Table 5.3-1, considering PDSCH processing time and PUCCH resource index (symbol#0,1), it is better to use different UL slot)<br>K1 = N/A if mod(i,5) = 0<br>- PDSCH not scheduled (K1=9 is the only possible setting to fall into a different UL slot than CSI Report but K1=9 > PdschNumHarq Process=8)<br>K1 = 8 if mod(i,5) = 1<br><br>where i is slot index per frame; i = {2,5,6} | - | FR2 |

5.6.3.3.5 Test requirement

Table 5.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.3.3.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS L1-RSRP measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9 | |
| Assumption for UE beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 9 |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 9 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.3.5-2 the corresponding relative accuracy requirements in Table 5.6.3.3.5-3.

**Table 5.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

**Table 5.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values R3**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

#### 5.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

#### 5.6.3.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle.

#### 5.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.4

#### 5.6.3.4.4 Test description

##### 5.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.3.4.1-2. Test environment parameters are given in Table 5.6.3.3.4.1-3.

**Table 5.6.3.4.4.1-1: EN-DC FR2 CSI-RS based L1-RSRP measurement in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.3.4.4.1-2: General test parameters for EN-D FR2 C CSI-RS based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.7 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| CSI-RS configuration | 1~2 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | DRX.3 |

| | | | |
|---|---|---|---|
| reportConfigType | 1~2 | | aperiodic |
| reportQuantity | 1~2 | | cri-RSRP |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 8 |
| Propagation condition | 1~2 | | AWGN |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.3.4.4.1-3: Test Environment parameters for EN-DC FR2 CSI-RS L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.3.4.4.2 Test procedure

Same test procedure as in subclause 5.6.3.3.4.2 with tables 5.6.3.3.4.1-2 and 5.6.3.3.5-1 replaced by tables 5.6.3.4.4.1-2 and 5.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

### 5.6.3.4.4.3 Message contents

Same message content as in subclause 5.6.3.3.4.3 with the following exception:

**Table 5.6.3.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 and Offset |

### 5.6.3.4.5 Test requirement

Table 5.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.3.4.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS L1-RSRP measurement in DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9 | |
| Assumption for UE beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 9 |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| NOTE 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 9 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.4.5-2 the corresponding relative accuracy requirements in Table 5.6.3.4.5-3.

**Table 5.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

**Table 5.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.4 CLI measurements

### 5.6.4.0 Minimum conformance requirements

#### 5.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

**Table 5.6.4.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$**

| Configuration | $T_{SRS_measurement_period}$ (ms) |
|---|---|
| No DRX | Max(60, 3 X $T_{SRS}$) |
| DRX cycle ≤ 320ms | Max(60, Ceil(1.5 X 3) X max($T_{SRS}$, $T_{DRX}$)) |
| DRX cycle > 320ms | 3 X $T_{DRX}$ |
| Note: $T_{SRS}$ is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and $T_{DRX}$ is the DRX cycle length. | |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

### 5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

#### 5.6.4.1.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

#### 5.6.4.1.2 Test applicability

FFS

#### 5.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.5.6.4.1.

#### 5.6.4.1.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2).

##### 5.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.4.1.4.1-1.

**Table 5.6.4.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.6.4.1 - 1 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.6.4.1 - 2 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| | Note: UE is only required to be tested in one of the supported test configurations |

Configure the test equipment and the DUT according to the parameters in Table 5.6.4.1.4.1-2.

**Table 5.6.4.1.4.1-2: Initial conditions EN-DC FR2 SRS-RSRP measurement in non-DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The test parameters are given in Table 5.6.4.1.4.1-3 below.

2. Message contents are defined in clause 5.6.4.1.4.3.

3. Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.1.4.1-3

. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

**Table 5.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table A.5.6.4.1.2-4 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -112 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | DRX.11 | |
| Time offset between DL from serving cell and SRS from test system | µs | 1,2 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

### 5.6.4.1.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 5.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 5.6.4.1.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.6.4.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 with event I1 configured.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

Editor's note: the rest of the steps are FFS.

### 5.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 5.6.4.1.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 5.6.4.1.5-1: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 |
|---|---|---|---|

| | | | T1 | T2 |
|---|---|---|---|---|
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |

**Table 5.6.4.1.5-2: NR OTA Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell and Neighbour cell UE in FR2**

| Parameter | Unit | Test configuration | Cell 2 | | Neighbour cell UE | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined A.9.1 | | | |
| Beam assumption Note 4 | | 1 | Fine | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -100.5 | | -100.5 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -91.5 | | -91.5 | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | - | - | -infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | - | - | -infinity | 7 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | - | - | -infinity | -84.5 |
| Io | dBm/95.04 MHz | 1 | -63.86 | -56.07 | -63.86 | -56.07 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Cell 2 doesn't transmit during the SRS and the 2 previous symbols. Es/NoC is not applied to those symbols.

**Table 5.6.4.1.5-3: SRS configuration for measurement reporting**

| | Field | SRSConf.1 | Comments |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | |
| | srs-ResourceIdList | 0 | |
| | resourceType | Periodic | |
| | Usage | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | |
| | nrofSRS-Ports | Port1 | |

| | | | |
|---|---|---|---|
| | transmissionComb | n2 | |
| | combOffset-n2 | 0 | |
| | cyclicShift-n2 | 0 | |
| | resourceMapping startPosition | 0 | |
| | resourceMapping nrofSymbols | n1 | |
| | resourceMapping repetitionFactor | n1 | |
| | freqDomainPosition | 0 | |
| | freqDomainShift | 0 | |
| | freqHopping c-SRS | 12 | |
| | freqHopping b-SRS | 0 | |
| | freqHopping b-hop | 0 | |
| | groupOrSequenceHopping | Neither | |
| | resourceType | Periodic | |
| | periodicityAndOffset | sl160, 25 | |
| | sequenceId | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.4.2 EN-DC FR2 CLI-RSSI measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

### 5.6.4.2.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLICLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5

### 5.6.4.2.2 Test applicability

FFS

### 5.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.5.6.4.2.

### 5.6.4.2.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2).

#### 5.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.4.2.4.1-1.

**Table 5.6.4.2.1-1: Applicable NR configurations for FR2 CLI-RSSI test**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.6.4.2.4.1-2.

**Table 5.6.4.2.4.1-2: Initial conditions EN-DC FR2 CLI-RSSI measurement in non-DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The test parameters are given in Table 5.6.4.2.4.1-3 below.

2. Message contents are defined in clause 5.6.4.2.4.3.

3. Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table 5.6.4.2.4.1-3

   The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

**Table 5.6.4.2.4.1-3: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| CLI-RSSI configuration | | 1 | CLI-RSSIConf.1 | Table 5.6.4.2.5-3 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -94.5 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | DRX.11 | |
| Time offset between DL from serving cell and OCNG from test system | µs | 1 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

#### 5.6.4.2.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 5.6.4.2.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 5.6.4.2.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.6.4.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 with event I1 configured.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

Editor's note: the rest of the steps are FFS.

### 5.6.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 5.6.4.2.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 5.6.4.2.5-1: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| PUSCH parameters | | 1 | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns Note 1 | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table 5.6.4.2.5-2: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.9.1 | |
| Beam assumption Note 3 | | 1 | Fine | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -119+TT | -108+TT |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -110 | -99 |
| Io on CLI-RSSI measurement resource | dBm/95.04 MHz | 1 | -81.01 | -70.01 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -100.46 | -89.46 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

**Table 5.6.4.2.5-3: CLI-RSSI measurement resource configuration for measurement reporting**

| | Field | CLI-RSSIConf.1 |
|---|---|---|
| RSSI-Resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120 |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl160, 25 |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.5 Measurements with autonomous gaps

### 5.6.5.0 Minimum conformance requirements

#### 5.6.5.0.1 Minimum conformance requirements for EN-DC inter-frequency CGI identification of NR neighbour cell in FR2

[TS 38.133, Clause 9.11]

##### 5.6.5.0.1.1 Introduction

The requirements in this clause are applicable for CGI identification of an intra-frequency and inter frequency NR target cell.

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC_CONNECTED state, and
- configured with SA or NR-DC or NE-DC operation mode, or with EN-DC operation mode for CGI identification requested by NR PSCell.

The overall CGI reporting delay is defined in clause 5.6.5.0.1.3.

The measurement reporting delay can be longer for the measurement reporting requirements in this clause when IDC autonomous denial is configured.

#### 5.6.5.0.1.2 CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of reportCGI. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may make autonomous gaps in both downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3 in TS 38.331 [13]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of reportCGI, regardless of whether DRX is used or not, or whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of NR cell within:

$$T_{identify_CGI} = (T_{MIB} + T_{SIB1})\ ms$$

Where:

$T_{MIB}$ is the time period used to acquire MIB message. $T_{MIB} = 6 * T_{SMTC}$ ms for target cell carrier frequency on FR1 and $T_{MIB} = 25 * T_{SMTC}$ ms for target cell carrier frequency on FR2.

$T_{SIB1}$ is the time period used to acquire SIB1 message. $T_{SIB1} = 6 * T_{RMSI\text{-}scheduling}$ ms.

Where $T_{SMTC}$ is the SMTC periodicity configured for the target cell measurement, and $T_{RMSI\text{-}scheduling}$ is

- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and 20ms when SSB and RMSI CORESET multiplexing pattern is 1
- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and $T_{SMTC}$ when SSB and RMSI CORESET multiplexing pattern is 2 or 3.

The requirement for identifying the CGI of an NR cell within $T_{identify_CGI}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

Within the time $T_{identify_CGI}$, over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in,

- Clause 8.2.1.2.16 in TS 38.133 [6] for NR serving cells and Clause 7.32.2.15 in TS36.133 [29] for E-UTRA serving cells if the UE is configured with EN-DC operation mode,
- Clause 8.2.2.2.14 in TS 38.133 [6] if the UE is configured with SA operation mode,
- Clause 8.2.3.2.14 in TS 38.133 [6] for NR serving cells and Clause 7.36.2.14 in TS36.133 [29] for E-UTRA serving cells if the UE is configured with NE-DC operation mode,
- Clause 8.2.4.2.11 in TS 38.133 [6] if the UE is configured with NR-DC operation mode.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and
- During MIB decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and
- During MIB decoding, the SSB for MIB decoding remains detectable with SNR $\geqslant$-3dB
- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with SNR $\geqslant$-3dB

#### 5.6.5.0.1.3 CGI reporting delay

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement

report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI}$ defined in clause 5.6.5.0.1.2 plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and additional 20ms margin if target cell is on FR2.

## 5.6.5.1 EN-DC inter-frequency CGI identification of NR neighbour cell in FR2

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing
- TT analysis is missing

### 5.6.5.1.1 Test purpose

The purpose of this test is to verify the requirements for inter-frequency identification of a new CGI of NR FR2 cell with autonomous gaps in clause 9.11 in TS 38.133 [6] for EN-DC.

### 5.6.5.1.2 Test applicability

This test applies to all types of EN-DC UE Rel-16 and forward supporting EN-DC with PSCell in FR2 and supporting acquisition of CGI from neighbour NR cell using autonomous gap, which is controlled by PICS pc_nr_CGI_Reporting.

### 5.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.5.1.

### 5.6.5.1.4 Test description

The test scenario comprises of one E-UTRA carrier and one NR FR2 carrier. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) on E-UTRA RF channel 1, NR FR2 PSCell (Cell 2) on NR RF channel 1 and NR FR2 neighbour cell (Cell 3) on NR RF channel 2.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 3. Starting T2, Cell 3 becomes detectable and the UE is expected to detect and send a measurement report with SSB index. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern configuration with id #0 is configured before T2 begins to enable inter-frequency monitoring.

#### 5.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.5.1.4.1-1.

**Table 5.6.5.1.4.1-1: Supported test configurations for EN-DC inter-frequency CGI identification of NR neighbour cell in FR2**

| Config | Description |
|---|---|
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 5.6.5.1.4.1-2.

**Table 5.6.5.1.4.1-2: Initial conditions for EN-DC PSCell FR2**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for NR Cells are given in Table 5.6.5.1.4.1-3 below. The test parameters and applicability for the E-UTRAN PCell are defined in Table A.3.7.2.1-1 in TS 38.133 [6]. Cell-specific parameters of NR PSCell are specified in Table 5.6.5.1.5-1 and 5.6.5.1.5-2.

2. Message contents are defined in clause 5.6.5.1.4.3.

3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 5.6.5.1.4.1-3: General test parameters for EN-DC inter-frequency CGI identification of NR neighbour cell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | As specified in clause 9.1.2-1 in TS 38.133 [6]. |
| Measurement gap offset | | Config 1,2 | 39 | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | As specified in clause A.3.10.2 in TS 38.133 [6] |
| A3-Offset | dB | Config 1,2 | [-30] | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 µs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3µs | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 7 for PC1; 4.5 for other PC | |
| T3 | s | Config 1,2 | 5 | |

### 5.6.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on E-UTRAN RF channel 1 (PCC) and to Cell 2 (PSCell) on NR RF

channel 1 (PSCC). NR Cell 3 is on NR RF channel 2. Set the parameters according to Tables 5.6.5.1.4.1-3 and 5.6.5.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 2.
3. T1 starts. At this moment, the UE does not have any timing information of Cell 3.
4. After 5 seconds, T2 starts. A RRC message implying SI reading with autonomous gap shall be sent to the UE during period T2, within 3s after the UE has reported Event A3. The RRC message shall create a measurement report configuration with *reportCGI* and *useAutonomousGaps-r16* setup.
5. After 4.5 seconds, T3 starts. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE. Measurement gaps shall be deconfigured before the start of T3.
6. If the UE transmits a measurement report containing the cell global identifier of Cell 3 within 775 ms from the start of T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. If it is successful, continue to step 9. Otherwise continue to step 8.
8. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.5.1.4.3 Message contents

TBD

### 5.6.5.1.5 Test requirement

Table 5.6.5.1.5-1 defines the cell specific test parameters, not including test tolerances yet [will update after TT analysis].

**Table 5.6.5.1.5-1: Cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbour cell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2, T3 | T1 | T2, T3 |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2 | DLBWP.0.1 | | | |
| Dedicated DL BWP | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| RMSI scheduling periodicity | ms | Config 1,2 | NA | | 40 | |

| | | | | |
|---|---|---|---|---|
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | NA |
| TCI configuration | | Config 1,2 | CSI-RS.Config.0 | NA |
| SMTC configuration defined in A.3.11 | | Config 1,2 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | 120 |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Propagation Condition | | Config 1,2 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 5.6.5.1.5-2: OTA cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbour cell in FR2**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2, T3 | T1 | T2, T3 |
| AoA setup | | Config 1,2 | Setup 1 defined in A.3.15.1 | | | |
| Assumption for UE beams[Note 4] | | Config 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 + TT | 4 + TT | -Infinity | -3 + TT |
| $N_{oc}$ [Note 2] | dBm/15 KHz | Config 1,2 | -102 + TT | | | |
| $N_{oc}$ [Note 2] | dBm/SCS | 1, 2 | -93 + TT | | | |
| SS-RSRP | dBm/SCS | 1, 2 | -89 + TT | -89 + TT | -Infinity | -96 + TT |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 + TT | 4 + TT | -Infinity | -3 + TT |
| $Io$ | dBm/95.04MHz | 1~4 | -58.56 + TT | | -62.25 + TT | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| Note 4: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation. | | | | | | |
| Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | | | | | |

The UE shall transmit a measurement report containing the cell global identifier of cell 3 within 775 milliseconds from the start of T3.

Test requirement = RRC Procedure delay + $T_{identify_CGI}$ + processing time for FR2 + reporting delay

= 10 + (25*20 + 6*40) + 20 + 2ms from the start of T3

= 772 ms, allow 775 ms.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 775 ms the number of interrupted slots shall not exceed the allowed number as defined in clause 8.2.1.2.16 in TS 38.133 [6].

The maximum number of interrupted slots allowed is 6*48 + 12*49 = 876.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.6 L1-SINR measurement for beam reporting

### 5.6.6.0 Minimum conformance requirements

#### 5.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 9.8.4.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS}$ < MGRP)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS}$ < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 9.8.4.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P*N)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

#### 5.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 9.8.4.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of $P_{CMR}$ shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 9.8.4.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(1.5*M*P*N)*T_{DRX}$ |
| Note 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

The UE shall transmit the periodic L1-SINR reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

For FR2, when the SSB configured as CMR for L1-SINR measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, there is no measurement restriction allowed when the network configures mixed numerology between SSB configured as CMR for L1-SINR measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, provided that UE is capable of independent beam management on this FR2 band pair.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and SSB. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as the CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and CSI-RS. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS in a resource set configured with repetition ON, or
  - The CSI-IM or the CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The CSI-RS is configured in q1 and beam failure is detected, or
  - The CMR for L1-SINR measurement and the CSI-RS are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

#### 5.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 9.8.4.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or
- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of $P_{CMR}$ and $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 9.8.4.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P*N)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.<br>Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and SSB. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as the CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and CSI-RS. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS in a resource set configured with repetition ON, or
  - The CSI-IM or the CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The CSI-RS is configured in q1 and beam failure is detected, or
  - The CMR for L1-SINR measurement and the CSI-RS are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

### 5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

#### 5.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

#### 5.6.6.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and long DRX cycle and L1-SINR measurement.

#### 5.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.1.

#### 5.6.6.1.4 Test description

##### 5.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.1.4.1-2. Test environment parameters are given in Table 5.6.6.1.4.1-3.

**Table 5.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-SINR test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based L1-SINR test**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| CSI-RS configuration | 1~2 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |

| | | | |
|---|---|---|---|
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | DRX.3 |
| reportConfigType | 1~2 | | aperiodic |
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 26 |
| Propagation condition | 1~2 | | AWGN |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based L1-SINR test**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.6.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 5.6.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.6.1.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 5.6.6.1.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.6.6.1.5-3 or the UE fails to report the measurement value for CSI-RS 0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

6. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7 If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.6.1.4.3-1: Common Exception messages for EN-DC FR2 CSI-based CMR and no dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.4-1<br>Table H.3.7-1 with condition DRX.3 |

**Table 5.6.6.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 5.6.6.1.5 Test requirement

Table 5.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.6.1.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | |
| Beam assumption Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 9 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.1.5-2 and the corresponding relative accuracy requirements in Table 5.6.6.1.5-3.

**Table 5.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 51 |
| Highest reported value (CSI-RS #1) | 74 |

**Table 5.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values R3**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS #0) | 4 |
| Highest DIFF SINR reported (CSI-RS #0) | 13 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

#### 5.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

#### 5.6.6.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and L1-SINR measurement reporting.

#### 5.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.2.

#### 5.6.6.2.4 Test description

##### 5.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.2.4.1-2. Test environment parameters are given in Table 5.6.6.2.4.1-3.

**Table 5.6.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.6.2.4.1-2: General test parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~4 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~4 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~4 | | CCR.3.1 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| CSI-RS configuration | 1~4 | | CSI-RS.3.1A TDD |

| | | | |
|---|---|---|---|
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~4 | | SMTC.1 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 |
| DRX configuration | 1~4 | | off |
| reportConfigType | 1~4 | | periodic |
| reportQuantity-r16 | 1~4 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~4 | | 2 |
| L1-SINR reporting period | 1~4 | slot | 640 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 3 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.6.2.4.1-3: Test Environment parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 5.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 5.6.6.2.4.1-2.

Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.6.6.2.4.1-2.

2. Set the parameters according to T1 in Table 5.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 5.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1 and 2, no later than 2920 ms for UE supporting power class 1 in configuration 3 and 4, no later than 2000 ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1960 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 in Table 5.6.6.2.5-3 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.6.2.5-4 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-SINR reports every 640 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.6.2.5-3 for all test configurations, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-SINR value of SSB#0 reported by the UE is compared to the expected DIFF-SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.6.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 5.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.6.2.4.3-1: Common Exception messages for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-3 with conditions PERIODIC<br>Table H.3.4-1 |

**Table 5.6.6.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

5.6.6.2.5 Test requirement

Table 5.6.6.2.5-1 and Table 5.6.6.2.5-1 define the primary level settings including test tolerances for all tests.

**Table 5.6.6.2.5-1: SSB specific test parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | | |
| Beam assumption Note 4 | | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.5 | -94.5 | -Infinity | -87 |
| | 3,4 | | -91.5 | -91.5 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -63.2 | -63.2 | -67 | -57.5 |
| | 3,4 | | -63.2 | -63.2 | -67 | -57.5 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 1.5 | 1.5 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 5.6.6.2.5-2: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | | CSI-RS#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | | |
| Beam assumption Note 4 | | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/CSI-RS SCS | -96 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 1.5 | 1.5 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 1.5 | 1.5 | -Infinity | 9 |
| CSI-RS RSRP Note3 | 1~4 | dBm/ CSI-RS SCS | -94.5 | -94.5 | -Infinity | -87 |
| Io Note3 | 1~4 | dBm/95.04MHz | -63.2 | -63.2 | -67 | -57.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2, 3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.2.5-3 for all test configurations and the corresponding relative accuracy requirements in Table 5.6.6.2.5-4 for all test configurations.

**Table 5.6.6.2.5-3: L1-SINR absolute accuracy requirements for the reported values for all test configurations R1 and R3**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 54 |
| Highest reported value (SSB#1) | - | 71 |

**Table 5.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for test configurations R1 and R4**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF SINR reported (SSB#0) | - | 4 |
| Highest DIFF SINR reported (SSB#0) | - | 10 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 5.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

### 5.6.6.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and L1-SINR measurement.

### 5.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.3.

### 5.6.6.3.4 Test description

#### 5.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.3.4.1-2. Test environment parameters are given in Table 5.6.6.3.4.1-3.

**Table 5.6.6.3.4.1-1: Applicable NR configurations for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 5.6.6.3.4.1-2: General test parameters for FR2 L1-SINR test with CMR and dedicated IMR**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |

| | | | |
|---|---|---|---|
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| CSI-RS configuration | 1~2 | | CSI-RS.3.3 TDD |
| CSI-IM configuration | 1~2 | | CSI-IM.3.2 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | Off |
| reportConfigType | 1~2 | | aperiodic |
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 26 |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 5.6.6.3.4.1-3: Test Environment parameters for FR2 L1-SINR test with CMR and dedicated IMR**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.6.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 5.6.6.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 5.6.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.6.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 5.6.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.6.6.3.5-3 or the UE fails to report the measurement value for CSI-RS 0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

6. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7 If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.6.3.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.6A-4 with conditions APERIODIC<br>Table H.3.4-1 |

**Table 5.6.6.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

5.6.6.3.5 Test requirement

Table 5.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.6.3.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9 | |
| Assumption for UE beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.3.5-2 and the corresponding relative accuracy requirements in Table 5.6.6.3.5-3. The reported L1-SINR value shall consider the Rx antenna gain in the range of [-10 ~ +20] dB when calculated.

**Table 5.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 53 |
| Highest reported value (CSI-RS #1) | 72 |

**Table 5.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values R3**

| Normal Conditions | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS #0) | 5 |
| Highest DIFF SINR reported (CSI-RS #0) | 12 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 5.6.7 CSI-RS based Intra-frequency Measurements

### 5.6.7.0 Minimum conformance requirements

#### 5.6.7.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.10.2]

The requirements in clause 9.10.2 apply, provided:

- Only one intra-frequency CSI-RS layer per serving cell is configured, and
- The BW of the CSI-RS on the intra-frequency neighbour cell is within the active BWP of the UE, and
- The associated SSB of the CSI-RS resources being identified or measured are detectable, and the CSI-RS resources configured for CSI-RS based L3 measurements are measurable, and
- The bandwidth of CSI-RS resources of intra-MO is the same as that of the CSI-RS resources configured for the serving cell, and
- All CSI-RS resources on one intra-frequency layer are configured within up to two separate windows where each window is up to 5ms, and
- for the case of single window further provided
- The periodicity of the configured CSI-RS resources is 10ms, 20ms or 40ms- for the case of two separate windows further provided
  - The two windows are either both fully non-overlapped with MG or both partially overlapped with MG
    - The periodicity of the configured CSI-RS resources is 20ms or 40ms
  - The starting point of the first window is the slot boundary of the serving cell, where the corresponding slot contains the configured L3 CSI-RS resource of the serving cell in the servingCellMO with the smallest offset, and
  - The starting point of the second window if configured is determined by an offset of half of the CSI-RS periodicity in slots with regards to the starting point of the first window, and
- Numerology for intra-frequency CSI-RS and data of serving cell are the same.

An intra-frequency cell shall be considered detectable when for each relevant associated SSB:

- SS-RSRP related side conditions given in clauses 10.1.2.1 and 10.1.3.1 for FR1 and FR2, respectively, for a corresponding band,
- SS-RSRQ related side conditions given in clauses 10.1.7.1 and 10.1.8.1 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in clauses 10.1.12.1 and 10.1.13.1 for FR1 and FR2, respectively, for a corresponding band,

- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding band.

A CSI-RS resource shall be considered measurable when for each relevant CSI-RS resource:

- CSI-RSRP related side conditions given in clauses 10.1.2.3 and 10.1.3.3 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RSRQ related side conditions given in clauses 10.1.7.2 and 10.1.8.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI-SINR related side conditions given in clauses 10.1.12.2 and 10.1.13.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI_RP and CSI-RS Ês/Iot according to Annex B.2.12 for a corresponding band.

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ as defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in Table 5.6.7.0.2-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in Table 5.6.7.0.2-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 5.6.7.0.2-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 5.6.7.0.2-1: Time period for PSS/SSS detection (Frequency range 2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133, clause 9.10.2.5]

The measurement period for CSI- RS based intra-frequency measurements without gaps is as shown in Table 5.6.7.0.2-2.

Additionally, for a given CSI-RS resource, if the associated SS/PBCH block is configured but not detected by the UE, or if CSI-RS is configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 5.6.7.0.2-2: Measurement period for intrafrequency CSI-RS based measurements without gaps(FR2)**

| DRX cycle | $T_{CSI\text{-}RS_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, ceil($M_{meas_period_w/o_gaps}$ x $K_{p_CSI\text{-}RS}$) x CSI-RS period) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_{p_CSI\text{-}RS}$) x max(CSI-RS period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{meas_period_w/o_gaps}$ x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: The requirements apply assuming CSI-RS configuration with {D=3 with PRBs ≥ 48}. D is frequency domain density for the 1-port CSI-RS for L3 mobility defined in clause 7.4.1 of TS 38.211 [7]. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.10.2, 9.2.4.3, 9.2.6.2, 9.10.2.5.

## 5.6.7.1 EN-DC event triggered reporting test without gap under non-DRX

Editor's Note: This test case is incomplete for the following configurations:

- TT analysis is missing.
- Test applicability needs to be updated

### 5.6.7.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the intra-frequency cell search requirements.

### 5.6.7.1.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurement.

#### 5.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.7.1.

#### 5.6.7.1.4 Test description

##### 5.6.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.7.1.4.1-1.

**Table 5.6.7.1.4.1-1: supported test configurations**

| Configuration | Description |
|---|---|
| 5.6.7.1-1 | LTE FDD, 120 kHz SSB SCS, 120Khz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.6.7.1-2 | LTE TDD, 120 kHz SSB SCS, 120Khz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 5.6.7.1.4.1-2.

**Table 5.6.7.1.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting without gap under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | TBD | | |

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.7.1.4.1-3 below.

2. Message contents are defined in clause 5.6.7.1.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

**Table 5.6.7.1.4.1-3: General test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) | |
| Neighbour cell | | 1,2 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2 | 1: Cell 1<br>2: Cell 2 and Cell 3 | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration | | 1,2 | SMTC.1 | |
| A3-Offset | dB | 1,2 | -6 | |

| | | | | |
|---|---|---|---|---|
| CP length | | 1,2 | Normal | |
| Hysteresis | dB | 1,2 | 0 | |
| Time To Trigger | s | 1,2 | 0 | |
| Filter coefficient | | 1,2 | 0 | L3 filtering is not used |
| DRX | | 1,2 | OFF | |
| Time offset between Cell 1 and Cell 2 | µs | 1,2 | 3 | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | µs | 1,2 | 0.58 | The timing of Cell 3 is CP later than the timing of Cell 2 |
| T1 | s | 1,2 | 5 | |
| T2 | s | 1,2 | 5 | |

#### 5.6.7.1.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 3202 ms for UE supporting power class 1, or 2402 ms for UE supporting other power class then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 5.6.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.6.7.1.4.3-1: Common Exception messages EN-DC FR2 inter frequency event triggered reporting tests without gap under non-DRX**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-7 with Condition INTRA-FREQ, CSI-RS MOBILITY<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-2 with conditions PERIODIC and CSI-RSRP |

**Table 5.6.7.1.4.3-2: MeasObjectNR (Step 3, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in TS 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 | | 5.6.1.1-1, 5.6.1.1-2 |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure CHOICE { | | | |
| setup CHOICE { | | | |
| longBitmap | 11000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | SSB#0 and SSB#1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 3 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

5.6.7.1.5 Test requirement

Tables 5.6.7.1.4.1-3, 5.6.7.1.5-1 and 5.6.7.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test without gap under non-DRX.

**Table 5.6.7.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |

| | | | | |
|---|---|---|---|---|
| TDD configuration | | 1,2 | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Initial BWP configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Active DL BWP configuration | | 1,2 | DLBWP.1.1 | DLBWP.1.1 |
| Active UL BWP configuration | | 1,2 | ULBWP.1.1 | ULBWP.1.1 |
| RLM-RS | | 1,2 | SSB | SSB |
| PDSCH RMC configuration | | 1,2 | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | 1,2 | OP.1 | OP.1 |
| TRS configuration | | 1,2 | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI state | | 1,2 | TCI.State.2 | N/A |
| SMTC configuration | | 1, 2 | SMTC.1 | SMTC.1 |
| SSB configuration | | 1,2 | SSB.3 FR2 | SSB.3 FR2 |
| CSI-RS RRM configuration | | 1,2 | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD |
| Propagation Condition | | 1,2 | AWGN | |

**Table 5.6.7.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1,2 | Setup 3 defined in A.3.15.3 | | | |
| | | | AoA1 | | AoA2 | |
| Assumption for UE beams[Note 4] | | 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ for SSB | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1,2 | -102 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,2 | -93 | | | |
| SS-RSRP | dBm/SCS | 1,2 | -89 | -89 | -Infinity | -85 |
| CSI-RSRP | dBm/SCS | 1,2 | -89 | -89 | -Infinity | -85 |
| $\hat{E}_s/N_{oc}$ for SSB | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $Io$ | dBm/95.04MHz | 1,2 | -58.56 | | -55.38 | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2.

3200 for UE supporting power class 1, or

2400 for UE supporting other power class.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 3202 ms in this test case and 2402 ms for other power classes (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

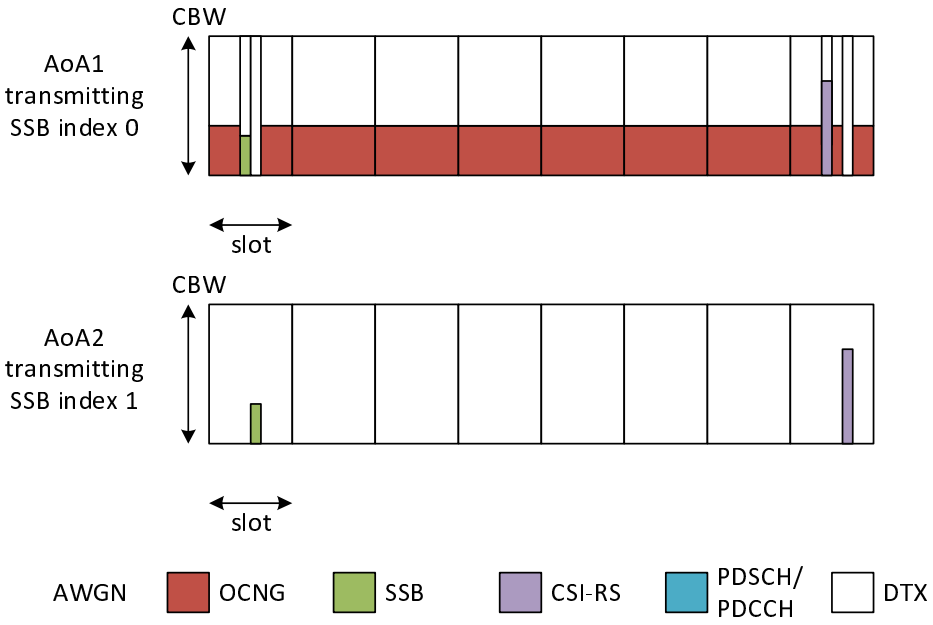



**Figure 5.6.7.1.5-1: Time multiplexed downlink transmissions (Config 1,2 example)**

## 5.6.8 CSI-RS based Inter-frequency Measurements

### 5.6.8.0 Minimum conformance requirements for Inter-frequency measurements

The requirements in clause 9.10.3 apply, provided:

- The associated SSB of the cell being identified or measured is detectable, and
- All CSI-RS resources on one inter-frequency layer are configured within a window of up to 5ms, and
- The periodicity of the configured CSI-RS resources is 10ms, 20ms or 40ms, and
- CSI-RS resources for measurements and the associated SSB for cell identification are configured within measurement gap.

An inter-frequency cell shall be considered detectable when for each relevant associated SSB:

- SS-RSRP related side conditions given in clauses 10.1.4.1 and 10.1.5.1 for FR1 and FR2, respectively, for a corresponding band,
- SS-RSRQ related side conditions given in clauses 10.1.9.1 and 10.1.10.1 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in clauses 10.1.14.1 and 10.1.15.1 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding band.

A CSI-RS resource shall be considered measurable when for each relevant CSI-RS resource:

- CSI-RSRP related side conditions given in clauses 10.1.4.3 and 10.1.5.3 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RSRQ related side conditions given in clauses 10.1.9.2 and 10.1.10.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI-SINR related side conditions given in clauses 10.1.14.2 and 10.1.15.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI_RP and CSI-RS Ês/Iot according to Annex B.2.13 for a corresponding band.

When measurement gaps are provided, if configured with the higher layer parameters *CSI-RS-Resource-Mobility* and *associatedSSB*, the UE shall be able to identify a new detectable CSI-RS based inter frequency cell within $T_{CSI-RS_identify_inter}$,

$$T_{CSI-RS_identify_inter} = (T_{PSS/SSS_sync} + T_{CSI-RS_measurement_period_inter} + T_{CSI-RS_SFN_inter})\ ms$$

Where:

$T_{PSS/SSS_sync}$ is the time period used in PSS/SSS detection which is determined according to $T_{PSS/SSS_sync_inter}$ in clause 9.3.4,

$T_{CSI-RS_SFN_inter}$ is the time period used to acquire the SFN information of the cell being measured, which is shown in Table 9.10.3.5-3 for FR1 and equals inter-frequency $T_{SSB_time_index_inter}$ in clause 9.3.4 for FR2,

$T_{CSI-RS_measurement_period_inter}$: equal to a measurement period of CSI-RS based measurement given in Table 9.10.3.5-1 and table 9.10.3.5-2.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1 or 5, $M_{meas_period_inter}$ =8×N samples. For a UE supporting FR2 power class 2, $M_{meas_period_inter}$=5×N samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =5×N samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 5×N samples. Note that scaling factor N = [8].

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5 for measurement conducted within measurement gaps.

When UE supports concurrent measurement gaps or [*musim-GapPreference-r17]* or both concurrent measurement gap and [*musim-GapPreference-r17]*, and concurrent measurement gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured, $K_{p_CSI-RS}$ is the scaling factor for a CSI-RS frequency layer to be measured within the associated measurement gap which is defined as $K_{p_CSI-RS} = N_{total} / N_{available}$. $K_{p_CSI-RS}$ = 1 for UE not configured with concurrent measurement gaps and MUSIM gaps.

- For a window W of duration max(CSI-RS period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG, periodic MUSIM gaps, and per-FR MG within the same FR as the CSI-RS frequency layer, and starting at the beginning of any gap occasions covering the CSI-RS resources.:
  - $N_{total}$ is the total number of associated gap occasions covering CSI-RS resources within the window, including those overlapped with other measurement gap and MUSIM gap instances within the window, and

- $N_{available}$ is the number of non-dropped associated gap occasions covering CSI-RS resources within the window W, after accounting for MG and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in clause 9.1.8.3 and 9.1.10.x3, respectively.

- Requirements do not apply if $N_{available} = 0$

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in clause 9.1.10.x3 is applied, longer cell identification period for the target inter-frequency is expected.

Additionally, for a given CSI-RS resource, if the associated SSB is configured but not detected by the UE, or if CSI-RS configured with associated SSB but not QCL-ed to the associated SSB, the UE is not required to monitor the corresponding CSI-RS resource.

**Table 5.6.8.0-1: Measurement period for CSI-RS based inter-frequency measurements with gaps (FR2)**

| Condition NOTE1,2 | $T_{CSI\text{-}RS_measurement_period_inter}$ |
|---|---|
| No DRX | Max(400 ms, ceil( $M_{meas_period_inter} \times K_{p_CSI\text{-}RS}$ )× Max(MGRP, CSI-RS period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | Max(400 ms, ceil(1.5 × $M_{meas_period_inter} \times K_{p_CSI\text{-}RS}$) × Max(MGRP, CSI-RS period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320ms | Ceil($M_{meas_period_inter} \times K_{p_CSI\text{-}RS}$ )× DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.<br>NOTE 3: If UE support concurrent gaps and multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the CSI-RS resources of the inter-frequency layer.<br>NOTE 4: $K_{p_CSI\text{-}RS}$ is applicable for a UE supporting concurrent gaps and/or MUSIM gaps. | |

Reported CSI-RSRP, CSI-RSRQ, and CSI-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.2, 10.1.5.2, 10.1.9.2, 10.1.10.2, 10.1.14.2 and 10.1.15.2..

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within CSI-RS based measurement defined in clause xxx. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.10.3.2, 9.10.3.4, 9.10.3.5.

## 5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used

Editor's Note: This test case is complete for the following configurations:

-- UE power class 3

- Test frequency f < 40.8 GHz

- Normal Condition

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

This test case is incomplete for extreme condition

### 5.6.8.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 5.6.8.1.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting NR EN-DC FR2 and CSI-RS based measurement and long DRX cycle. Tests 2 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13, otherwise Tests 1 are applicable.

#### 5.6.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.8.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.8.1.

#### 5.6.8.1.4 Test description

##### 5.6.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.8.1.4.1-1.

**Table 5.6.8.1.4.1-1 EN-DC FR2-FR2 event triggered reporting tests in DRX supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS,100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 5.6.8.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection with DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | 39 | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1,2 | -6 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | | As specified in clause A.3.3.3 |
| Time offset between PCell and PSCell | μs | Config 1,2 | 3 | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | μs | Config 1,2 | 0.58 | | The timing of Cell 3 is CP later than the timing of Cell 2 |

| | | | | | |
|---|---|---|---|---|---|
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 21 for PC1; 13 for other PC | 21 for PC1; 13 for other PC | |

**Table 5.6.8.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 5.6.8.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.2.
3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 5.6.8.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.8.1.4.1-2 is provided for UE that does not support per-FR gap and in test 3 measurement gap pattern configuration #13 as defined in Table 5.6.8.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.8.1.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.8.1.4.1-2.
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 20162 ms for UE supporting power class 1, or 12482 ms for UE supporting other power class for Test 1 and Test

3, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.8.1.4.1-2 as appropriate.

#### 5.6.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ. For Test 1 and Test 3, with condition GAP NEEDED additionally.<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and CSI-RS MOBILITY<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 1 and Test 3<br>Table H.3.4-4 with Condition gapUE Test 1 and Test 3<br>Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 3<br>Table H.3.1-7 with Condition INTER-FREQ and CSI-RS MOBILITY<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3<br>Table H.3.4-1<br>Table H.3.4-2<br>Table H.3.4-3 |

#### 5.6.8.1.5 Test requirement

Table 5.6.8.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 5.6.8.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2 | Setup 1 as specified in clause A.3.15 | | | |
| Assumption for UE beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| TDD configuration | | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2 | ULBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dedicated DL BWP | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| TCI configuration | | Config 1,2 | CSI-RS.Config.0 | | NA | |
| SMTC configuration defined in A.3.11 | | Config 1,2 | SMTC.1 | | SMTC.1 | |
| CSI-RS RRM configuration | | Config 1,2 | CSI-RS.RRM.FR2.1 TDD | | CSI-RS.RRM.FR2.1 TDD | |
| firstOFDMSymbolInTimeDomain | | Config 1,2 | 7 | | 12 | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| CSI-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ for SSB | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ for SSB | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone

Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

20160 ms for UE supporting power class 1, or

12480 ms for UE supporting other power class.

The UE is required to read the neighbour cell SSB index in this test in order to detect associated SSB for the CSI-RS resource of Cell 3.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 5.7 Measurement performance requirements

## 5.7.1 SS-RSRP

### 5.7.1.0 Minimum conformance requirements

#### 5.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

##### 5.7.1.0.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute SS-RSRP accuracy in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.1.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.1.0.1.1-1: SS-RSRP Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 2] range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / $SCS_{SSB}$ [Note 1] | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| ±6 | ±9 | ≥-6 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8 | ±11 | | N/A | | -70 | -50 |

NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

##### 5.7.1.0.1.2 Relative SS-RSRP Accuracy

The relative SS-RSRP accuracy is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.1.0.1.2-1: SS-RSRP Intra-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / $SCS_{SSB}$ Note 1 | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | $dBm/BW_{Channel}$ |
| ±6 | ±9 | ≥-6 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | | -50 |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.<br>NOTE 4: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.3.1 and 10.1.6.

## 5.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

### 5.7.1.0.2.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute SS-RSRP accuracy in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 5.7.1.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [2].

**Table 5.7.1.0.2.1-1: SS-RSRP Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | | | |
| | | | Minimum Io | | | Maximum Io |
| | | | dBm / $SCS_{SSB}$ Note 1 | | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±6 | ±9 | ≥-4 | Same value as SSB_RP in Table B.2.3-2, according to UE Power | | N/A | -70 |

| | | | | | |
|---|---|---|---|---|---|
| | | | class, operating band and angle of arrival | | |
| ±8 | ±11 | | N/A | -70 | -50 |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.1 and 10.1.6.

#### 5.7.1.0.2.2 Relative SS-RSRP Accuracy

The relative SS-RSRP accuracy is defined as the SS-RSRP measured from one cell on a frequency in FR2 compared to the SS-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 5.7.1.0.2.2-1 are valid under the following conditions:

- Conditions defined in TS 38.101-2 [3] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27dB$
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.1.0.2.2-1: SS-RSRP Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / $SCS_{SSB}$ Note 1 | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | $dBm/BW_{Channel}$ |
| ±6 | ±9 | ≥-4 | Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival | | -50 |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.<br>NOTE 4: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.1 and 10.1.6.

### 5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC1, PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC1 and PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 5.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

#### 5.7.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 5.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.1.

#### 5.7.1.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

##### 5.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.1.4.1-1.

**Table 5.7.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.1.1-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.1.4.1-2.

**Table 5.7.1.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.1.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 5.7.1.1.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

   - R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R9. Otherwise, R9 is passed.

   - R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 5.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

- R7: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

- R8: The SS-RSRP value of Cell 3 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 3 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

- R11: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R11. Otherwise, R11 is passed.

- R12: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 5.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

#### 5.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.7.1.1.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.1.1 and relative accuracy requirements in clause 5.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-4.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3 and Table 5.7.1.1.5-3a.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3 and Table 5.7.1.1.5-3a.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-4.

R11: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

R12: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-5.

R8: Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-5.

**Table 5.7.1.1.5-1: SS-RSRP Intra-frequency general test parameters**

| Parameter[Note 5] | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | **489** | **0** | **489** | **0** |
| SSB ARFCN | | freq1 | | freq1 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | | 24 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration | | ULBWP.0.1 | - | ULBWP.0.1 | - |

| Parameter[Note 5] | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration | | Not applicable | - | Not applicable | - |
| TRS configuration | | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3.2 TDD | - | SR.3.2 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 2 | µs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: Void
NOTE 4: Void
NOTE 5: All parameters apply for configuration 1 and 2
NOTE 6: Void

**Table 5.7.1.1.5-2: SS-RSRP Intra-frequency OTA related test parameters**

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 | | | |
| Assumption for UE beams[Note 8] | | Rough | | | |
| $N_{oc}$ [Note1] | dBm/15kHz [Note4] | -97.4 | | N/A | |
| $N_{oc}$ [Note1] | dBm/SCS[Note4] | -88.37 | | N/A | |
| $\hat{E}_s / N_{oc}$ | dB | 6.0 | 1.4 | N/A | N/A |
| $E_s$ PC1 | dBm/SCS[Note4] | | | (Table B.2.2-2 Rx Beam Peak +8.1dB) | (Table B.2.2-2 Rx Beam Peak +8.1dB) |

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| $E_s$ PC3 | dBm/SCS Note4 | | | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| SSB_RP Note2 PC1 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +8.1dB) | (Table B.2.2-2 Rx Beam Peak +8.1dB) |
| SSB_RP Note2 PC3 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| $\hat{E}_s / I_{ot\ BB}$ Note6 | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.74 | | (Table B.2.2-2 Rx Beam Peak +37.40dB) | |

NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: Void
NOTE 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.
NOTE 7: All parameters apply for configurations 1 and 2
NOTE 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 5.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 1 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 60 | n257, n258, n261 | 41 |
| | | n260 | 44 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 126 | n257, n258, n261 | 118 |
| | | n260 | 121 |
| | | n259 | FFS |
| Lowest reported value (Cell 3) | 56 | n257, n258, n261 | 41 |
| | | n260 | 44 |
| | | n259 | FFS |
| Highest reported value (Cell 3) | 126 | n257, n258, n261 | 118 |
| | | n260 | 121 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 57+ FFS | n257, n258, n261 | 38 + FFS |
| | | n260 | 41 + FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 126+ FFS | n257, n258, n261 | 121 + FFS |
| | | n260 | 124 + FFS |
| | | n259 | FFS |

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 3) | 53+ FFS | n257, n258, n261 | 38+ FFS |
| | | n260 | 41+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 3) | 126+ FFS | n257, n258, n261 | 121+ FFS |
| | | n260 | 125+ FFS |
| | | n259 | FFS |
| **UE power class 3** | | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 50 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 108 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| Lowest reported value (Cell 3) | 46 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 3) | 103 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 47+ FFS | n257, n258, n261 | 28 + FFS |
| | | n260 | 30 + FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 111+ FFS | n257, n258, n261 | 91 + FFS |
| | | n260 | 93 + FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 3) | 46+ FFS | n257, n258, n261 | 28+ FFS |
| | | n260 | 30+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 3) | 106+ FFS | n257, n258, n261 | 91+ FFS |
| | | n260 | 93+ FFS |
| | | n259 | FFS |

**Table 5.7.1.1.5-3a: evaluation limits for the ∆(Max-Min) reported values for each cell during each time period**

| **UE power class 1** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16 | 16 |
| ∆(Max-Min) reported value Cell 3 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16 + FFS | 16+ FFS |
| ∆(Max-Min) reported value Cell 3 | 16 + FFS | 16 + FFS |
| **UE power class 3** | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16 | 16 |
| ∆(Max-Min) reported value Cell 3 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16 + FFS | 16+ FFS |
| ∆(Max-Min) reported value Cell 3 | 16 + FFS | 16 + FFS |

**Table 5.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 1 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3 – Cell 2) | RSRP_x - 12 | RSRP_x - 6 |
| Highest reported value (Cell 3 – Cell 2) | RSRP_x + 2 | RSRP_x + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3 – Cell 2) | RSRP_x - 15+ FFS | RSRP_x - 9+ FFS |
| Highest reported value (Cell 3 – Cell 2) | RSRP_x + 5+ FFS | RSRP_x + 9+ FFS |
| **UE power class 3** | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3 – Cell 2) | RSRP_x - 12 | RSRP_x - 6 |
| Highest reported value (Cell 3 – Cell 2) | RSRP_x + 2 | RSRP_x + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3 – Cell 2) | RSRP_x - 15+ FFS | RSRP_x - 9+ FFS |
| Highest reported value (Cell 3 – Cell 2) | RSRP_x + 5+ FFS | RSRP_x + 9+ FFS |
| RSRP_x is the reported value of Cell 2 | | |

**Table 5.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8**

| UE power class 1 | | | |
|---|---|---|---|
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_x - 28 | RSRP_x - 31+ FFS |
| | n260 | RSRP_x - 25 | RSRP_x - 28+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_x - 12 | RSRP_x - 9+ FFS |
| | n260 | RSRP_x - 9 | RSRP_x - 6+ FFS |
| | n259 | FFS | FFS |
| Lowest reported value (Cell 3 T2 – Cell 3 T1) | n257, n258, n261 | RSRP_y - 24 | RSRP_y - 27+ FFS |
| | n260 | RSRP_y - 21 | RSRP_y - 24+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 3 T2 – Cell 3 T1) | n257, n258, n261 | RSRP_y - 8 | RSRP_y - 5+ FFS |
| | n260 | RSRP_y - 5 | RSRP_y - 2+ FFS |
| | n259 | FFS | FFS |
| **UE power class 3** | | | |
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_x - 28 | RSRP_x - 31+ FFS |
| | n260 | RSRP_x - 26 | RSRP_x - 29+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_x - 12 | RSRP_x - 9+ FFS |
| | n260 | RSRP_x - 10 | RSRP_x - 7+ FFS |
| | n259 | FFS | FFS |
| Lowest reported value (Cell 3 T2 – Cell 3 T1) | n257, n258, n261 | RSRP_y - 24 | RSRP_y - 27+ FFS |
| | n260 | RSRP_y - 21 | RSRP_y - 24+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 3 T2 – Cell 3 T1) | n257, n258, n261 | RSRP_y - 8 | RSRP_y - 5+ FFS |
| | n260 | RSRP_y - 5 | RSRP_y - 2+ FFS |
| | n259 | FFS | FFS |
| RSRP_x is the reported value of Cell 2 during T1 | | | |

| |
|---|
| RSRP_y is the reported value of Cell 3 during T1 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

### 5.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

### 5.7.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 5.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.2.

### 5.7.1.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

#### 5.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.2.4.1-1.

**Table 5.7.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.1.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.1.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| 5.7.1.2-3 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.1.2-4 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.2.4.1-2.

**Table 5.7.1.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |

| | | |
|---|---|---|
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.7.1.2.4.1-3.

2. Message contents are defined in clause 5.7.1.2.4.3.

3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

4. The Rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

#### 5.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point As defined in clause A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.7.1.2.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

   - R7: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R7. Otherwise, R7 is passed.

   - R8: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point As defined in clause A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 5.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.2.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

    - R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R9. Otherwise, R9 is passed.

    - R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R10. Otherwise, R10 is passed.

#### 5.7.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

### 5.7.1.2.5 Test requirement

Table 5.7.1.2.5-1 defines the cell specific settings for all tests. Table 5.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.2.1 and relative accuracy requirements in clause 5.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2 and Table 5.7.1.2.5-3a for both configurations.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.2.5-5.

R7: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

R8: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2 and Table 5.7.1.2.5-3a for both configurations.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.2.5-5.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

**Table 5.7.1.2.5-1: SS-RSRP Inter-frequency general test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | 1~4 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1~4 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1,2 | | 24 | | 24 | |
| | 3,4 | | 48 | | 48 | |
| Duplex mode | 1~4 | | TDD | | TDD | |
| TDD configuration | 1~4 | | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1,2 | | SR.3. 2 TDD | - | SR.3. 2 TDD | - |
| | 3,4 | | SR.3.3 TDD | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | 1,2 | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| | 3,4 | | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| | 3,4 | | CCR.3.7 TDD | | CCR.3.7 TDD | |
| SSB configuration | 1,2 | | SSB.3 FR2 | | SSB.3 FR2 | |
| | 3,4 | | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~4 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~4 | | OP.3 | | OP.3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Initial BWP Configuration | 1~4 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1~4 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~4 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | 1~4 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1~4 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~4 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void | | | | | | |

**Table 5.7.1.2.5-2: SS-RSRP Inter-frequency OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | 1~4 | | Setup 4b according to clause A.9.4 | | Setup 4b according to clause A.9.4 | |
| | | | AoA1 Spherical coverage | AoA2 Rx Beam Peak | AoA1 Spherical coverage | AoA2 Rx Beam Peak |
| Assumption for UE beams Note 7 | 1~4 | | Rough | | Rough | |
| $N_{oc}$ Note1 | 1, 2 | dBm/15kHz Note4 | -96.3 | -96.3 | (Table B.2.3-2 Rx Beam Peak Note 8 - 4.63dB) | (Table B.2.3-2 Rx Beam Peak Note 8 - 3.03dB) |
| | 3, 4 | | -99.3 | -99.3 | | |
| $N_{oc}$ Note1 | 1, 2 | dBm/SCS Note4 | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +4.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +6.0dB) |
| | 3, 4 | | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +7.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +9.0dB) |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 6.0 | 6.0 | 17.0 | 1.0 |
| SSB_RP Note2 | 1, 2 | dBm/SCS | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +21.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +7.0dB) |
| | 3, 4 | | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +24.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +10.0dB) |

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| ($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 3}$) | 1~4 | dB | 0 | | 14.40 | |
| $\hat{E}_s/I_{ot}$ BB Note6 | 1, 2 | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| | 3, 4 | | 4. 58 | 5.87 | | |
| Io Note2 | 1, 2 | dBm/95.04 MHz Note4 | -55.70 | -55.70 | (Table B.2.3-2 Rx Beam Peak Note 8 +46.08dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +35.13dB) |
| | 3, 4 | | -55.7 | -55.7 | (Table B.2.3-2 Rx Beam Peak Note 8 +49.09dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +38.14dB) |
| ($Io_{freq\ 1}$ – $Io_{freq\ 2}$) | 1~4 | dB | 0 | | 11.95 | |

NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 3}$ – $SSB_RP_{Cell\ 2}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: Void
NOTE 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
NOTE 7: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation
NOTE 8: The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB_RP for $SCS_{SSB}$ = 120 kHz, selected according to the operating band of Cell 3 and UE power class, without $\Delta MB_{P,n}$ adjustment.

**Table 5.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 | n257, n258, n261 | 33 |
| | n260 | 39 | n260 | 34 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 101 |
| | | | n260 | 104 |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 | | n257, n258, n261 | 32 |
| | | | n260 | 34 |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 | | n257, n258, n261 | 87 |
| | | | n260 | 90 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 33 + FFS |
| | n260 | 39 + FFS | n260 | 34 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 101 + FFS |
| | | | n260 | 104 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 + FFS | | n257, n258, n261 | 32+ FFS |
| | | | n260 | 34+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 + FFS | | n257, n258, n261 | 87+ FFS |

| | | | |
|---|---|---|---|
| | | n260 | 91+ FFS |
| | | n259 | FFS |

**Table 5.7.1.2.5-3a: evaluation limits for the Δ(Max-Min) reported absolute values for cell 3 during each time period**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 3 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 3 | 16 + FFS | 16 + FFS |

**Table 5.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 | n257, n258, n261 | 36 |
| | n260 | 39 | n260 | 37 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 104 |
| | | | n260 | 107 |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 | | n257, n258, n261 | 35 |
| | | | n260 | 37 |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 | | n257, n258, n261 | 90 |
| | | | n260 | 93 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 28 + FFS |
| | n260 | 39 + FFS | n260 | 30 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 91 + FFS |
| | | | n260 | 93 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 + FFS | | n257, n258, n261 | 28+ FFS |
| | | | n260 | 30+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 + FFS | | n257, n258, n261 | 91+ FFS |
| | | | n260 | 93+ FFS |
| | | | n259 | FFS |

**Table 5.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 3 – RSRP report Cell 2) | All bands: -23 | | -37 | |
| Highest value (RSRP report Cell 3 – RSRP report Cell 2) | n257, n258, n261 | +26 | n257, n258, n261 | +17 |
| | n260 | +27 | n260 | +19 |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 3 – RSRP report Cell 2) | -23 + FFS | | -37+ FFS | |

| | | | | |
|---|---|---|---|---|
| Highest value (RSRP report Cell 3 – RSRP report Cell 2) | n257, n258, n261 | +26 + FFS | n257, n258, n261 | +17 + FFS |
| | n260 | +27+ FFS | n260 | +19 + FFS |
| | n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- E-UTRA - FR2 OTA testability is still FFS.

### 5.7.1.3.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands, when the PSCell is on an NR FR1 carrier.

### 5.7.1.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 5.7.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.3.

### 5.7.1.3.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR1 PSCell and Cell 3 is the NR FR2 neighbour cell on a NR FR2 carrier.

#### 5.7.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.3.4.1-1.

**Table 5.7.1.3.4.1-1: Supported test configurations**

| Config | Description of serving cell | Description of target cell |
|---|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.3.4.1-2.

**Table 5.7.1.3.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |

| | | |
|---|---|---|
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.7.1.3.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.7.1.3.4.1-3.
2. Message contents are defined in clause 5.7.1.3.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR1 carrier and Cell 3 is the neighbour cell on the NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

#### 5.7.1.3.4.2 Test procedure

1. Configure the positioning system for a valid test point As defined in clause A.9.2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.7.1.3.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.3.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.
8. The SS shall select a new test point As defined in clause A.9.2 and rotate the positioning system for the selected test point.
9. Set the parameters according to Test 2 in Table 5.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.3.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

#### 5.7.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.1.3.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

5.7.1.3.5 Test requirement

Table 5.7.1.3.5-1 defines the cell specific settings for all tests. Table 5.7.1.3.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.2. The following requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.3.5-3.

During Test 2:

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.3.5-3.

**Table 5.7.1.3.5-1: SS-RSRP inter-frequency test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | 1~6 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Data RBs allocated | 1,2,4,5 | | 52 | 24 | 52 | 66 |
| | 3,6 | | 106 | | 106 | |

| Gap pattern ID | | | 0 | | 0 | |
|---|---|---|---|---|---|---|
| Duplex mode | 1,4 | | FDD | TDD | FDD | TDD |
| | 2,5 | | TDD | | TDD | |
| | 3,6 | | TDD | | TDD | |
| TDD configuration | 1,4 | | N/A | TDDConf. 3.1 | N/A | TDDConf. 3.1 |
| | 2,5 | | TDDConf. 1.1 | | TDDConf. 1.1 | |
| | 3,6 | | TDDConf. 2.1 | | TDDConf. 2.1 | |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3,6 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2,5 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | 3,6 | | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | 2,5 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | 3,6 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1,4 | | SSB.1 FR1 | SSB.3 FR2 | SSB.1 FR1 | SSB.3 FR2 |
| | 2,5 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | 3,6 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | 1~6 | | OP.1 | OP.3 | OP.1 | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1~6 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~6 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~6 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | 1~6 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1~6 | - | NA | AWGN | NA | AWGN |
| Antenna configuration | 1~6 | - | Link only, see clause A.3.7A of TS 38.133 [6] | 1x2 | Link only, see clause A.3.7A of TS 38.133 [6] | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void | | | | | | |

**Table 5.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Angle of arrival configuration according to clause A.9 | | | NA | Setup 2b | NA | Setup 2b |
| Assumption for UE beams[Note 4] | | | N/A | Rough | N/A | Rough |
| $N_{oc}$ | 1~6 | dBm/15 kHz | NA Link only, see clause A.3.7A of TS 38.133 [6] | -95.5 | NA Link only, see clause A.3.7A of TS 38.133 [6] | NA |
| $N_{oc}$ | 1~6 | dBm/SSB SCS | | -86.47 | | NA |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | | 5 | | NA |
| $E_s$ | 1~6 | dBm/SCS | | NA | | (Table B.2.3-2 Spherical coverage +6.5dB) |
| SSB_RP[Note1] | 1~6 | dBm/SCS | | -81.47 | | (Table B.2.3-2 Spherical coverage +6.5dB) |
| $\hat{E}_s / I_{otBB}$[Note6] | 1~6 | dB | | 4.35 | | 1.69 |
| Io[Note1] | 1~6 | dBm/ 95.04MHz | | -55.68 | | SSB_RP+34.48 |

Note 1: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.
Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [2] Table 6.2.1.3-4.

**Table 5.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 3) | n257, n258, n261 | 46 | n257, n258, n261 | 46 |
| | n260 | 45 | n260 | 47 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | 103 | n257, n258, n261 | 101 |
| | n260 | 102 | n260 | 104 |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 3) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS |

| | | | | |
|---|---|---|---|---|
| | n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.2 SS-RSRQ

### 5.7.2.0 Minimum conformance requirements

#### 5.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Unless otherwise specified, the requirements for absolute SS-RSRQ accuracy in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.2.0.1-1: SS-RSRQ Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±2.5 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-6 | | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.8.1 and 10.1.11.

#### 5.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

##### 5.7.2.0.2.1 Absolute SS-RSRQ Accuracy

The requirements for absolute SS-RSRQ accuracy in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 5.7.2.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.2.0.2.1-1: SS-RSRQ Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±2.5 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-4 | | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.10.1 and 10.1.11.

### 5.7.2.0.2.2 Relative SS-RSRQ Accuracy

The relative SS-RSRQ accuracy in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR2 compared to the RSRP measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 5.7.2.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.2.0.2.2-1: SS-RSRQ Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±3 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±4 | ±4 | ≥-4 | | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.<br>NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.10.1 and 10.1.11.

## 5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 5.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy for NR FR2 is within the specified limits for all bands.

### 5.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 5.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.2.1.

### 5.7.2.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

#### 5.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.2.1.4.1-1.

**Table 5.7.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.2.1-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.2.1.4.1-2.

**Table 5.7.2.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |

| | | |
|---|---|---|
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.2.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.2.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 5.7.2.1.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.2.1.5-2 as appropriate and repeat steps 5-7.

#### 5.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |

| | | | |
|---|---|---|---|
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 5.7.2.1.5 Test requirement

Table 5.7.2.1.5-1 defines the cell specific settings for all tests. Table 5.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 5.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 5.7.2.1.5-3.

**Table 5.7.2.1.5-1: SS-RSRQ Intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | Freq1 | | Freq1 | |
| Duplex mode | | | TDD | | TDD | |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state | | | TCI.State. 0 | | TCI.State. 0 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC | | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | | SMTC.1 | | | |
| SSB configuration | | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | | | AWGN | | AWGN | |
| Antenna Configuration | | | 1x2 | | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void.<br>NOTE 3: Void.<br>NOTE 4: Void.<br>NOTE 5: Void | | | | | | |

**Table 5.7.2.1.5-2: SS-RSRQ Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 9 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -100.7 | | -96.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91.67 | | -87.67 | |
| SSB_RP Note2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| SS-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
| $\hat{E}_s / I_{ot}$ | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| $\hat{E}_s / N_{oc}$ | dB | 3 | 3 | -3 | -3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | | -55.67 | -55.67 |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRQ and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Void.
NOTE 7: Void
NOTE 8: Void
NOTE 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 5.7.2.1.5-3: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 (All bands) | Test 2 | |
|---|---|---|---|
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_41 | n257, n258, n261 | SS-RSRQ_35 |
| | | n260 | SS-RSRQ_34 |
| | | n259 | FFS |
| Highest reported value (Cell 3) | SS-RSRQ_73 | All bands | SS-RSRQ_71 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_38+ FFS | n257, n258, n261 | SS-RSRQ_34+ FFS |
| | | n260 | SS-RSRQ_33+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 3) | SS-RSRQ_76+ FFS | All bands | SS-RSRQ_72+ FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 5.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ measurement accuracy for NR FR2 is within the specified limits for all bands.

#### 5.7.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 5.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.2.2.

#### 5.7.2.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

##### 5.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.2.2.4.1-1.

**Table 5.7.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.2.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.2.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.2.2.4.1-2.

**Table 5.7.2.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.7.2.2.4.1-3.

2. Message contents are defined in clause 5.7.2.2.4.3.

3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the

other NR FR2 carrier. Cell 3 is the target for the SS-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5..
2. Set the parameters according to Table 5.7.2.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ for Cell 3. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRQ value of Cell 3 reported by the UE is compared to the reported SS-RSRQ of Cell 2. If the resulting value is outside the limits in Table 5.7.2.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 5.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ for Cell 3. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRQ value of Cell 3 reported by the UE is compared to the reported SS-RSRQ of Cell 2. If the resulting value is outside the limits in Table 5.7.2.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

#### 5.7.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

5.7.2.2.5 Test requirement

Table 5.7.2.2.5-1 defines the cell specific settings for all tests. Table 5.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.2.0.2.1 and relative accuracy requirements in clause 5.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 5.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 5.7.2.2.5-4.

**Table 5.7.2.2.5-1: SS-RSRQ Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration | | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration | | Not applicable | - | Not applicable | - |
| TRS configuration | | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void<br>NOTE 3: Void<br>NOTE 4: Void | | | | | |

**Table 5.7.2.2.5-2: SS-RSRQ Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| AoA setup | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 8 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -95.93 | -95.93 | -95.44 | -95.44 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -86.9 | -86.9 | -86.41 | -86.41 |
| $\hat{E}_s / N_{oc}$ | dB | -1.75 | -1.75 | -3 | -3 |

| | | | | | |
|---|---|---|---|---|---|
| SSB_RP[Note2] | dBm/SCS Note4 | -88.65 | -88.65 | -89.41 | -89.41 |
| SS-RSRQ[Note2] | dB | -14.75 | -14.75 | -15.56 | -15.56 |
| $\hat{E}_s / I_{ot}$ | dB | -1.75 | -1.75 | -3 | -3 |
| Io[Note2] | dBm/95.04 MHz Note4 | -55.7 | -55.7 | -55.7 | -55.7 |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| NOTE 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| NOTE 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |
| NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | | | | |
| NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone | | | | | |
| NOTE 6: Void | | | | | |
| NOTE 7: Void | | | | | |
| NOTE 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | |

**Table 5.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 2) | RSRQ_73 | RSRQ_74 |
| Lowest reported value (Cell 3) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 3) | RSRQ_73 | RSRQ_74 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2) | RSRQ_41 + FFS | RSRQ_37 + FFS |
| Highest reported value (Cell 2) | RSRQ_73 + FFS | RSRQ_74 + FFS |
| Lowest reported value (Cell 3) | RSRQ_41 + FFS | RSRQ_37 + FFS |
| Highest reported value (Cell 3) | RSRQ_73 + FFS | RSRQ_74 + FFS |

**Table 5.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 3 – RSRQ report Cell 2) | - 7 | - 9 |
| Highest value (RSRQ report Cell 3 – RSRQ report Cell 2) | + 7 | + 9 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 3 – RSRQ report Cell 2) | – 7 + FFS | – 9 + FFS |
| Highest value (RSRQ report Cell 3 – RSRQ report Cell 2) | + 7 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.3 SS-SINR

### 5.7.3.0 Minimum conformance requirements

#### 5.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Unless otherwise specified, the requirements for absolute SS-SINR accuracy in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.3.0.1-1: SS-SINR Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±3 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-6 | | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.<br>NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB. | | | | |

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1 and 10.1.16.

#### 5.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

##### 5.7.3.0.2.1 Absolute SS-SINR Accuracy

The requirements for absolute SS-SINR accuracy in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 5.7.3.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.3.0.2.1-1: SS-SINR Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±3 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power | -50 |
| ±3.5 | ±4 | ≥-4 | | |

| | | | | |
|---|---|---|---|---|
| | | | class, operating band and angle of arrival | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. | | | | |
| NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. | | | | |
| NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |
| NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB. | | | | |

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.15.1 and 10.1.16.

#### 5.7.3.0.2.2 Relative SS-SINR Accuracy

The relative SS-SINR accuracy in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR2 compared to the SS-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 5.7.3.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.3.0.2.2-1: SS-SINR Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz \| $SCS_{SSB}$ = 240kHz | |
| ±3.5 | ±4 | ≥-3 | Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±4 | ±4 | ≥-6 | | |
| NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. | | | | |
| NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. | | | | |
| NOTE 3: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. | | | | |
| NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |
| NOTE 5: The requirements apply for SSB Ês/Iot ≤ 25 dB. | | | | |

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.15.1 and 10.1.16.

### 5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 5.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy for NR FR2 is within the specified limits for all bands.

#### 5.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

#### 5.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.3.1.

#### 5.7.3.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

##### 5.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.3.1.4.1-1.

**Table 5.7.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.3.1-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.3.1.4.1-2.

**Table 5.7.3.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.3.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-SINR measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.3.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 5.7.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 5.7.3.1.5-1 as appropriate and repeat steps 5-7.

#### 5.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells, SS-SINR<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

### 5.7.3.1.5 Test requirement

Table 5.7.3.1.5-1 defines the cell specific settings for all tests. Table 5.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 5.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 5.7.3.1.5-3.

**Table 5.7.3.1.5-1: SS-SINR Intra-frequency test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq2 | | Freq2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration | | TRS.2.1 TDD | | | |
| TCI state | | TCI.State.0 | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | | | |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation condition | | AWGN | | AWGN | |
| Antenna Configuration | | 1x2 | | 1x2 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void<br>NOTE 3: Void<br>NOTE 4: Void | | | | | |

**Table 5.7.3.1.5-2: SS-SINR Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 9 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105 | |

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| $N_{oc}$ Note1 | | dBm/SCS Note3 | -96 | | -96 | |
| SSB_RP Note2 | | dBm/SCS Note4 | -91.46 | -93.34 | -98.8 | -98.8 |
| SS-SINR Note2 | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| $\hat{E}_s / I_{ot}$ | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54 | 2.66 | -3 | -3 |
| Io Note2 | | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-SINR and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Void
NOTE 7: Void
NOTE 8: Void
NOTE 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 5.7.3.1.5-3: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 3) | n257, n258, n261 | SS-SINR_22 | All bands | SS-SINR_18 |
| | n260 | SS-SINR_21 | | |
| | n259 | FFS | | |
| Highest reported value (Cell 3) | All bands | SS-SINR_58 | n257, n258, n261 | SS-SINR_55 |
| | | | n260 | SS-SINR_54 |
| | | | n259 | FFS |
| Extreme Conditions | | | | |
| Lowest reported value (Cell 3) | n257, n258, n261 | SS-SINR_21+ FFS | All bands | SS-SINR_17+ FFS |
| | n260 | SS-SINR_20+ FFS | | |
| | n259 | FFS | | |
| Highest reported value (Cell 3) | All bands | SS-SINR_59+ FFS | n257, n258, n261 | SS-SINR_56+ FFS |
| | | | n260 | SS-SINR_55+ FFS |
| | | | n259 | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 5.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy for NR FR2 is within the specified limits for all bands

#### 5.7.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

#### 5.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.3.2.

#### 5.7.3.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

##### 5.7.3.2.4.1 Initial conditions

**This test shall be tested using any of the test configurations in Table 5.7.3.2.4.1-1.Table 5.7.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.3.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.3.2.4.1-2.

**Table 5.7.3.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.7.3.2.4.1-3.

2. Message contents are defined in clause 5.7.3.2.4.3.

3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the

other NR FR2 carrier. Cell 3 is the target for the SS-SINR measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5

2. Set the parameters according to Table 5.7.3.2.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

   - R4: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   And the following requirements for Test 3:

   - R7: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

- R8: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

- R9: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

#### 5.7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.3.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells, SS-SINR<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.3. 2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.7.3.2.5 Test requirement

Table 5.7.3.2.5-1 defines the cell specific settings for all tests. Table 5.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.3.0.2.1 and relative accuracy requirements in clause 5.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R8: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R9: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

**Table 5.7.3.2.5-1: SS-SINR Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 | freq1 | Freq2 |
| Duplex mode | | TDD | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | | 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna Configuration | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: Void
NOTE 4: Void

**Table 5.7.3.2.5-2: SS-SINR Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | degrees | Setup 1 | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 10 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | -105 | -105.1 | -105.1 | -105 | -105 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | -96 | -96.1 | -96.1 | -96 | -96 |
| $\hat{E}_s / N_{oc}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| SS-RSRP Note2 | dBm/SCS Note4 | -96.5 | -96.5 | -85.1 | -85.1 | -98.1 | -98.1 |
| SS-SINR Note2 | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| $\hat{E}_s / I_{ot}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| Io Note2 | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.75 | -55.75 | -64.9 | -64.9 |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Void
NOTE 7: Void
NOTE 8: Void
NOTE 9: Void
NOTE 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 5.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 2) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 3) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 2) | SINR_27 + FFS | | SINR_48 + FFS | | n257, n258, n261 | SINR_23 + FFS |
| | | | | | n260 | SINR_22 + FfS |
| | | | | | n259 | FFS |

| | | | | | | |
|---|---|---|---|---|---|---|
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_62 + FFS | n257, n258, n261 | SINR_87 + FFS | n257, n258, n261 | SINR_60 + FFS |
| | n260 | SINR_61 + FFS | n260 | SINR_86 + FFS | n260 | SINR_59 + FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 3) | SINR_27 + FFS | | SINR_48 + FFS | | n257, n258, n261 | SINR_23 + FFS |
| | | | | | n260 | SINR_22 + FfS |
| | | | | | n259 | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | SINR_62 + FFS | n257, n258, n261 | SINR_87 + FFS | n257, n258, n261 | SINR_60 + FFS |
| | n260 | SINR_61 + FFS | n260 | SINR_86 + FFS | n260 | SINR_59 + FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |

**Table 5.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 3 – SINR report Cell 2) | - 8 | - 17 | - 9 |
| Highest value (SINR report Cell 3 – SINR report Cell 2) | + 8 | + 17 | + 9 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 3 – SINR report Cell 2) | – 8 + FFS | – 17 + FFS | – 9 + FFS |
| Highest value (SINR report Cell 3 – SINR report Cell 2) | + 8 + FFS | + 17 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.4 L1-RSRP

### 5.7.4.0 Minimum conformance requirements

#### 5.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 5.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.4.0.1-1: SSB based L1-RSRP absolute accuracy in FR2**

| **Accuracy** | | **Conditions** | | | |
|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io [Note 1] range** | | |
| | | | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **dBm / $SCS_{SSB}$ [Note 2]** | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |

| | | | **$SCS_{SSB}$ = 120kHz** | **$SCS_{SSB}$ = 240kHz** | | |
|---|---|---|---|---|---|---|
| ±6.5 | ±9.5 | ≥-3 | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | N/A | | -70 | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.1.1 and 10.1.6.

### 5.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 5.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.4.0.2-1: SSB based L1-RSRP relative accuracy in FR2**

| **Accuracy** | | **Conditions** | | |
|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io [Note 1] range** | |
| | | | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** | **dBm / $SCS_{SSB}$ [Note 3]** | **$dBm/BW_{Channel}$** |
| | | | **$SCS_{SSB}$ = 120kHz** / **$SCS_{SSB}$ = 240kHz** | |
| ±6.5 | ±9.5 | ≥-3 | Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.<br>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | |

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.1.2 and 10.1.6.

### 5.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 5.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.4.0.3-1.

**Table 5.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz / $SCS_{CSI-RS}$ = 120kHz | | |
| ±6.5 | ±9.5 | ≥-3 | Same value as CSI-RS_RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | N/A | -70 | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.2.1 and 10.1.6.

### 5.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 5.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 for a corresponding band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.4.0.4-1.

**Table 5.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz / $SCS_{CSI-RS}$ = 120kHz | |
| ±6.5 | ±9.5 | ≥-3 | Same value as CSI-RS RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.2.2 and 10.1.6.

## 5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 5.7.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

### 5.7.4.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

#### 5.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.4.0.1 and 5.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.4.1.

#### 5.7.4.1.4 Test description

##### 5.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.4.1.4.1-1.

**Table 5.7.4.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.7.4.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.7.4.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.7.4.1-3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.7.4.1-4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.4.1.4.1-2.

**Table 5.7.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.7.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.7.4.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 5.7.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.7.4.1.4.1-2.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.4.1.4.1-2.

2. Set the parameters according to T1 in Table 5.7.4.1.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T1 starts.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 320 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall check following requirements:

   - R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 5.7.4.1.5-3, Table 5.7.4.1.5-3a or Table 5.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according T2 in Table 5.7.4.1.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T2 starts.

7. Repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 5.7.4.1.5-3, Table 5.7.4.1.5-3b or Table 5.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [18].

#### 5.7.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.4.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table H.3.6-10<br>Table H.3.4-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.4.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM | |

| | | | |
|---|---|---|---|
| | | and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

5.7.4.1.5 Test requirement

Table 5.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 5.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.4.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 5.7.4.1.5-3 for test configurations 3 and 6 and Table 5.7.4.1.5-3a for all configurations.

**Table 5.7.4.1.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | freq1 |
| Duplex mode | 1~4 | | TDD | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~4 | | 66 | 66 |
| PDSCH Reference measurement channel | 1,2 | | SR.3.2 TDD | SR.3.2 TDD |
| | 3,4 | | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 | | CR.3.1 TDD | CR.3.1 TDD |
| | 3,4 | | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.3.1 TDD | CCR.3.1 TDD |
| | 3,4 | | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1~4 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3 ULBWP.1.3 | DLBWP.1.3 ULBWP.1.3 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1~4 | | SMTC.1 | SMTC.1 |
| reportConfigType | 1~4 | | periodic | periodic |
| reportQuantity | 1~4 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 | 2 |
| L1-RSRP reporting period | 1~4 | | slot320 | slot320 |
| Propagation condition | 1~4 | | AWGN | AWGN |
| Antenna configuration | | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |

**Table 5.7.4.1.5-2: L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15 kHz | -104.1 | | n.a. | |
| $N_{oc}$ | 1,2 | dBm/SS B SCS | -95.1 | | n.a. | |
| | 3,4 | | -92.1 | | n.a. | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | -1.6 | n.a. | |
| SSB_RP Note1 | 1,2 | dBm/SC S | -85.1 | -96.9 | As in Table B.2.4-2 + 5.7 | |
| | 3,4 | | -78 | -90 | As in Table B.2.4-2 + 5.7 | |
| Io Note1 | 1~4 | dBm/ 95.04M Hz | -55.67 | | SSB_RP+34.68 | |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | -1.6 | n.a. | |
| Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: Void<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

**Table 5.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 (SSB#0) All bands** | **Test 2 (SSB#0 or SSB#1)** | |
| Lowest reported value | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 (SSB#0) All bands** | **Test 2 (SSB#0 or SSB#1)** | |
| Lowest reported value | 39+ FFS | n257, n258, n261 | 24 + FFS |
| | | n260 | 27 + FFS |
| | | n259 | FFS |
| Highest reported value | 104+ FFS | n257, n258, n261 | 86 + FFS |

| | | | |
|---|---|---|---|
| | | n260 | 89 + FFS |
| | | n259 | FFS |

**Table 5.7.4.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 | 18 + FFS | 18+ FFS |

**Table 5.7.4.1.5-3b: evaluation limits for the Δ(Max-Min) reported values for SSB#0 or SSB#1 for rules R3**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | 18 + FFS | 18+ FFS |

**Table 5.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 (SSB#0) All bands** | **Test 2 (SSB#0 or SSB#1)** | |
| Lowest reported value | 45 | n257, n258, n261 | 30 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value | 104 | n257, n258, n261 | 86 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 (SSB#0) All bands** | **Test 2 (SSB#0 or SSB#1)** | |
| Lowest reported value | 42+ FFS | n257, n258, n261 | 27 + FFS |
| | | n260 | 30 + FFS |
| | | n259 | FFS |
| Highest reported value | 107+ FFS | n257, n258, n261 | 89 + FFS |
| | | n260 | 92 + FFS |
| | | n259 | FFS |

**Table 5.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | +4 |

| Extreme Conditions | Test 1<br>All bands | Test 2<br>All bands |
|---|---|---|
| Lowest DIFF RSRP reported value | 1+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | + 7+ FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 5.7.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

### 5.7.4.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

### 5.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.4.0. 3 and 5.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.4.1.

### 5.7.4.2.4 Test description

#### 5.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.4.2.4.1-1.

**Table 5.7.4.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 5.7.4.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.7.4.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.4.2.4.1-2.

**Table 5.7.4.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 5.7.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 5.7.4.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.7.4.2.4.1-2.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.4.2.4.1-2.

2. Set the parameters according to T1 in Table 5.7.4.2.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T1 starts.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 5.7.4.2.5-3, Table 5.7.4.2.5-3a or Table 5.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according T2 in Table 5.7.4.2.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T2 starts.

7. Repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 5.7.4.2.5-3, Table 5.7.4.2.5-3b or Table 5.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-

RS1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

- R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [18].

#### 5.7.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.4.2.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table H.3.4-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.4.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.7.4.2.5 Test requirement

Table 5.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 5.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 5.7.4.2.5-3 for test configurations 3 and 6 and Table 5.7.4.2.5-3a for all configurations.

**Table 5.7.4.2.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 | freq1 |
| Duplex mode | 1~2 | | TDD | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD | CR.3.1 TDD |

| | | | | |
|---|---|---|---|---|
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1~2 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| CSI-RS | 1~2 | | CSI-RS.3.2 TDD | CSI-RS.3.2 TDD |
| reportConfigType | 1~2 | | periodic | periodic |
| reportQuantity | 1~2 | | cri-RSRP | cri-RSRP |
| Number of reported RS | 1~2 | | 2 | 2 |
| L1-RSRP reporting period | 1~2 | | slot320 | slot320 |
| Propagation condition | 1~2 | | AWGN | AWGN |
| Antenna configuration | 1~2 | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |

**Table 5.7.4.2.5-2: L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.10 | | n.a. | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -95.11 | | n.a.<br>n.a. | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 10 | -1.8 | n.a. | |
| CSI-RS_RP Note1 | 1~2 | dBm/SCS | -85.11 | -96.93 | As in Table B.2.4.2-2 + 5.7 | |
| Io Note1 | 1~2 | dBm/95.04MHz | -55.67 | | CSI-RS_RP+34.68 | |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 10 | -1.82 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

| | |
|---|---|
| Note 2: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 3: | No additional noise is added by the test system in Test 2. |
| Note 4: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table 5.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 (CSI-RS0) All bands** | **Test 2 (CSI-RS0 or CSI-RS1)** | |
| Lowest reported value | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 (CSI-RS0) All bands** | **Test 2 (CSI-RS0 or CSI-RS1)** | |
| Lowest reported value | 39+ FFS | n257, n258, n261 | 25 + FFS |
| | | n260 | 27 + FFS |
| | | n259 | FFS |
| Highest reported value | 104+ FFS | n257, n258, n261 | 86 + FFS |
| | | n260 | 89 + FFS |
| | | n259 | FFS |

**Table 5.7.4.2.5-3a: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 for rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value CSI-RS#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value CSI-RS#0 | 18 + FFS | 18+ FFS |

**Table 5.7.4.2.5-3b: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 + FFS | 18+ FFS |

**Table 5.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |

| | | |
|---|---|---|
| Highest DIFF RSRP reported value | 9 | + 4 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 1+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | + 7+ FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.5 SRS-RSRP

### 5.7.5.0 Minimum conformance requirements

#### 5.7.5.0.1 Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 5.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 3.67us for FR2
  - $N_{TA_offset}$ is defined in Table 7.1.2-2
  - $T_C$ is 0.509ns
- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

**Table 5.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SRS Ês/Iot** | **Io [Note 1] range** |

| | | | | | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| dB | | | | | | dB | | dBm / $SCS_{SRS}$ | | | dBm/BW Channel | dBm/BW Channel |
| $SCS_{SRS}$ (kHz) | | | $SCS_{SRS}$ (kHz) | | | | | $SCS_{SRS}$ = 15 kHz | $SCS_{SRS}$ = 30 kHz | $SCS_{SRS}$ = 60 kHz | | |
| 15 | 30 | 60 | 15 | 30 | 60 | | | | | | | |
| ±3 | ±3.5 | ±5 | ±7.5 | ±8 | ±9.5 | ≥1 | NR_TDD_FR1_A, | -120 | -117 | -114 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_C | -119 | -116 | -113 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_E | -118 | -115 | -112 | N/A | -70 |
| ±6.5 | ±7 | ±8.5 | ±9.5 | ±10 | ±11.5 | ≥1 | NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

**Table 5.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2**

| Accuracy | | | | Conditions | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | | Extreme condition | | SRS Ês/Iot | Io [Note 1] range | | |
| | | | | | Minimum Io | | Maximum Io |
| dB | | | | dB | dBm / $SCS_{SRS}$ [Note 2] | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| $SCS_{SRS}$ (kHz) | | $SCS_{SRS}$ (kHz) | | | $SCS_{SRS}$ = 60kHz | $SCS_{SRS}$ = 120kHz | | |
| 60 | 120 | 60 | 120 | | | | | |
| ±6 | ±8.5 | ±9 | ±11.5 | ≥1 | Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±9 | ±11.5 | ±11 | ±13.5 | ≥1 | N/A | | -70 | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

5.7.5.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 5.7.7.0.1.2-1: SRS-RSRP measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| SRS-RSRP_0 | SRS-RSRP<-140 | dBm |

| | | |
|---|---|---|
| SRS-RSRP_1 | -140≤ SRS-RSRP<-139 | dBm |
| SRS-RSRP_2 | -139≤ SRS-RSRP<-138 | dBm |
| SRS-RSRP_3 | -138≤ SRS-RSRP<-137 | dBm |
| SRS-RSRP_4 | -137≤ SRS-RSRP<-136 | dBm |
| .. | .. | … |
| SRS-RSRP_95 | -46≤ SRS-RSRP<-45 | dBm |
| SRS-RSRP_96 | -45≤ SRS-RSRP<-44 | dBm |
| SRS-RSRP_97 | -44≤ SRS-RSRP | dBm |
| SRS-RSRP_98 | Infinity | |
| Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure. | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

## 5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- The test procedure is incomplete
- The message content is FFS
- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.
- MU/TT analysis for UE power class other than PC3 is incomplete.
- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

### 5.7.5.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

### 5.7.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and CLI-SRS-RSRP

### 5.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.5.1.

### 5.7.5.1.4 Test description

#### 5.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.5.1.4.1-1.

**Table 5.7.5.1.4.1-1: EN-DC FR2 SRS-RSRP accuracy supported test configurations**

| Config | Description |
|---|---|
| 5.7.5.1 - 1 | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 5.7.5.1 - 2 | LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.5.1.4.1-2.

**Table 5.7.5.1.4.1-2: Initial conditions EN-DC FR2 SRS-RSRP measurement accuracy**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.5.1.4.3.

2. In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2).

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.5.1.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

The test parameters and applicability for Cell 1 are defined in A.3.7.2 of TS 38.133. The test parameters for the Cell 2 are given in Table 5.7.5.1.5-1 and 5.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 5.7.5.1.5-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 5.7.5.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 5.7.5.1.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS>

#### 5.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 5.7.5.1.5 Test requirement

Table 5.7.5.1.5-1 defines the cell specific settings for all tests. Table 5.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in Table 5.7.5.1.5-3 and absolute accuracy requirements in Table 5.7.5.1.5-4. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in Table 5.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in Table 5.7.5.1.5-4.

**Table 5.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 | freq1 |
| Duplex mode | 1~2 | | TDD | TDD |
| TDD configuration | 1~2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns | 1~2 | | OP.1 | OP.1 |
| TRS configuration | 1~2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | 1~2 | μs | 10.76 | 10.67 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~2 | | AWGN | AWGN |
| Antenna configuration | 1~2 | | 1x2 | 1x2 |
| SRS configuration | 1~2 | | SRSConf.1 | SRSConf.1 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 5.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PSCell and Neighbour cell UE in FR2**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.9.1 | Setup 1 defined A.9.1 |
| Beam assumption Note 5 | | Fine | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note3 | -100 | N/A |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91 | N/A |
| $\hat{E}_s / N_{oc}$ | dB | 2 | N/A |
| $E_s$ | dBm/SCS Note3 | | (Table B.2.7-2 Rx Beam Peak)+5 |

| | | | |
|---|---|---|---|
| SRS_RP Note2 | dBm/SCS | -89 | (Table B.2.7-2 Rx Beam Peak) +5 |
| $\hat{E}_s / I_{ot\ BB}$ Note4 | dB | >1 | 1 |
| Io Note2 | dBm/95.04 MHz Note3 | -57.89 | (Table B.2.7-2 Rx Beam Peak +50.79dB) |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

**Table 5.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 |
| | srs-ResourceIdList | 0 |
| | resourceType | Periodic |
| | Usage | Codebook |
| SRS-Resource | SRS-ResourceId | 0 |
| | nrofSRS-Ports | Port1 |
| | transmissionComb | n2 |
| | combOffset-n2 | 0 |
| | cyclicShift-n2 | 0 |
| | resourceMapping startPosition | 0 |
| | resourceMapping nrofSymbols | n1 |
| | resourceMapping repetitionFactor | n1 |
| | freqDomainPosition | 0 |
| | freqDomainShift | 0 |
| | freqHopping c-SRS | 12 |
| | freqHopping b-SRS | 0 |
| | freqHopping b-hop | 0 |
| | groupOrSequenceHopping | Neither |
| | resourceType | Periodic |
| | periodicityAndOffset-p | sl160,25 |
| | sequenceId | 0 |

**Table 5.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement**

| | Test requirement Notes1,2,3 |
|---|---|
| SRS | SRS_RP -δ +$G_{min}$ ≤ Reported SRS-RSRP(dBm) ≤SRS_RP +δ +$G_{max}$ |

Note 1: SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test

Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test

Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 5.7.5.0.10.1 The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in Table 5.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in Table 5.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.5.2 EN-DC FR2 CLI-RSSI measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

### 5.7.5.2.1 Test purpose

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits with CLI-RSSI measurement requirements in TS 38.133 [6] clause 10.1.22.2.1.

### 5.7.5.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and CLI-CLI-RSSI

### 5.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.5.2.

### 5.7.5.2.4 Test description

#### 5.7.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.5.2.4.1-1.

**Table 5.7.5.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.5.2.4.1-2.

**Table 5.7.5.2.4.1-2: Initial conditions EN-DC FR2 CLI-RSSI measurement accuracy**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |

| | | |
|---|---|---|
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.5.2.4.3.
2. In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2).
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.5.2.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

The test parameters and applicability for Cell 1 are defined in A.3.7.2 of TS 38.133. The test parameters for the Cell 2 are given in Table 5.7.5.2.5-1 and 5.7.5.2.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 5.7.5.2.5-2.

Before the test UE is configured to perform CLI-RSSI measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 5.7.5.2.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.5.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS>

#### 5.7.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 5.7.5.2.5 Test requirement

Table 5.7.5.2.5-1 defines the cell specific settings for all tests. Table 5.7.5.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in Table 5.7.5.2.5-3 and absolute accuracy requirements in Table 5.7.5.2.5-4. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in Table 5.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in Table 5.7.5.2.5-4.

**Table 5.7.5.2.5-1: FR2 test parameters for CLI-RSSI accuracy**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 | freq1 |
| Duplex mode | 1~2 | | TDD | TDD |
| TDD configuration | 1~2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns Note2 | 1~2 | | OP.1 | OP.1 |
| TRS configuration | 1~2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1~2 | μs | 10.67 | 10.67 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~2 | | AWGN | AWGN |
| Antenna configuration | 1~2 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table 5.7.5.2.5-2: CLI-RSSI accuracy OTA related test parameters**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.9.1 | |
| Beam assumption Note 5 | | Fine | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/15kHz Note3 | -100+TT | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/SCS Note3 | -91 | |
| $\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource | dB | -Infinity | |
| RSRP on CLI-RSSI measurement resource Note2 | dBm/SCS | -Infinity | |

| | | |
|---|---|---|
| $\hat{E}_s/I_{ot}$ BB on CLI-RSSI measurement resource Note4 | dB | -Infinity |
| Io on CLI-RSSI measurement resource Note2 | dBm/95.04 MHz Note3 | -62.01 |
| Io on CLI-RSSI measurement resource Note2 | dBm/1.08 MHz | -81.46 |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | |
| Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | |
| Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | |

**Table 5.7.5.2.5-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| CLI-RSSI measurement resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120kHz |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl160, 25 |

**Table 5.7.5.2.5-4: CLI-RSSI absolute accuracy test requirement**

| | Test requirement Notes1,2,3 |
|---|---|
| | Io -δ +$G_{min}$ ≤ Reported CLI-RSSI(dBm) ≤Io +δ +$G_{max}$ |
| Note 1: Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz | |
| Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test | |
| Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in Table 5.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in Table 5.7.5.2.5-4.

## 5.7.6 L1-SINR measurement for beam reporting

### 5.7.6.0 Minimum conformance requirements

#### 5.7.6.0.1 L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured

##### 5.7.6.0.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and no dedicated resource configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements in Table 5.7.6.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 5.7.6.0.1.1-1.

**Table 5.7.6.0.1.1-1: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | | |
| ±5.5 | ±6.5 | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | | N/A | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

##### 5.7.6.0.1.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS compared to the largest measured value of L1-SINR among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 5.7.6.0.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 5.7.6.0.1.2-1.

**Table 5.7.6.0.2.1-1: L1-SINR relative accuracy for CSI-RS based CMR only in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 2, Note 4 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 3 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±[4.5] | ±[5.5] | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | N/A | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

## 5.7.6.0.2 L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured

### 5.7.6.0.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-SINR in this clause apply to all SSBs configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 5.7.6.0.2.1-1 for SSB based CMR and NZP-IMR and in Table 5.7.6.0.2.1-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.2.1-1 and 5.7.6.0.2.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.2.1-1 and 5.7.6.0.2.1-2.

**Table 5.7.6.0.2.1-1: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB CMR Ês/Iot Note 3 | NZP-IMR Ês/Iot Note 3 | Io Note 1 range | |
| | | | | Minimum Io | Maximum Io |

| dB | dB | dB | dB | dBm / $SCS_{SSB}$ Note 2 | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
|---|---|---|---|---|---|---|---|
| | | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

**Table 5.7.6.0.2.1-2: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB CMR Ês/Iot Note 3 | Io Note 1 range | | | |
| | | | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 2 | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | | |
| ±4.5 | ±5.5 | ≥-3 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

### 5.7.6.0.2.2 Relative Accuracy

The relative accuracy of SSB based L1-SINR is defined as the L1-SINR measured from one SSB configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all SSB based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 5.7.6.0.2.2-1 for SSB based CMR and NZP-IMR and in Table 5.7.6.0.2.2-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.2.2-1 and 5.7.6.0.2.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.2.2-1 and 5.7.6.0.2.2-2.

**Table 5.7.6.0.2.2-1: L1-SINR relative accuracy for SSB based CMR and NZP-IMR in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB CMR Ês/Iot Note 2, Note 4 | NZP-IMR Ês/Iot Note 4 | Io Note 1 range | | |
| | | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | dBm / $SCS_{SSB}$ Note 3 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | |
| ±[3.0] | ±[4.0] | ≥0 | ≥0 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | N/A | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

**Table 5.7.6.0.2.2-2: L1-SINR relative accuracy for SSB based CMR and ZP-IMR in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB CMR Ês/Iot Note 2, Note 4 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{SSB}$ Note 3 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | |
| ±[3.5] | ±[4.5] | ≥-3 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | N/A | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

### 5.7.6.0.3 L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured

#### 5.7.6.0.3.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 5.7.6.0.3.1-1 for CSI-RS based CMR and NZP-IMR and in Table 5.7.6.0.3.1-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.3.1-1 and 5.7.6.0.3.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.3.1-1 and 5.7.6.0.3.1-2.

**Table 5.7.6.0.3.1-1: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | NZP-IMR Ês/Iot Note 3 | Io Note 1 range | | |
| | | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

**Table 5.7.6.0.3.1-2: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±4.5 | ±5.5 | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | |

#### 5.7.6.0.3.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all CSI-RS based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 5.7.6.0.3.2-1 for CSI-RS based CMR and NZP-IMR and in Table 5.7.6.0.3.2-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.3.2-1 and 5.7.6.0.3.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.3.2-1 and 5.7.6.0.3.2-2.

**Table 5.7.6.0.3.2-1: L1-SINR relative accuracy for CSI-RS based CMR and NZP-IMR in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 2, Note 4 | NZP-IMR Ês/Iot Note 4 | Io Note 1 range | | |
| | | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 3 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±[3.0] | ±[4.0] | ≥0 | ≥0 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.<br>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

**Table 5.7.6.0.3.2-2: L1-SINR relative accuracy for CSI-RS based CMR and ZP-IMR in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 2, Note 4 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 3 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **$SCS_{CSI-RS}$ = 60kHz** | **$SCS_{CSI-RS}$ = 120kHz** | | |
| ±[3.5] | ±[4.5] | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.<br>NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

## 5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 5.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 5.7.6.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

### 5.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.1.

### 5.7.6.1.4 Test description

#### 5.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.1.4.1-1.

**Table 5.7.6.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.1.4.1-2.

**Table 5.7.6.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.6.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.7.6.1.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 5.7.6.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.1.5-1.

2. Set the parameters according to Table 5.7.6.1.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS#1.

4. The SS shall check the L1-SINR reported values of CSI-RS0 and CSI-RS1 in the periodic L1-SINR reports for the following requirements:

   - R1: The L1-SINR value of CSI-RS0 reported by the UE is compared to the expected L1-SINR value for CSI-RS0. If the value is outside the limits in Table 5.7.6.1.5-3 or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF SINR value of CSI-RS1 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

### 5.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.6.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.4-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.6.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

5.7.6.1.5 Test requirement

Table 5.7.6.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 5.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.6.1.5-3 for all test configurations, and the corresponding relative accuracy requirements in Table 5.7.6.1.5-4 for all test configurations.

**Table 5.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 |
| CSI-RS | 1~2 | | CSI-RS.3.2 TDD |
| reportConfigType | 1~2 | | periodic |

| | | | |
|---|---|---|---|
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| nrofReportedRS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | | slot640 |
| Propagation condition | 1~2 | | AWGN |
| Antenna configuration | 1~2 | | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |

**Table 5.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.1 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -95.1 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 10 | -1.8 |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -85.07 | -96.87 |
| Io Note1 | 1~2 | dBm/95.04MHz | -55.67 | -63.88 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 10 | -1.8 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: Void.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table 5.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 53 |

| | |
|---|---|
| Highest reported value (CSI-RS0) | 76 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest reported value (CSI-RS0) | 51 |
| Highest reported value (CSI-RS0) | 78 |

**Table 5.7.6.1.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2**

| **UE power class 3** | |
|---|---|
| **Normal Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 6 |
| Highest DIFF L1-SINR reported value | 15 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 5 |
| Highest DIFF L1-SINR reported value | 15 |

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 5.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 5.7.6.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

#### 5.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.2.

#### 5.7.6.2.4 Test description

##### 5.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.2.4.1-1. Test environment parameters are given in Table 5.7.6.2.4.1-3.

**Table 5.7.6.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.2.4.1-2.

**Table 5.7.6.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.6.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for SSB-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.6.2.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in Table 5.7.6.2.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.2.5-1.

2. Set the parameters according to Table 5.7.6.2.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1.

4. The SS shall check the L1-SINR reported values of SSB#0 and SSB#1 in the periodic L1-SINR reports for the following requirements:

- R1: The L1-SINR value of SSB#0+CSI-RS#0 reported by the UE is compared to the expected L1-SINR value for SSB#0+CSI-RS#0. If the value is outside the limits in Table 5.7.6.2.5-4 or the UE fails to report the measurement value for SSB#0+CSI-RS#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The DIFF L1-SINR value of SSB#1+CSI-RS#1 reported by the UE is compared to the expected DIFF L1-SINR value. If the resulting value is outside the limits in Table 5.7.6.2.5-5 or the UE fails to report the measurement value for SSB#0+CSI-RS#0 or SSB#1+CSI-RS#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 5.7.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.6.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-3 with conditions PERIODIC<br>Table H.3.4-1 |

**Table 5.7.6.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.7.6.2.5 Test requirement

Table 5.7.6.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 5.7.6.2.5-1: FR2 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |

| | | | |
|---|---|---|---|
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~4 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~4 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~4 | | CCR.3.1 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| CSI-RS configuration | 1~4 | | CSI-RS 3.1A TDD |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 |
| SMTC configuration | 1~4 | | SMTC.1 |
| reportConfigType | 1~4 | | periodic |
| reportQuantity-r16 | 1~4 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~4 | | 2 |
| L1-SINR reporting period | 1~4 | | slot640 |
| Propagation condition | 1~4 | | AWGN |
| Antenna configuration | 1~4 | | 1x2 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 5.7.6.2.5-2: FR2 SSB specific test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | SSB#0 | SSB#1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15 kHz | -104.1 | |
| $N_{oc}$ | 1,2 | dBm/SS B SCS | -95.1 | |
| | 3,4 | | -92.1 | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | 1.2 |
| SSB RSRP Note1 | 1,2 | dBm/SCS | -85.07 | -93.87 |
| | 3,4 | | -82.07 | -90.87 |

| | | | | |
|---|---|---|---|---|
| Io[Note1] | 1~4 | dBm/ 95.04M Hz | -55.67 | -62.43 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | 1.2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table 5.7.6.2.5-3: FR2 CSI-RS specific test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams[Note 4] | | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15k Hz | -104.1 | |
| $N_{oc}$ | 1~4 | dBm/CSI-RS SCS | -95.1 | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | 1.2 |
| CSI-RS RSRP[Note1] | 1~4 | dBm/SCS | -85.07 | -93.87 |
| Io[Note1] | 1~4 | dBm/ 95.04MHz | -55.67 | -62.43 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | 1.2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table 5.7.6.2.5-4: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest reported value (SSB#0+CSI-RS#0) | 56 |
| Highest reported value (SSB#0+CSI-RS#0) | 73 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest reported value (SSB#0+CSI-RS#0) | 54 |
| Highest reported value (SSB#0+CSI-RS#0) | 75 |

| | | |
|---|---|---|

**Table 5.7.6.2.5-5: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 5 |
| Highest DIFF L1-SINR reported value | 12 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 4 |
| Highest DIFF L1-SINR reported value | 13 |

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 5.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 5.7.6.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

### 5.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.3.

### 5.7.6.3.4 Test description

#### 5.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.3.4.1-1.

**Table 5.7.6.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 2 | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.3.4.1-2.

**Table 5.7.6.3.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.6.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.7.6.3.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 5.7.6.3.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.3.5-1.

2. Set the parameters according to T1 in Table 5.7.6.3.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1.

4. The SS shall check the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-SINR reports for the following requirements:

   - R1: The L1-SINR value of CSI-RS#0+CSI-IM#0 reported by the UE is compared to the expected L1-SINR value for CSI-RS#0+CSI-IM#0. If the value is outside the limits in Table 5.7.6.3.5-3 or the UE fails to report the measurement value for CSI-RS#0+CSI-IM#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF L1-SINR value of CSI-RS#1+CSI-IM#1 reported by the expected DIFF L1-SINR. If the resulting value is outside the limits in Table 5.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS#1+CSI-IM#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 5.7.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.6.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-4 with conditions APERIODIC<br>Table H.3.4-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.6.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 5.7.6.3.5 Test requirement

Table 5.7.6.3.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 5.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.6.3.5-3 for all test configurations, and the corresponding relative accuracy requirements in Table 5.7.6.1.5-4 for all test configurations.

**Table 5.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |

| | | | |
|---|---|---|---|
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 |
| CSI-RS configuration as CMR | 1~2 | | CSI-RS.3.2 TDD |
| CSI-IM configuration as IMR | 1~2 | | CSI-IM.3.3 TDD |
| reportConfigType | 1~2 | | periodic |
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| nrofReportedRS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | | slot640 |
| Propagation condition | 1~2 | | AWGN |
| Antenna configuration | 1~2 | | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |

**Table 5.7.6.3.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.1 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -95.1 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | -1.8 |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -85.07 | -96.87 |
| Io Note1 | 1~2 | dBm/95.04MHz | -55.67 | -63.88 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | -1.8 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table 5.7.6.3.5-3: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1<br>All bands** |
| Lowest reported value (CSI-RS0) | 55 |
| Highest reported value (CSI-RS0) | 74 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest reported value (CSI-RS0) | 53 |
| Highest reported value (CSI-RS0) | 76 |

**Table 5.7.6.3.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 7 |
| Highest DIFF L1-SINR reported value | 15 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest DIFF L1-SINR reported value | 6 |
| Highest DIFF L1-SINR reported value | 15 |

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.7 CSI-RSRP

### 5.7.7.0 Minimum conformance requirements

#### 5.7.7.0.1 Intra-frequency CSI-RSRP measurement accuracy requirements

##### 5.7.7.0.1.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR2.

The accuracy requirements in Table 5.7.7.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each associated SSB(s).

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.7.0.1.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 5.7.7.0.1.1-1: CSI-RSRP Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz / $SCS_{CSI-RS}$ = 120kHz | | |
| ±6 | ±9 | ≥-6 | Same value as CSI-RS_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | N/A | -70 |
| ±8 | ±11 | | N/A | -70 | -50 |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

### 5.7.7.0.1.2 Relative SS-RSRP Accuracy

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each associated SSB(s).

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding band for each CSI-RS to be measured.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.7.0.1.2-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 5.7.7.0.1.2-1: CSI-RSRP Intra-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / SCS CSI-RS Note 1 | | |
| dB | dB | dB | SCS CSI-RS = 60kHz | SCS CSI-RS = 120kHz | dBm/BW Channel |
| ±6 | ±9 | ≥-6 | Same value as CSI-RS_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. | | | | | |
| Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. | | | | | |
| Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | |
| Note 4: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies. | | | | | |

The reporting range for CSI-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.3.3 and 10.1.6.

## 5.7.7.0.2 Inter-frequency CSI-RSRP measurement accuracy requirements

### 5.7.7.0.2.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell on a frequency in FR2 where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell.

The accuracy requirements in Table 5.7.7.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.7.0.2.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 5.7.7.0.2.1-1: CSI-RSRP Inter-frequency absolute accuracy in FR2**

| Accuracy | Conditions |
|---|---|

| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | | |
|---|---|---|---|---|---|---|
| | | | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | | |
| ±6 | ±9 | ≥-4 | Same value as CSI_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8 | ±11 | | N/A | | -70 | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.3 and 10.1.6.

### 5.7.7.0.2.2 Relative SS-RSRP Accuracy

The relative accuracy of CSI-RSRP in inter frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR2 compared to the CSI-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 5.7.7.0.2.2-1 are valid under the following conditions:

- Conditions defined in TS 38.101-2 [19] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding band for each relevant CSI-RS to be measured.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3. The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.7.0.2.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27dB$
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 5.7.7.0.2.2-1: CSI-RSRP Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±6 | ±9 | ≥-4 | Same value as CSI_RP in Table B.2.9-2, according to | | -50 |

| | | | | |
|---|---|---|---|---|
| | | | UE Power class, operating band and angle of arrival | |
| Note 1: | Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. | | | |
| Note 2: | Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. | | | |
| Note 3: | In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | |
| Note 4: | The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies. | | | |

The reporting range for CSI-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.3 and 10.1.6.

## 5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

Editor's Note: This test case is complete for the following configurations:- UE power class 3

- Test frequency f < 40.8 GHz
- Normal Condition

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

This test case is incomplete for extreme condition

### 5.7.7.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency CSI-RS based RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

### 5.7.7.1.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting NR EN-DC and CSI-RS based RSRP and RSRQ measurement.

### 5.7.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.7.1.

### 5.7.7.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

#### 5.7.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.7.1.4.1-1.

**Table 5.7.7.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.7.1-1 | NR 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.7.1-2 | NR 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |

| Note: The UE is only required to pass in one of the supported test configurations |
|---|

Configure the test equipment and the DUT according to the parameters in Table 5.7.7.1.4.1-2.

**Table 5.7.7.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.7.1.4.3.
2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the CSI-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.7.7.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.7.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-RS reported values in the periodic MeasurementReport for the following requirements:

   - R1: The CSI-RS value of Cell 2 reported by the UE is compared to the expected CSI-RS for Cell 2. If the value is outside the limits in Table 5.7.7.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The CSI-RS value of Cell 3 reported by the UE is compared to the expected CSI-RS for Cell 3. If the value is outside the limits in Table 5.7.7.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The CSI-RS value of Cell 3 reported by the UE is compared to the reported CSI-RS of Cell 2. If the resulting value is outside the limits in Table 5.7.7.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a The SS shall check all the CSI-RS reported values during Test 1 for the following requirements:

- R9: The maximum CSI-RS value is compared to the minimum CSI-RS of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.7.1.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum CSI-RS value is compared to the minimum CSI-RS of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.7.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 5.7.7.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The CSI-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.7.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The CSI-RSRP value of Cell 3 reported by the UE is compared to the expected CSI-RSRP for Cell 3. If the value is outside the limits in Table 5.7.7.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The CSI-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.7.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

- R7: The CSI-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported CSI-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.7.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

- R8: The CSI-RSRP value of Cell 3 reported by the UE during Test 2 is compared to the reported CSI-RSRP of Cell 3 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.7.1.5-5 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a The SS shall check all the CSI-RSRP reported values during Test 2 for the following requirements:

- R11: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.7.1.5-3a count a fail for R11. Otherwise, R11 is passed.

- R12: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.7.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 5.7.7.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

#### 5.7.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.7.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.7.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

5.7.7.1.5 Test requirement

Table 5.7.7.1.5-1 defines the cell specific settings for all tests. Table 5.7.7.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The CSI-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.7.0.1.1 and relative accuracy requirements in clause 5.7.7.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.1.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.1.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.1.5-4.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.1.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.1.5-3 and Table 5.7.7.1.5-3a.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.1.5-3 and Table 5.7.7.1.5-3a.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.1.5-4.

R11: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.1.5-3a.

R12: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.1.5-5.

R8: Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.1.5-5.

**Table 5.7.7.1.5-1: CSI-RSRP Intra-frequency general test parameters**

| Parameter[Note 5] | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | 489 | 0 | 489 | 0 |
| SSB ARFCN | | freq1 | | freq1 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD |
| Time offset with Cell 2 | µs | - | 0.58 | - | 0.58 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: All parameters apply for configuration 1 and 2
Note 6: Void

**Table 5.7.7.1.5-2: CSI-RSRP Intra-frequency OTA related test parameters**

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beams[Note 8] | | Rough | | | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -97.4 | | N/A | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note1 | dBm/SCS Note4 | -88.4 | | N/A | |
| $\hat{E}_s/N_{oc}$ for SSB | dB | 6.0 | 1.4 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | 6.0 | 1.4 | N/A | N/A |
| $E_s$ | dBm/SCS Note4 | N/A | N/A | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| SSB_RP Note2 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| $\hat{E}_s/I_{ot\ BB}$ Note6 for SSB | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| $\hat{E}_s/I_{ot\ BB}$ Note6 for CSI-RS | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| CSI_RP | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| Io Note2 | dBm/95.04 MHz Note4 | -56.53 | | (Table B.2.2-2 Rx Beam Peak +37.40dB) | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the center of the quiet zone
Note 5: Void
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 7: All parameters apply for configurations 1 and 2
Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 5.7.7.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 50 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 108 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| Lowest reported value (Cell 3) | 46 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Highest reported value (Cell 3) | 103 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 47+ FFS | n257, n258, n261 | 28 + FFS |
| | | n260 | 30 + FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 111+ FFS | n257, n258, n261 | 91 + FFS |
| | | n260 | 93 + FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 3) | 46+ FFS | n257, n258, n261 | 28+ FFS |
| | | n260 | 30+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 3) | 106+ FFS | n257, n258, n261 | 91+ FFS |
| | | n260 | 93+ FFS |
| | | n259 | FFS |

**Table 5.7.7.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for each cell during each time period**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 2 | 8 | 8 |
| Δ(Max-Min) reported value Cell 3 | 8 | 8 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 2 | 16 + FFS | 16+ FFS |
| Δ(Max-Min) reported value Cell 3 | 16 + FFS | 16 + FFS |

**Table 5.7.7.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3) | RSRP_x - 12 | RSRP_x - 6 |
| Highest reported value (Cell 3) | RSRP_x + 2 | RSRP_x + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 3) | RSRP_x - 15+ FFS | RSRP_x - 9+ FFS |
| Highest reported value (Cell 3) | RSRP_x + 5+ FFS | RSRP_x + 9+ FFS |
| RSRP_x is the reported value of Cell 2 | | |

**Table 5.7.7.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8**

| UE power class 3 | | | |
|---|---|---|---|
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 2) | n257, n258, n261 | RSRP_x - 28 | RSRP_x - 31+ FFS |
| | n260 | RSRP_x - 26 | RSRP_x - 29+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | RSRP_x - 12 | RSRP_x - 9+ FFS |
| | n260 | RSRP_x - 10 | RSRP_x - 7+ FFS |

| | | | |
|---|---|---|---|
| | n259 | FFS | FFS |
| Lowest reported value (Cell 3) | n257, n258, n261 | RSRP_y - 24 | RSRP_y - 27+ FFS |
| | n260 | RSRP_y - 21 | RSRP_y - 24+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | RSRP_y - 8 | RSRP_y - 5+ FFS |
| | n260 | RSRP_y - 5 | RSRP_y - 2+ FFS |
| | n259 | FFS | FFS |
| RSRP_x is the reported value of Cell 2 during T1<br>RSRP_y is the reported value of Cell 3 during T1 | | | |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

Editor's Note: This test case is complete for the following configurations:

- UE power class 3
- Test frequency f < 40.8 GHz
- Normal Condition

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

This test case is incomplete for extreme conditions.

### 5.7.7.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency CSI-RS based RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

### 5.7.7.2.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting NR EN-DC and CSI-RS based RSRP measurement.

### 5.7.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.7.2.

### 5.7.7.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

#### 5.7.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.7.2.4.1-1.

**Table 5.7.7.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 5.7.7.2-1 | NR 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 5.7.7.2-2 | NR 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.7.2.4.1-2.

**Table 5.7.7.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.7.2.4.3.

2. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE RX beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

### 5.7.7.2.4.2 Test procedure

1. Configure the positioning system for a valid test point As defined in clause A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.7.7.2.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The CSI-RSRP value of Cell 2 reported by the UE is compared to the expected CSI-RSRP for Cell 2. If the value is outside the limits in Table 5.7.7.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

   - R2: The CSI-RSRP value of Cell 3 reported by the UE is compared to the expected CSI-RSRP for Cell 3. If the value is outside the limits in Table 5.7.7.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

   - R3: The CSI-RSRP value of Cell 3 reported by the UE is compared to the reported CSI-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.7.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the CSI-RSRP reported values during Test 1 for the following requirements:

- R7: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.7.2.5-3a count a fail for R7. Otherwise, R7 is passed.

- R8: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.7.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point As defined in clause A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 5.7.7.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The CSI-RSRP value of Cell 2 reported by the UE is compared to the expected CSI-RSRP for Cell 2. If the value is outside the limits in Table 5.7.7.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

- R5: The CSI-RSRP value of Cell 3 reported by the UE is compared to the expected CSI-RSRP for Cell 3. If the value is outside the limits in Table 5.7.7.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

- R6: The CSI-RSRP value of Cell 3 reported by the UE is compared to the reported CSI-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.7.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the CSI-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.7.2.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum CSI-RSRP value is compared to the minimum CSI-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.7.2.5-3a count a fail for R10. Otherwise, R10 is passed.

#### 5.7.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 5.7.7.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells, CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ, CSI-RS MOBILITY<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 5.7.7.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |

| | | | |
|---|---|---|---|
| periodical SEQUENCE { | | | PERIODICAL |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 5.7.7.2.5 Test requirement

Table 5.7.7.2.5-1 defines the cell specific settings for all tests. Table 5.7.7.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The CSI-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.7.0.2.1 and relative accuracy requirements in clause 5.7.7.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.2.5-3 for test configuration 1 and in Table 5.7.7.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.2.5-3 for test configuration 1 and in Table 5.7.7.2.5-4 for test configuration 2 and Table 5.7.7.2.5-3a for both configurations.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.2.5-5.

R7: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.2.5-3a.

R8: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.2.5-3a.During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.2.5-3 for test configuration 1 and in Table 5.7.7.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table 5.7.7.2.5-3 for test configuration 1 and in Table 5.7.7.2.5-4 for test configuration 2 and Table 5.7.7.2.5-3a for both configurations.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-RSRP meets the requirements in Table 5.7.7.2.5-5.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.2.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum CSI-RSRP report does not exceed the limit in Table 5.7.7.2.5-3a.

**Table 5.7.7.2.5-1: CSI-RSRP inter-frequency general test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | | 489 | 0 | 489 | 0 |
| SSB ARFCN | 1,2 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1,2 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | 1,2 | | TDD | TDD | TDD | TDD |
| TDD configuration | 1,2 | | TDDConf.3.1 | | TDDConf.3.1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | 1,2 | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | 1,2 | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| SSB configuration | 1,2 | | SSB.3 FR2 | | SSB.3 FR2 | |
| OCNG Patterns | 1,2 | | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1,2 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1,2 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1,2 | | SMTC.1 | | SMTC.1 | |
| CSI-RS configuration for RRM | 1,2 | | CSI-RS.RRM.3.1 TDD | CSI-RS.RRM.3.2 TDD | CSI-RS.RRM.3.1 TDD | CSI-RS.RRM.3.2 TDD |
| Time offset between Cell 2 and Cell 3 | 1,2 | µs | 0.58 | | 0.58 | |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1,2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1,2 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void | | | | | | |

**Table 5.7.7.2.5-2: CSI-RSRP inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 4b according to clause A.3.15.4.2 | | Setup 4b according to clause A.3.15.4.2 | |
| | | AoA1 Spherical coverage | AoA2 Rx Beam Peak | AoA1 Spherical coverage | AoA2 Rx Beam Peak |
| Assumption for UE beams Note 7 | | Rough | Rough | Assumption for UE beams Note 7 | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -96.3 | -96.3 | (Table B.2.3-2 Rx Beam Peak +3.97dB) | (Table B.2.3-2 Rx Beam Peak - 1.03dB) |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam | (Table B.2.3-2 Rx Beam |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Peak +13.0dB) | Peak +8.0dB) |
| $\hat{E}_s/N_{oc}$ for SSB | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| SSB_RP Note2 | dBm/SCS | -81.27 | -81.27 | (Table B.2.3-2 Rx Beam Peak +30.0dB) | (Table B.2. 3-2 Rx Beam Peak +7.0dB) |
| ($SSB_RP_{Cell\ 1}$ – $SSB_RP_{Cell\ 2}$) | dB | 0 | | 9.00 | |
| $\hat{E}_s/I_{ot\ BB}$ Note6 for SSB | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| $\hat{E}_s/I_{ot\ BB}$ Note6 for CSI-RS | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| CSI_RP | dBm/SCS | -88.7 | -103.10 | (Table B.2.2-2 Rx Beam Peak +4.1dB) | (Table B.2.2-2 Rx Beam Peak +4.1dB) |
| Io Note2 | dBm/95.04 MHz Note4 | -56.49 | -56.49 | (Table B.2.3-2 Rx Beam Peak +54.68dB) | (Table B.2.3-2 Rx Beam Peak +35.13dB) |
| ($Io_{freq\ 1}$ – $Io_{freq\ 2}$) | dB | 0 | | 7.6 | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 1}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 5.7.7.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 | n257, n258, n261 | 33 |
| | n260 | 39 | n260 | 34 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 101 |
| | | | n260 | 104 |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 | | n257, n258, n261 | 32 |
| | | | n260 | 34 |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 | | n257, n258, n261 | 87 |

| | | | | |
|---|---|---|---|---|
| | | | n260 | 90 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 33 + FFS |
| | n260 | 39 + FFS | n260 | 34 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 101 + FFS |
| | | | n260 | 104 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 + FFS | | n257, n258, n261 | 32+ FFS |
| | | | n260 | 34+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 + FFS | | n257, n258, n261 | 87+ FFS |
| | | | n260 | 91+ FFS |
| | | | n259 | FFS |

**Table 5.7.7.2.5-3a: evaluation limits for the ∆(Max-Min) reported absolute values for cell 3 during each time period**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 3 | 8 | 8 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 3 | 8 | 8 |

**Table 5.7.7.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2**

| **UE power class 3** | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 | n257, n258, n261 | 36 |
| | n260 | 39 | n260 | 37 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 104 |
| | | | n260 | 107 |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 | | n257, n258, n261 | 35 |
| | | | n260 | 37 |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 | | n257, n258, n261 | 90 |
| | | | n260 | 93 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 28 + FFS |
| | n260 | 39 + FFS | n260 | 30 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 91 + FFS |
| | | | n260 | 93 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 3) | All bands: 52 + FFS | | n257, n258, n261 | 28+ FFS |
| | | | n260 | 30+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 3) | All bands: 109 + FFS | | n257, n258, n261 | 91+ FFS |
| | | | n260 | 93+ FFS |
| | | | n259 | FFS |

**Table 5.7.7.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 3 – RSRP report Cell 2) | All bands: -23 | | -37 | |
| Highest value (RSRP report Cell 3 – RSRP report Cell 2) | n257, n258, n261 | +31 | n257, n258, n261 | +17 |
| | n260 | +32 | n260 | +19 |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 3 – RSRP report Cell 2) | -23 + FFS | | -37+ FFS | |
| Highest value (RSRP report Cell 3 – RSRP report Cell 2) | n257, n258, n261 | +26 + FFS | n257, n258, n261 | +17 + FFS |
| | n260 | +27+ FFS | n260 | +19 + FFS |
| | n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

# 5.7.8 CSI-RSRQ

## 5.7.8.0 Minimum conformance requirements

### 5.7.8.0.1 Intra-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.8.2 and Clause 10.1.11]

#### 5.7.8.0.1.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in FR2 in TS 38.133 [6].

The accuracy requirements in Table 5.7.8.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 in TS 38.133 [6] for a corresponding band for each relevant SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.8.0.1.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 5.7.8.0.1.1-1: CSI-RSRQ Intra-frequency absolute accuracy in FR2**

| **Accuracy** | | **Conditions** | |
|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io [Note 2] range** |

| | | | Minimum Io | | Maximum Io |
|---|---|---|---|---|---|
| **dB** | **dB** | **dB** | **dBm / $SCS_{CSI-RS}$ Note 1** | | **dBm/$BW_{Channel}$** |
| | | | **$SCS_{CSI-RS}$ = 60kHz** | **$SCS_{CSI-RS}$ = 120kHz** | |
| ±2.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.8-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-6 | | | |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.<br>Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | |

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 5.7.8.0.1.1-2. The range in the signaling may be larger than the guaranteed accuracy range.

**Table 5.7.8.0.1.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

## 5.7.8.0.2 Inter-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.10.2 and Clause 10.1.11]

### 5.7.8.0.2.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply the inter-frequency measurement defined in 9.10.3.1 in FR2 in TS 38.133 [6].

The accuracy requirements in Table 5.7.8.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

- The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.8.0.2.1-1.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 5.7.8.0.2.1-1: CSI-RSRQ Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±2.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-4 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 5.7.8.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 5.7.8.0.2.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 5.7.8.0.2.2 Relative CSI-RSRQ accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR2.

The accuracy requirements in Table 5.7.8.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding band for the associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.8.0.2.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 5.7.8.0.2.2-1: CSI-RSRQ Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±4 | ±4 | ≥-4 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
Note 4: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

## 5.7.8.1 EN-DC intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 5.7.8.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.8 in TS 38.133 [6] for inter-frequency measurement.

### 5.7.8.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurements.

#### 5.7.8.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.7.8.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.5.7.8.1.

#### 5.7.8.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

##### 5.7.8.1.4.1 Initial conditions

Supported test configuration are shown in Table 5.7.8.1.4.1-1.

**Table 5.7.8.1.4.1-1: CSI-RSRQ intra-frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.8.1.4.1-2.

**Table 5.7.8.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] Clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.8.1.4.3.
2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the CSI-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] Clause C.1.0 and C.1.1.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 5.7.8.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 5.7.8.1.5-1 and Table 5.7.8.1.5-2 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 3 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 5.7.8.0.1.1-1 and Table 5.7.8.0.1.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.8.1.5-1 and Table 5.7.8.1.5-2 as appropriate and repeat steps 5-7.

### 5.7.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 5.7.8.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and RSRQ<br>Table H.3.4-1a<br>Table H.3.4-2 |

**Table 5.7.8.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 5.7.8.1.5 Test Requirements

The absolute accuracy of CSI-RSRQ intra-frequency measurement is test by using the parameters in Table 5.7.8.1.5-1. The CSI-RSRQ intra-frequency OTA related test parameters are provided in Table 5.7.8.1.5-2.

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ –3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ –4.5dB according to the requirements in clause 5.7.8.0.1 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test. Nominal CSI-RSRQ is the value shown in Table 5.7.8.1.5-2.

**Table 5.7.8.1.5-1: CSI-RSRQ intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | Freq1 | | Freq1 | |
| Duplex mode | | | TDD | | TDD | |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| | Initial DL BWP | | DLBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| BWP configuration | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| CSI-RS configuration for RRM | | | CSI-RS.RRM.FR2.1 TDD | | | |
| TCI state | | | TCI.State .0 | | TCI.State .0 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC | | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | | SMTC.1 | | | |
| SSB configuration | | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| Time offset with Cell 2 | | µs | - | 0.58 | - | 0.58 |
| | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Void

**Table 5.7.8.1.5-2: CSI-RSRQ intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | | | |
| Assumption for UE beams Note 9 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -100.7 | | -96.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91.7 | | -87.7 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| CSI-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
| $\hat{E}_s / N_{oc}$ for SSB | dB | 3 | 3 | -3 | -3 |
| $\hat{E}_s / N_{oc}$ for CSI-RS | dB | 3 | 3 | -3 | -3 |
| $\hat{E}_s / I_{ot}$ for SSB | dB | -1.83 | -1.83 | -4.81 | -4.81 |
| $\hat{E}_s / I_{ot}$ for CSI-RS | dB | -1.83 | -1.83 | -4.81 | -4.81 |

| | | | | |
|---|---|---|---|---|
| Io[Note2] | dBm/95.04 MHz [Note4] | -55.7 | -55.67 | -55.67 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
Note 7: Void
Note 8: Void
Note 9: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation.

**Table 5.7.8.1.5-3: CSI-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 3) | n257, n258, n261 | CSI-RSRQ_52 | n257, n258, n261 | CSI-RSRQ_46 |
| | n260 | CSI-RSRQ_51 | n260 | CSI-RSRQ_46 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 3) | All bands | CSI-RSRQ_62 | All bands | CSI-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 5.7.8.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 5.7.8.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.10 in TS 38.133 [6] for inter-frequency measurement.

### 5.7.8.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurements.

### 5.7.8.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.7.8.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.5.7.8.2.

### 5.7.8.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

#### 5.7.8.2.4.1 Initial conditions

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 5.7.8.2.4.1-1.

**Table 5.7.8.2.4.1-1: CSI-RSRQ Inter-frequency CSI-RSRQ supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.7.8.2.4.1-2.

**Table 5.7.8.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2 and Table E.3-1 and TS 38.508-1 [14] Clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 5.7.8.2.5-1.
2. Message contents are defined in clause 5.7.8.2.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] Clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 5.7.8.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 5.7.8.2.5-1 and Table 5.7.8.2.5-2 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 3 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 5.7.8.0.2.1-1 and Table 5.7.8.0.2.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.8.2.5-1 and Table 5.7.8.2.5-2 as appropriate and repeat steps 5-7.

### 5.7.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 5.7.8.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and RSRQ<br>Table H.3.4-1a with condition GAP_NEEDED<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 |

**Table 5.7.8.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

]

### 5.7.8.2.5 Test Requirements

Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test setup in Table 5.7.8.2.5-1 and Table 5.7.8.2.5-2.

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in clause 5.7.8.0.2.1 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test.

The CSI-RSRQ relative measurement accuracy shall fulfil the requirements in clause 5.7.8.0.2.2.

**Table 5.7.8.2.5-1: CSI-RSRQ Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |

| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
|---|---|---|---|---|---|
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| Time offset with Cell 2 | µs | - | 0.58 | - | 0.58 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RSRQ, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 5.7.8.2.5-2: CSI-RSRQ Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| AoA setup | | Setup 1 in clause A.3.15 in TS 38.133 [6] | | Setup 1 in clause A.3.15 in TS 38.133 [6] | |
| Assumption for UE beams Note 8 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -95.93 | | -95.44 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -86.90 | | -86.41 | |
| CSI-RP Note2 | dBm/SCS Note4 | -88.65 | -88.65 | -89.41 | -89.41 |
| CSI-RSRQ Note2 | dB | -14.80 | -14.80 | -15.59 | -15.59 |
| $\hat{E}_s / N_{oc}$ for SSB | dB | -1.75 | -1.75 | -3 | -3 |
| $\hat{E}_s / N_{oc}$ for CSI-RS | dB | -1.75 | -1.75 | -3 | -3 |
| $\hat{E}_s / I_{ot}$ for SSB | dB | -1.81 | -1.81 | -3.06 | -3.06 |
| $\hat{E}_s / I_{ot}$ for CSI-RS | dB | -1.81 | -1.81 | -3.06 | -3.06 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.69 | -55.69 | -55.66 | -55.66 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-RSRQ, CSI-RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-RSRQ and CSI-RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: Void
Note 7: Void
Note 8: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 5.7.8.2.5-3: Evaluation limits for the reported values for T1 and T2 absolute accuracy**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | RSRQ 52 | n257, n258, n261 | RSRQ_48 |
| | | n260 | RSRQ_48 |
| Highest reported value (Cell 2) | RSRQ 62 | n257, n258, n261 | RSRQ_63 |
| | | n260 | RSRQ_62 |
| Lowest reported value (Cell 3) | RSRQ 52 | n257, n258, n261 | RSRQ_48 |
| | | n260 | RSRQ_48 |
| Highest reported value (Cell 3) | RSRQ 62 | n257, n258, n261 | RSRQ_63 |
| | | n260 | RSRQ_62 |

**Table 5.7.8.2.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 3 – RSRQ report Cell 2) | - 7 | - 9 |
| Highest value (RSRQ report Cell 3 – RSRQ report Cell 2) | + 7 | + 9 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 5.7.9 CSI-SINR

### 5.7.9.0 Minimum conformance requirements

#### 5.7.9.0.1 Intra-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.13.2 and Clause 10.1.16]

##### 5.7.9.0.1.1 Absolute CSI-SINR accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.9.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for intra-frequency measurement is serving cell timing.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.9.0.1.1-1.

**Table 5.7.9.0.1.1-1: CSI-SINR Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.8-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-6 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
Note 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 5.7.9.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 5.7.9.0.1.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

## 5.7.9.0.2 Inter-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.15.2 and Clause 10.1.16]

### 5.7.9.0.2.1 Absolute CSI-SINR accuracy

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 5.7.9.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding band.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.9.0.2.1-1.

**Table 5.7.9.0.2.1-1: CSI-SINR Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| 3.5 | ±4 | ≥-4 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
Note 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 5.7.9.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 5.7.9.0.2.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

#### 5.7.9.0.2.2 Relative CSI-SINR accuracy

The relative accuracy of CSI-SINR in inter frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR2 compared to the CSI-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 5.7.9.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding band.
- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.9.0.2.2-1.

**Table 5.7.9.0.2.2-1: CSI-SINR Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz / $SCS_{CSI-RS}$ = 120kHz | |
| ±3.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | -50 |
| ±4 | ±4 | ≥-6 | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
Note 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

### 5.7.9.1 EN-DC intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

#### 5.7.9.1.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.2.1 in TS 38.133 [6].

#### 5.7.9.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward, which supports CSI-RS based SINR measurements.

#### 5.7.9.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.7.9.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.5.7.9.1.

#### 5.7.9.1.4 Test description

##### 5.7.9.1.4.1 Initial conditions

Supported test configurations are shown in Table 5.7.9.1.4.1-1.

**Table 5.7.9.1.4.1-1: CSI-SINR Intra-frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 5.7.9.1.4.1-2.

**Table 5.7.9.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] Clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.9.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier which is specified in clause A.3.7.2.1 in TS 38.133 [6], Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the CSI-SINR measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] Clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 5.7.9.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.

2. Set the parameters according to Table 5.7.9.1.5-1 and Table 5.7.9.1.5-2 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 3 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 5.7.9.0.1.1-1 and Table 5.7.9.0.1.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 5.7.9.1.5-1 and Table 5.7.9.1.5-2 as appropriate and repeat steps 5-7.

### 5.7.9.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 5.7.9.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and SINR<br>Table H.3.4-1a<br>Table H.3.4-2 |

**Table 5.7.9.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 5.7.9.1.5 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 5.7.9.0.1.1 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test. Nominal CSI-SINR is the value shown in Table 5.7.9.1.5-2.

**Table 5.7.9.1.5-1: CSI-SINR Intra-frequency test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq2 | | Freq2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration | | TRS.2.1 TDD | | | |
| TCI state | | TCI.State.0 | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | | | |
| SSB configuration | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| CSI-RS for mobility | | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| Time offset with Cell 2 | µs | - | 0.29 | - | 0.29 |
| CSI-RSSI-Measurement | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 5.7.9.1.5-2: CSI-SINR Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 7 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96 | |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ for SSB | dB | 4.54 | 2.66 | -2.8 | -2.8 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | 4.54 | 2.66 | -2.8 | -2.8 |
| CSI-RSRP Note2 | dBm/SCS Note4 | -91.43 | -93.31 | -98.77 | -98.77 |
| CSI-SINR Note2 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| $\hat{E}_s/I_{ot}$ for SSB | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| Io Note2 | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
Note 7: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 5.7.9.1.5-3: CSI-SINR Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 3) | n257, n258, n261 | CSI-SINR_32 | n257, n258, n261 | CSI-SINR_29 |
| | n260 | CSI-SINR_32 | n260 | CSI-SINR_28 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 3) | All bands | CSI-SINR_48 | All bands | CSI-SINR_45 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 5.7.9.2 EN-DC inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 5.7.9.2.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.2.1 and 10.1.15.2.2 in TS 38.133 [6] for inter-frequency measurement.

### 5.7.9.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward, which supports CSI-RS based SINR measurements.

### 5.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.7.9.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.5.7.9.2.

### 5.7.9.2.4 Test description

#### 5.7.9.2.4.1 Initial conditions

Supported test configurations are shown in Table 5.7.9.2.4.1-1.

**Table 5.7.9.2.4.1-1: CSI-SINR inter frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 5.7.9.2.4.1-2.

**Table 5.7.9.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2 and Table E.3-1 and TS 38.508-1 [14] Clause 4.3.1 for E-UTRA and 7.2.3 for NR. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 5.7.9.2.4.3.

2. There are two carriers and three cells specified in the test. In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier which is specified in clause A.3.7.2.1 in TS 38.133 [6]. The TCI status for Cell 1 is defined in Table A.3.16.2-1 in TS 38.133 [6] and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1 in TS 38.133 [6]. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] Clause C.1.0 and C.1.1. Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the CSI-SINR measurements.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 5.7.9.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.

2. Set the parameters according to Table 5.7.9.2.5-1 and Table 5.7.9.2.5-2 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 3 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 5.7.9.0.2.1-1 and Table 5.7.9.0.2.1-2) or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.9.2.5-1 and Table 5.7.9.2.5-2 as appropriate and repeat steps 5-7.

### 5.7.9.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 5.7.9.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and SINR<br>Table H.3.4-1a with condition GAP_NEEDED<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 |

**Table 5.7.9.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 5.7.9.2.5 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR+3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 5.7.9.0.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal CSI-SINR is the value shown in Table 5.7.9.2.5-2.

The CSI-SINR relative measurement accuracy shall fulfil the requirements in clause 5.7.9.0.2.2.

**Table 5.7.9.2.5-1: CSI-SINR inter frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 | freq1 | Freq2 |
| Duplex mode | | TDD | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| Time offset with cell 2 | µs | - | 0.29 | - | 0.29 | - | 0.29 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| CSI-RS for mobility | | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: CSI-SINR, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 5.7.9.2.5-2: CSI-SINR Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | degrees | Setup 1 according to A.3.15.1 in TS 38.133 [6] | | Setup 1 according to A.3.15.1 in TS 38.133 [6] | | Setup 1 according to A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 7 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105.1 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96.1 | | -96 | |
| $\hat{E}_s/N_{oc}$ for SSB | dB | -0.5 | -0.5 | 11.0 | 11.0 | -2.1 | -2.1 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | -0.5 | -0.5 | 11.0 | 11.0 | -2.1 | -2.1 |
| CSI-RSRP Note2 | dBm/SCS Note4 | -96.47 | -96.47 | -85.07 | -85.07 | -98.07 | -98.07 |
| CSI-SINR Note2 | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| $\hat{E}_s/I_{ot}$ for SSB | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| Io Note2 | dBm/95.04 MHz Note4 | -64.21 | | -55.75 | | -64.90 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: NR operating band groups are as defined in clause 3.5.2 in TS 38.133 [6].
Note 7: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 5.7.9.2.5-3: Evaluation limits for the reported values for T1 and T2 absolute accuracy**

| UE power class 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | | **Test 3** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SINR_37 | n257, n258, n261 | SINR_54 | n257, n258, n261 | SINR_33 |
| | n260 | SINR_36 | n260 | SINR_54 | n260 | SINR_32 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_52 | n257, n258, n261 | SINR_81 | n257, n258, n261 | SINR_50 |
| | n260 | SINR_52 | n260 | SINR_80 | n260 | SINR_50 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 3) | n257, n258, n261 | SINR_37 | n257, n258, n261 | SINR_54 | n257, n258, n261 | SINR_33 |
| | n260 | SINR_36 | n260 | SINR_54 | n260 | SINR_32 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 3) | n257, n258, n261 | SINR_52 | n257, n258, n261 | SINR_81 | n257, n258, n261 | SINR_50 |
| | n260 | SINR_52 | n260 | SINR_80 | n260 | SINR_50 |
| | n259 | FFS | n259 | FFS | n259 | FFS |

**Table 5.7.9.2.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1** | **Test 2** | **Test 3** |
| Lowest value (SINR report Cell 3 – SINR report Cell 2) | -8 | -17 | -9 |
| Highest value (SINR report Cell 3 – SINR report Cell 2) | 8 | 17 | 9 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 6 NR standalone in FR1

## 6.0 General

This clause contains test scenarios for NR standalone. This configuration is also known as NR/5GC. All NR cells are in Frequency Range 1.

## 6.1 RRC_IDLE state mobility

### 6.1.1 NR cell re-selection

#### 6.1.1.0 Minimum conformance requirements

##### 6.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra}$ as defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0. An intra-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR_Intra}$ when Treselection = 0 as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least 3 dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If Treselection timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

##### 6.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If $Srxlev > S_{nonIntraSearchP}$ and $Squal > S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

If $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $K_{carrier} * T_{detect,NR_Inter} + K_{carrier_HST} * T_{detect,NR_Inter_HST}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5 dB for reselections based on ranking or 6dB for SS-RSRP reselections based on absolute priorities or 4dB for SS-RSRQ reselections based on absolute priorities.

The parameter $K_{carrier}$ is the number of NR inter-frequency carriers which are not configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter $K_{carrier_HST}$ is the number of NR inter-frequency carriers which are configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter $K_{carrier}$ for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are not configured with *highSpeedMeasInterFreq-r17* for FR1. The parameter $K_{carrier_HST}$ for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are configured with *highSpeedMeasInterFreq-r17* for FR1.

Note: combined total number means that if a carrier is an inter-frequency carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_HST} * T_{measure,NR_Inter_HST}$ (see table 6.1.1.0.2-1 and table 6.1.1.0.2-2 if UE declares support of idle mode inter-frequency measurement enhancement when configured with highSpeedMeasInterFreq-r17 for FR1, otherwise see table 6.1.1.0.2-1 only of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$ for carriers which are not configured with highSpeedMeasInterFreq-r17 for FR1or Tmeasure,NR_Inter_HST /2 for carriers which are configured with highSpeedMeasInterFreq-r17 forFR1.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within

$K_{carrier} * T_{evaluate,NR_Inter} + K_{carrier_HST} * T_{evaluate,NR_Inter_HST}$ when Treselection = 0 as specified in table 6.1.1.0.2-1 and table 6.1.1.0.2-2 in TS 38.133 [6] if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17* for FR1, otherwise see table 6.1.1.0.2-1 only, provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  when *rangeToBestCell* is not configured:

  - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.

  when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

  - if there are multiple such cells, the cell has the highest rank among them

- the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or

- 6dB for SS-RSRP reselections based on absolute priorities or

- 4dB for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If Treselection timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 6.1.1.0.2-1 of TS 38.133 [6] under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where $T_{SMTC_intra}$ and $T_{SMTC_inter}$ are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion in TS 38.304 [30].

**Table 6.1.1.0.2-1: $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$**

| DRX cycle length [s] | Scaling Factor (N1) | | | $T_{detect,NR_Inter}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|---|
| | FR1 | FR2-1 Note1 | FR2-2 Note2 | | | |
| 0.32 | 1 | 8 | 12 | 11.52 x N1 x 1.5 (36 x N1 x 1.5) | 1.28 x N1 x 1.5 (4 x N1 x 1.5) | 5.12 x N1 x 1.5 (16 x N1 x 1.5) |
| 0.64 | | 5 | 8 | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 6 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 5 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |

Note 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.
Note 2: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length.

**Table 6.1.1.0.2-2: $T_{detect,NR_Inter_HST}$, $T_{measure,NR_Inter_HST}$ and $T_{evaluate,NR_Inter_HST}$ for FR1 configured with *highSpeedMeasInterFreq-r17* note2**

| DRX cycle length [s] | $T_{detect,NR_Inter_HST}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_HST}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_HST}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 3.2 x M2 (10 x M2) Note 1 | 0.32 x M3 (M3) Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | 6.4 (10) | 0.64 (1) | 1.92 (3) |
| 1.28 | 10.24 (8) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

| | |
|---|---|
| Note 1: | When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2 |
| Note 2: | The support of HST Idle mode inter-frequency measurement enhancement is optional without capability signalling. Apply for UE declaring supports idle mode inter-frequency measurement enhancement for HST, otherwise Table 6.1.1.0.2-1 shall be used. |

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

#### 6.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with highSpeedMeasFlag-r16

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra}$ as defined in table 4.2.2.3-2 of TS 38.133 [6] when that Treselection= 0. An intra-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-2 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR_Intra}$ when Treselection = 0 as specified in table 4.2.2.3-2 of TS 38.133 [6] provided that the cell has at least 3dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If Treselection timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

#### 6.1.1.0.4 Minimum conformance requirements for intra-frequency cell re-selection when UE configured with relaxed measurement criterion

[TS 38.133, clause 4.2.2.3]

An intra-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS 38.304 [30] within $T_{evaluate,NR_Intra}$ when Treselection = 0 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

[TS 38.133, clause 4.2.2.9.2]

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvalutation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- $T_{detect,NR_Intra}$ as specified in Table 4.2.2.9.2-1.
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.2-1.
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.2-1.

**Table 4.2.2.9.2-1: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 | | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.<br>Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | | | |

[TS 38.133, clause 4.2.2.9.3]

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criteria and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- $T_{detect,NR_Intra}$ as specified in Table 4.2.2.9.3-1.
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.3-1.
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.3-1.

**Table 4.2.2.9.3-1: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 | | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.<br>Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [13] criterion. | | | | | |

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

**Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1**

| Parameter | NR operating band groups [Note1] | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| **Conditions** | Depending on band group | -124+ $\Delta_{BG_offset}$ | -121+ $\Delta_{BG_offset}$ | ≥ -4 |
| NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.<br>NOTE 2: For NR operating band groups, $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

### 6.1.1.0.5 Minimum conformance requirements for inter-frequency cell re-selection when UE configured with relaxed measurement criterion

[TS 38.133, clause 4.2.2.4]

An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier}$ * $T_{evaluate,NR_Inter}$ when Treselection = 0 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and
- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

[TS 38.133, clause 4.2.2.10.2]

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *lowMobilityEvalutation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

When Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- $T_{detect,NR_Inter}$ as specified in Table 4.2.2.10.2-1.
- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.2-1.
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.2-1.

**Table 4.2.2.10.2-1: $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 | | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | | | |

[TS 38.133, clause 4.2.2.10.3]

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *cellEdgeEvaluation* [13] criterion, and UE has fulfilled or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- $T_{detect,NR_Inter}$ as specified in Table 4.2.2.10.3-1.

- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.3-1.
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.3-1.

**Table 4.2.2.10.3-1: $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 | | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [13] criterion. | | | | | |

[TS 38.133, Annex B.1.3]

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

**Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1**

| Parameter | NR operating band groups [Note1] | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| **Conditions** | Depending on band group | -124+ $\Delta_{BG_offset}$ | -121+ $\Delta_{BG_offset}$ | ≥ -4 |
| NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.<br>NOTE 2: For NR operating band groups, $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | |

## 6.1.1.1 NR SA FR1 cell re-selection

### 6.1.1.1.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

### 6.1.1.1.2 Test applicability

This test applies to all types of NR UE from release 15 onwards.

### 6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.1.

6.1.1.1.4 Test description

6.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.1.4.1-1.

**Table 6.1.1.1.4.1-1: Supported test configurations for NR SA FR1 cell re-selection**

| Configuration | Description |
|---|---|
| 6.1.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.1.4.1-2.

**Table 6.1.1.1.4.1-2: Initial conditions for NR SA FR1 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.1.4.1-3.

2. Message contents are defined in clause 6.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.1.4.1-3: General test parameters for NR SA FR1 cell re-selection**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell1 | |
| T2 end condition | Active cell | | 1, 2, 3 | Cell2 | |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| Final condition | Active cell | | 1, 2, 3 | Cell1 | |
| | Neighbour cell | | 1, 2, 3 | Cell2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 µs | Synchronous cells |
| | | | 3 | 3 µs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |

| | | | | |
|---|---|---|---|---|
| PRACH configuration index | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 1, 2, 3 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2, 3 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.12.
Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.1.1.4.3-2: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | -130 is actual value in dBm (-65 * 2 dBm) | 6.1.1.1-1, 6.1.1.1-2 |
| | -64 | -128 is actual value in dBm (-64 * 2 +1 dBm) | 6.1.1.1-3 |
| } | | | |
| } | | | |

**Table 6.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | Actual value is -65*2 = -130dBm | 6.1.1.1-1, 6.1.1.1-2 |
| | -64 | Actual value is -64*2 = -128dBm | 6.1.1.1-3 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.1-1 AND Cell 1 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.1-1 AND Cell 2 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 | | 6.1.1.1-2, 6.1.1.1-3 |

| | | | |
|---|---|---|---|
| | with condition SMTC.1 | | |
| deriveSSB-IndexFromCell | false | | 6.1.1.1-1 |
| | true | | 6.1.1.1-2, 6.1.1.1-3 |
| } | | | |
| } | | | |

### 6.1.1.1.5 Test requirement

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 6.1.1.1.5-1: Cell specific test parameters for NR SA FR1 cell re-selection**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -130 | | | -130 | | |
| | | 3 | -127 | | | -127 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell_selection_and_Re-selection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 2 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 3 | -79 | -82 | -78.54 | -infinity | -78.54 | -82 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -51.91 | -51.91 | Specified in Cell 1 columns | | |
| | dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 | | | |
| | dBm/38.16 MHz | 3 | -47.85 | -45.81 | -45.81 | | | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | | 60 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra} + T_{SI-NR}$

$T_{detect,NR_Intra}$ = 32 s; as specified in TS 38.133 [6] clause 4.2.2.3.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 33.28 seconds in this test case (note: this gives a total of 33.28 seconds but the test allows 34 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 6.4 s; as specified in TS 38.133 [6] clause 4.2.2.3.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 7.68 seconds in this test case (note: this gives a total of 7.68 seconds but the test allows 8 seconds).

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

### 6.1.1.2 NR SA FR1-FR1 cell re-selection

#### 6.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection.

#### 6.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.2.

#### 6.1.1.2.4 Test description

##### 6.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.2.4.1-1.

**Table 6.1.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.2.4.1-2.

**Table 6.1.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.1.2.4.1-3.

2. Message contents are defined in clause 6.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than Cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

**Table 6.1.1.2.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on Cell 2 in the initial phase and during T1 period the UE reselects to Cell 1 |
| | Neighbour cell | | 1, 2, 3 | Cell1 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T3 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to Cell 2 with higher priority during T3 |
| | Neighbour cell | | 1, 2, 3 | Cell1 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 µs | Synchronous cells |
| | | | 3 | 3 µs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC 2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB4 of Cell 2 |
| | | | 2 | SMTC 1 | |
| | | | 3 | SMTC 1 | |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |

| | | | | |
|---|---|---|---|---|
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3 | >7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 6.1.1.2.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.2.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.2.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2<br>Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | |

#### 6.1.1.2.5 Test requirement

Tables 6.1.1.2.4.1-3 and 6.1.1.2.5-1 define the primary level settings including test tolerances for inter-frequency NR cell re-selection test case.

**Table 6.1.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| | | 2 | | | | | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | -100 | -98 | -98 |
| | | 2 | -98 | | | -100 | -98 | -98 |
| | | 3 | -95 | | | -97 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | -100 | -98 | -98 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| | | 2 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| | | 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 |
| Io | dBm/9.36 MHz | 1 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| | dBm/9.36 MHz | 2 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| | dBm/38.16 MHz | 3 | -48.23 | -48.23 | -48.23 | -67.37 | -infinity | -53.17 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3 | 48 | | | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3 | 44 | | | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3 | 50 | | | 50 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration updateon Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate, NR_inter}$ + $T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate, NR_inter}$ + $T_{SI\text{-}NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, NR_inter}$ See Table 4.2.2.4-1 in clause 4.2.2.4 of TS 38.133 [6]

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

### 6.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.9.2.

### 6.1.1.3.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

### 6.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.3.

### 6.1.1.3.4 Test description

#### 6.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.3.4.1-1.

**Table 6.1.1.3.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 6.1.1.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.3-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.3.4.1-2.

**Table 6.1.1.3.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.3.4.1-3.

2. Message contents are defined in clause 6.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.3.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell1 | The UE camps on Cell 1 in the initial phase |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE reselects to Cell 2 during T1 period |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| Final condition | Active cell | | 1, 2, 3 | Cell1 | The UE reselects to Cell 1 during T2 period |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC pattern 2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC pattern 6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC pattern 1 | |
| | | | 3 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2, 3 | Not configured | |
| T1 | | s | 1, 2, 3 | 25 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 25 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *lowMobilityEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

SIB2 of Cell 1 and Cell 2 are configured as follows:

- *lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.3.5-1.
- *cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

1. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
2. Set the parameters according to T1 in Table 6.1.1.3.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.3.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
9. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 14
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.
13. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.1.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.1.3.4.3-2: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.3.4.3-3: SIB2 (Cell 1)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.3-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.3-2, 6.1.1.3-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.3-1 |
| | true | | 6.1.1.3-2, 6.1.1.3-3 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB6 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.3.4.3-4: SIB2 (Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.3-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.3-2, 6.1.1.3-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.3-1 |
| | true | | 6.1.1.3-2, 6.1.1.3-3 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB6 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

### 6.1.1.3.5 Test requirement

Tables 6.1.1.3.4.1-3 and 6.1.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

**Table 6.1.1.3.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | 0 | |
| $S_{SearchDeltaP}$ | dB | 1, 2, 3 | 6 | | 6 | |
| $T_{SearchDeltaP}$ | s | 1, 2, 3 | 5 | | 5 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3 | -3.56 | 3.22 | 3.22 | -3.56 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3 | -98 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3 | 12.55 | 16 | 16 | 12.55 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85.45 | -82 | -82 | -85.45 |
| | | 2 | -85.45 | -82 | -82 | -85.45 |
| | | 3 | -82.45 | -79 | -79 | -82.45 |
| Io | dBm/9.36 MHz | 1 | -52.35 | -52.35 | specified in Cell 1 columns- | |
| | dBm/9.36 MHz | 2 | -52.35 | -52.35 | | |
| | dBm/38.16 MHz | 3 | -46.25 | -46.25 | | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell re-selection delay to detected cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling low mobility criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to an already detected cell = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.2-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

### 6.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.9.3.

### 6.1.1.4.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

### 6.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.4.

### 6.1.1.4.4 Test description

#### 6.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.4.4.1-1.

**Table 6.1.1.4.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 6.1.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.4-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.4.4.1-2.

**Table 6.1.1.4.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.4.4.1-3.

2. Message contents are defined in clause 6.1.1.4.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.4.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active Cell | | 1, 2, 3 | Cell1 | The UE camps on Cell 1 in the initial phase |
| | Neighbour Cells | | 1, 2, 3 | Cell2 | |
| T1 end condition | Active Cell | | 1, 2, 3 | Cell2 | The UE shall fulfil the not-at-cell edge criterion and reselect to Cell 2 during T1 period during T1. |
| | Neighbour Cells | | 1, 2, 3 | Cell1 | |
| T2 end condition | Active Cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T2 |
| | Neighbour Cells | | 1, 2, 3 | Cell2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between Cells | | | 1 | 3 ms | Asynchronous Cells |
| | | | 2 | 3 µs | Synchronous Cells |
| | | | 3 | 3 µs | Synchronous Cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC pattern 2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC pattern 6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC pattern 1 | |
| | | | 3 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all Cells in the test. |
| PRACH configuration index | | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2, 3 | Not configured | |
| T1 | | s | 1, 2, 3 | 20 | T1 needs to be defined so that Cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 20 | T2 needs to be defined so that Cell re-selection reaction time is taken into account. |

### 6.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *cellEdgeEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.4.5-1. T1 starts.
4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
5. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.4.5-1. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
10. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
11. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. Skip to 14
13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.
14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.1.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.1.4.4.3-2: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.4.4.3-3: SIB2 (Cell 1)**

| Derivation Path: Table H.2.1-1 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.4-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.4-2, 6.1.1.4-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.4-1 |
| | true | | 6.1.1.4-2, 6.1.1.4-3 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| cellEdgeEvaluation-r16 SEQUENCE { | | | |
| s-SearchThresholdP-r16 | 25 | Actual value is 25*2 = 50dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.4.4.3-4: SIB2 (Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.4-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.4-2, 6.1.1.4-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.4-1 |
| | true | | 6.1.1.4-2, 6.1.1.4-3 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| cellEdgeEvaluation-r16 SEQUENCE { | | | |
| s-SearchThresholdP-r16 | 25 | Actual value is 25*2 = 50dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

### 6.1.1.4.5 Test requirement

Tables 6.1.1.4.4.1-3 and 6.1.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

**Table 6.1.1.4.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | -3.56 | 3.22 | 3.22 | -3.56 |
| | | 2 | | | | |
| | | 3 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 12.55 | 16 | 16 | 12.55 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -85.45 | -82 | -82 | -85.45 |
| | | 2 | -85.45 | -82 | -82 | -85.45 |
| | | 3 | -82.45 | -79 | -79 | -82.45 |
| Io | dBm/9.36 MHz | 1 | -52.35 | -52.35 | -52.35 | -52.35 |
| | dBm/9.36 MHz | 2 | -52.35 | -52.35 | -52.35 | -52.35 |
| | dBm/38.16 MHz | 3 | -46.25 | -46.25 | -46.25 | -46.25 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| $S_{searchThresholdP}$ | dB | 1, 2, 3 | 50 | | 50 | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: OCNG shall be used such that both Cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other Cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected cell = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.3-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

### 6.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.10.2.

### 6.1.1.5.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

### 6.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.5.

### 6.1.1.5.4 Test description

#### 6.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.5.4.1-1.

**Table 6.1.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.1.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.5-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.5.4.1-2.

**Table 6.1.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.5.4.1-3.

2. Message contents are defined in clause 6.1.1.5.4.3.

3. There is 2 NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.5.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on Cell 2 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T2 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 µs | Synchronous cells |
| | | | 3 | 3 µs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| | | | 2 | SMTC pattern 1 | |
| | | | 3 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2, 3 | Not configured | |
| T1 | | s | 1, 2, 3 | 25 s | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3 | 25 s | T2 is defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

   *lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.5.5-1.

   *cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T2 in Table 6.1.1.5.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.5.5-1. T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

5. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.5.5-1. T2 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

10. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

11. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 14

13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.1.1.5.4.3-1: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.5.4.3-2: SIB2 (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 22 | Actual value = 22*2 = 44dB | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB3 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.5.4.3-3: SIB2 (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 23 | Actual value = 23*2 = 46dB | Cell 2 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB15 | | Cell 2 |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.5.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.5-1 |

| | | | |
|---|---|---|---|
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.5-2, 6.1.1.5-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.5-1 |
| | true | | 6.1.1.5-2, 6.1.1.5-3 |
| threshX-HighP | 24 | Actual value = 24*2 = 48dB | |
| threshX-LowP | 24 | Actual value = 24*2 = 48dB | |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.5.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | Cell 2 |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.5-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.5-2, 6.1.1.5-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.5-1 |
| | true | | 6.1.1.5-2, 6.1.1.5-3 |
| threshX-HighP | 22 | Actual value = 22*2 = 44dB | Cell 2 |
| threshX-LowP | 25 | Actual value = 25*2 = 50dB | Cell 2 |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | Cell 2 |
| } | | | |
| } | | | |
| } | | | |

### 6.1.1.5.5 Test requirement

Tables 6.1.1.5.4.1-3 and 6.1.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

**Table 6.1.1.5.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | 0 | |
| Cell_selection_and_ reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 14 | 14 | -3.70 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 14 | 14 | -3.70 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -84 | -84 | -101.70 | -88.25 |
| | | 2 | -84 | -84 | -101.70 | -88.25 |
| | | 3 | -81 | -81 | -98.70 | -85.25 |
| Io | dBm/9.36 MHz | 1 | -55.88 | -55.88 | -68.50 | -59.86 |
| | dBm/9.36 MHz | 2 | -55.88 | -55.88 | -68.50 | -59.86 |
| | dBm/38.16 MHz | 3 | -49.79 | -49.79 | -62.40 | -53.76 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | Not sent | | Not sent | |
| $Thresh_{x,highP}$ | dB | 1, 2, 3 | 48 | | 44 | |
| $Thresh_{serving,lowP}$ | dB | 1, 2, 3 | 44 | | 46 | |
| $Thresh_{x,lowP}$ | dB | 1, 2, 3 | 48 | | 50 | |
| $S_{SearchDeltaP}$ | dB | 1, 2, 3 | 3 | | 15 | |
| $T_{SearchDeltaP}$ | s | 1, 2, 3 | 5 | | 5 | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The cell re-selection delay to detected lower priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling low mobility criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

### 6.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.10.3.

### 6.1.1.6.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

#### 6.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.6.

#### 6.1.1.6.4 Test description

##### 6.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.6.4.1-1.

**Table 6.1.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.1.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.6-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.6.4.1-2.

**Table 6.1.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.6.4.1-3.

2. Message contents are defined in clause 6.1.1.6.4.3.

3. There is 2 NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.6.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on Cell 2 in the initial phase, it fulfils Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T2 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |

| | | | | |
|---|---|---|---|---|
| | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| | | | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| | | 2 | SMTC pattern 1 | |
| | | 3 | SMTC pattern 1 | |
| DRX cycle length | s | 1, 2, 3 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | 20 s | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3 | 20 s | T2 is defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:
   - *cellEdgeEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.6.5-1.
   - *lowMobilityEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.
2. Set the parameters according to T2 in Table 6.1.1.6.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
3. Set the parameters according to T1 in Table 6.1.1.6.5-1. T1 starts.
4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
5. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.6.5-1. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
10. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

11. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 14

13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.1.1.6.4.3-1: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.6.4.3-2: SIB2 (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present | | |
| s-SearchThresholdP-r16 | 25 | Actual value = 25*2 = 50dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.6.4.3-3: SIB2 (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present | | |

| | | | |
|---|---|---|---|
| s-SearchThresholdP-r16 | 17 | Actual value = 17*2 = 34dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.1.6.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 SSB | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.6-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.6-2, 6.1.1.6-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.6-1 |
| | true | | 6.1.1.6-2, 6.1.1.6-3 |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.1.6.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | |
| smtc | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.6-1 |
| | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.1.6-2, 6.1.1.6-3 |
| deriveSSB-IndexFromCell | false | | 6.1.1.6-1 |
| | true | | 6.1.1.6-2, 6.1.1.6-3 |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | Cell 2 |
| } | | | |
| } | | | |
| } | | | |

6.1.1.6.5 Test requirement

Tables 6.1.1.6.4.1-3 and 6.1.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

**Table 6.1.1.6.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | 0 | |
| Cell_selection_and_ reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 16 | 14 | -3.65 | 16 |
| | | 2 | | | | |
| | | 3 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | -100 | |
| | | 2 | -98 | | -100 | |
| | | 3 | -95 | | -97 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | -100 | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 16 | 14 | -3.65 | 16 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -84 | -103.65 | -84 |
| | | 2 | -82 | -84 | -103.65 | -84 |
| | | 3 | -79 | -81 | -100.65 | -81 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -55.88 | -70.49 | -55.94 |
| | dBm/9.36 MHz | 2 | -53.94 | -55.88 | -70.49 | -55.94 |
| | dBm/38.16 MHz | 3 | -47.84 | -49.79 | -63.39 | -49.84 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | Not sent | | Not sent | |
| $Thresh_{x,highP}$ | dB | 1, 2, 3 | 48 | | 48 | |

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3 | 44 | | 44 | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3 | 50 | | 50 | |
| $S_{SearchThresholdP}$ | dB | 1, 2, 3 | 50 | | 50 | |
| $S_{SearchThresholdQ}$ | dB | 1, 2, 3 | Not Configured | | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The cell re-selection delay to detected lower priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

$T_{SI-NR}$ = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

### 6.1.1.7.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE configured with *highSpeedMeasFlag-r16* is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

#### 6.1.1.7.2 Test applicability

This test applies to all types of NR UE from release 15 onwards that supports measurement enhancements in high speed scenario

#### 6.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.7.

#### 6.1.1.7.4 Test description

##### 6.1.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.7.4.1-1.

**Table 6.1.1.7.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16**

| Configuration | Description |
|---|---|
| 6.1.1.7-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.1.1.7-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.1.1.7-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.7.4.1-2.

**Table 6.1.1.7.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.7.4.1-3.
2. Message contents are defined in clause 6.1.1.7.4.3.
3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.7.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell1 | |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T2 end condition | Active cell | | 1, 2, 3 | Cell2 | |
| | Neighbour cells | | 1, 2, 3 | Cell1 | |
| Final condition | Active cell | | 1, 2, 3 | Cell1 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |

| | | | | |
|---|---|---|---|---|
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 1, 2, 3 | 10 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2, 3 | 9 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. *highSpeedMeasFlag-r16* is broadcasted to UE.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.7.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.7.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 4 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.7.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 3 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.1.7.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks on condition of HighSpeedMeas with exceptions | Table H.2.1-1 with Condition SMTC.2 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 1<br>Table H.2.1-1 with Condition SMTC.6 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 2<br>Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-2<br>Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-3<br><br>Table H.2.1-2<br><br>Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions | |

### 6.1.1.7.5 Test requirement

Tables 6.1.1.7.4.1-3 and 6.1.1.7.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16.

**Table 6.1.1.7.5-1: Cell specific test parameters for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| configuration | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.2.1-1 | | | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | 81.55 | -infinity | -81.55 | -85 |
| | | 2 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 3 | -79 | -82 | -78.54 | -infinity | -78.54 | -82 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -51.91 | -51.91 | specified in Cell 1 columns- | | |
| | dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 | | | |
| | dBm/38.16 MHz | 3 | -47.85 | -45.81 | -45.81 | | | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | | 60 | | |
| Propagation Condition | | 1, 2 | AWGN | | | AWGN 1944Hz Note4 | | |
| Propagation Condition | | 3 | AWGN | | | AWGN 3334Hz Note5 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.
Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra} + T_{SI\text{-}NR}$

$T_{detect,NR_Intra}$ = 2.56 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 3.84 seconds in this test case (note: this gives a total of 3.84 seconds but the test allows 4 seconds).

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 0.96 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 2.24 seconds in this test case (note: this gives a total of 2.24 seconds but the test allows 3 seconds).

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 6.1.1.8 NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

### 6.1.1.8.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE configured with *highSpeedMeasInterFreq-r17* specified in TS 38.133 [6] in clause 4.2.2.4.

### 6.1.1.8.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting the high-speed inter-frequency IDLE/INACTIVE measurements.

### 6.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.8

### 6.1.1.8.4 Test description

#### 6.1.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.1.1.8.4.1-1.

**Table 6.1.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.1.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.1.1.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.1.1.8-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.8.4.1-2.

**Table 6.1.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.1.1.8.4.1-3.
2. Message contents are defined in clause 6.1.1.8.4.3.
3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than Cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

**Table 6.1.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on Cell 2 in the initial phase and during T1 period the UE reselects to Cell 1 |
| | Neighbour cell | | 1, 2, 3 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T3 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to Cell 2 during T3 |
| | Neighbour cell | | 1, 2, 3 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC.2 | |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2, 3 | Not configured | |
| T1 | | s | 1, 2, 3 | 10 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2, 3 | >7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3 | 12 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.1.8.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Cell 2 is of higher priority than Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.
2. Set the parameters according to T1 in Table 6.1.1.8.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on Cell 1 during time duration T1 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.8.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.
8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.8.5-1. T3 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
10. If the UE responds on Cell 2 during time duration T3 within 5 seconds from the beginning of time period T3, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 12. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.
14. Repeat step 2-13 until a test verdict has been achieved.
    Each of the events “Re-select Cell 1” and “Re-select Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 6.1.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.1.8.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.8-1 and Cell 1<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.8-1 and Cell 2<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.8-2<br>Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.8-3<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.1.8.4.3-2: *SIB4*: NR inter-frequency cell re-selection with highSpeedMeasInterFreq-r17**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| InterFreqCarrierFreqInfo-v1700 ::= SEQUENCE { | | | |
| highSpeedMeasInterFreq-r17 | TRUE | | |
| } | | | |
| } | | | |

6.1.1.8.5 Test requirement

Table 6.1.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

**Table 6.1.1.8.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | -100 | -98 | -98 |
| | | 2 | -98 | | | -100 | -98 | -98 |
| | | 3 | -95 | | | -97 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| | | 2 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| | | 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 |
| Io | dBm/9.36 MHz | 1 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| | dBm/9.36 MHz | 2 | -54.33 | -54.33 | -54.33 | -70.46 | -infinity | -56.26 |
| | dBm/38.16 MHz | 3 | -48.23 | -48.23 | -48.23 | -67.37 | -infinity | -53.17 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3 | 48 | | | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3 | 44 | | | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3 | 50 | | | 50 | | |
| Propagation Condition | | 1, 2 | AWGN | | | AWGN 1944Hz Note4 | | |
| Propagation Condition | | 3 | AWGN | | | AWGN 3334Hz Note5 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.
Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 5 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 3 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 6.1.1.9 NR SA FR1 cell re-selection for UE operating on a cell with less than 5MHz BW

### 6.1.1.9.1 Test Purpose

The purpose of this test is to verify the requirement for intra-frequency NR cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.3 for UE capable of operating on a cell with less than 5MHz BW.

#### 6.1.1.9.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting less than 5 MHz BW.

#### 6.1.1.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.1.1.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.9.

#### 6.1.1.9.4 Test description

##### 6.1.1.9.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.9.4.1-1.

**Table 6.1.1.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.1.1.9-1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.9.4.1-2.

**Table 6.1.1.9.4.1-2: Initial conditions for NR SA FR1 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. General test parameters as specified in Table 6.1.1.1.4.1-3 with config 1 apply except those specified in Table 6.1.1.9.4.1-3.

2. Message contents are defined in clause 6.1.1.9.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.1.1.9.4.1-3: General test parameters for intra-frequency NR cell re-selection test case**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| BWchannel | MHz | Config 1 | 3: $N_{RB,c}$ = 12 | |
| SSB Configuration | | Config 1 | SSB.13 | |

#### 6.1.1.9.4.2 Test procedure

Same as 6.1.1.1.4.2.

#### 6.1.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.1.9.4.3-1: Common Exception messages**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.1.9.4.3-2: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | -130 is actual value in dBm (-65 * 2 dBm) | 6.1.1.9-1 |
| } | | | |
| } | | | |

**Table 6.1.1.9.4.3-3: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | Actual value is -65*2 = -130dBm | 6.1.1.9-1 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.1.9-1 AND Cell 1 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 6.1.1.9-1 AND Cell 2 |
| deriveSSB-IndexFromCell | false | | 6.1.1.9-1 |
| } | | | |
| } | | | |

### 6.1.1.9.5 Test requirements

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case. Cell specific test parameters as specified in Table 6.1.1.1.5-1 with test configuration 6.1.1.9-1 apply except those specified in Table 6.1.1.9.5-1.

**Table 6.1.1.9.5-1: Cell specific test parameters for intra-frequency NR cell re-selection test case**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| PDSCH RMC | | 6.1.1.9-1 | SR.1.2 FDD | | | SR.1.2 FDD | | |
| RMSI CORESET | | 6.1.1.9-1 | CR.1.2 FDD | | | CR.1.2 FDD | | |
| Dedicated CORESET | | 6.1.1.9-1 | CCR.1.6 FDD | | | CCR.1.6 FDD | | |
| Io | dBm/2.7 MHz | 6.1.1.9-1 | -60.31 | -58.28 | -58.28 | Specified in Cell 1 columns | | |
| $\hat{E}_s/N_{oc}$ | dB | 6.1.1.9-1 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34 s for UE operating on a cell with less than 5MHz BW.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s for UE operating on a cell with less than 5MHz BW.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $T_{detect, NR_Intra} + T_{SI-NR}$, and to an already detected cell can be expressed as: $T_{evaluate, NR_intra} + T_{SI-NR}$,

Where:

$T_{detect, NR_Intra}$ + 40ms See Table 4.2.2.3-1 in TS 38.133 [6] clause 4.2.2.3

$T_{evaluate, NR_intra}$ See Table 4.2.2.3-1 in TS 38.133 [6] clause 4.2.2.3

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that need to be received by the UE to camp on a cell; 1320ms is assumed in this test case.

This gives a total of 33.36 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.76 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

## 6.1.2 NR – E-UTRA cell re-selection

### 6.1.2.0 Minimum conformance requirements

#### 6.1.2.0.1 Minimum conformance requirements for NR – E-UTRA cell re-selection

The cell re-selection delay to a higher priority cell shall be less than $T_{higher_priority_search} + T_{evaluate, EUTRAN} + T_{SI-E-UTRA}$ in RRC_IDLE state.

The cell re-selection delay to a lower priority E-UTRA cell shall be less than $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$ in RRC_IDLE state.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2 of TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this section apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this section. The parameter $N_{EUTRA_carrier}$ is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,EUTRAN}/2$.

The parameter $N_{EUTRA_carrier}$ is the total number of configured E-UTRA carriers indicated to meet non high speed requirements in the neighbour frequency list. The parameter $N_{EUTRA_carrier_HST}$ is the total number of configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list. If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, an inter-RAT E-UTRAN layer is indicated to meet high speed requirements if highSpeedMeasFlag-r16 is configured and the carrier to be measured is configured with highSpeedEUTRACarrier-r16 and UE supports the enhanced inter-RAT E-UTRAN measurement requirements. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, UE is required to meet non high speed requirements no matter whether highSpeedMeasFlag-r16 or highSpeedEUTRACarrier-r16 is configured or not.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band, and

- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band.

- SCH conditions specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band.

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS 38.304 [30] within $N_{EUTRA_carrier_HST} * T_{detect,EUTRAN_HST} + N_{EUTRA_carrier} * T_{detect,EUTRAN}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every $(N_{EUTRA_carrier}) * T_{measure,EUTRAN}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,EUTRAN}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within $(N_{EUTRA_carrier}) * T_{evaluate,EUTRAN}$ when Treselection = 0 as specified in table 4.2.2.5-1 of TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If Treselection timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this E-UTRA cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.5.

**Table 6.1.2.0.1-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$**

| DRX cycle length [s] | $T_{detect,EUTRAN}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Table 6.1.2.0.1-2: $T_{detect,EUTRAN_HST}$, $T_{measure,EUTRAN_HST}$, and $T_{evaluate,EUTRAN_HST}$ for UE configured with highSpeedMeasFlag-r16**

| DRX cycle length [s] | $T_{detect,EURAN_HST}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN_HST}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN_HST}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 4.16 (13) | 0.64 (2) | 0.96 (3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: When highSpeedMeasFlag-r16 is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[interRAT-MeasurementEnhancement-r16]*. | | | |

The requirements in Table 6.1.2.0.1-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 6.1.2.0.1-2.

### 6.1.2.0.2 Minimum conformance requirement for inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

#### 6.1.2.0.2.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells when the UE is configured with any of following relaxed measurement critera:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

#### 6.1.2.0.2.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *lowMobilityEvalutation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

When Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- $T_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.
- $T_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.
- $T_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.

When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every $K2*T_{higher_priority_search}$ seconds where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6] and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

**Table 6.1.2.0.2.2-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$**

| DRX cycle length [s] | $T_{detect,EUTRAN}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 x K1 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | |

#### 6.1.2.0.2.3 Measurements for UE fulfilling with not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- $T_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.
- $T_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.
- $T_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.

When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every $T_{higher_priority}$_search where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

**Table 6.1.2.0.2.3-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$**

| DRX cycle length [s] | $T_{detect,EUTRAN}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 x K1 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion. | | | |

#### 6.1.2.0.2.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and
- has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed,

In this case the UE is not required to meet $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$ and $T_{evaluate,EUTRAN}$ as defined in Table 6.1.2.0.1-1.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.11.

### 6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA

#### 6.1.2.1.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of higher priority.

#### 6.1.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.1.

6.1.2.1.4 Test description

6.1.2.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.1.4.1-1.

**Table 6.1.2.1.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.2.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.1-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.1-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.1-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.1.4.1-2.

**Table 6.1.2.1.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to higher priority E-UTRA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.2.1.4.1-3.

2. Message contents are defined in clause 6.1.2.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.1.2.1.4.1-3: General test parameters for NR to higher priority E-UTRAN cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on Cell 1 in the initial phase and during T2 period the UE reselects to Cell 2. |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to Cell 2 during T2. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell1 | |
| T3 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 1 during T3 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |

| | | | | |
|---|---|---|---|---|
| NR PRACH configuration index | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | 4, 5, 6 | 4 | |
| T1 | s | 1, 2, 3, 4, 5, 6 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2, 3, 4, 5, 6 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR Cell 1 is already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of higher priority than Cell 1.

Before T1 the UE is camped on to Cell 1. During T1, Cell 2 shall be powered off. At the start of T2 the UE is expected to detect Cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2. At the start of T3 Cell 2 becomes weaker than Cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority cell, Cell 2.

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

7a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority cell, Cell 1.

10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until a test verdict has been achieved.

#### 6.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 1 and higher priority for configuration 6.1.2.1-2, 6.1.2.1-3, 6.1.2.1-5 and 6.1.2.1-6<br>Table H.2.3-2 with Condition SMTC 2 and higher priority for configuration 6.1.2.1-1 and 6.1.2.1-4<br><br>Table H.2.3-3 with Condition higher priority |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.2.1.4.3-2: SystemInformationBlockType3**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 5 | | higher priority E-UTRA |
| } | | | |
| } | | | |

**Table 6.1.2.1.4.3-3: SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 4 | | higher priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

#### 6.1.2.1.5 Test requirement

Tables 6.1.2.1.4.1-3, 6.1.2.1.5-1 and 6.1.2.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

**Table 6.1.2.1.5-1: Cell specific test parameters for NR Cell 1**

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| PDSCH parameters | | 1, 4 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET parameters | | 1, 4 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET parameters | | 1, 4 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| SSB parameters | | 1, 4 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.2 FR1 | | |
| NR SMTC parameters | | 1, 4 | SMTC 2 | | |
| | | 2, 5 | SMTC 1 | | |
| | | 3, 6 | SMTC 1 | | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.2.1-1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| | | 3, 6 | -137 | | |
| $N_{\mathrm{oc}}$ | dBm/SCS | 1, 4 | -98 | | |
| | | 2, 5 | -98 | | |
| | | 3, 6 | -95 | | |
| $N_{\mathrm{oc}}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| SS-RSRP | dBm/SCS | 1, 4 | -84 | -82.4 | -82.4 |
| | | 2, 5 | -84 | -82.4 | -82.4 |
| | | 3, 6 | -81 | -79.39 | -79.39 |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | 1, 4 | 14 | 15.6 | 15.6 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $\hat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | 1, 4 | 14 | 15.6 | 15.6 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| Io | dBm/9.36 MHz | 1, 4 | -55.88 | -54.33 | -54.33 |
| | dBm/9.36 MHz | 2, 5 | -55.88 | -54.33 | -54.33 |
| | dBm/38.16 MHz | 3, 6 | -49.79 | -48.23 | -48.23 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| $\mathrm{Thresh}_{\mathrm{x,\ highP\ (Note\ 2)}}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| $\mathrm{Thresh}_{\mathrm{serving,\ lowP}}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| $\mathrm{Thresh}_{\mathrm{x,\ lowP}}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of threshX-High which is included in NR system information, and is a threshold for the E-UTRA target cell.

**Table 6.1.2.1.5-2: Cell specific test parameters for E-UTRA Cell 2**

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $\mathrm{BW}_{\mathrm{channel}}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ | dBm/15 kHz | -98 | -98 | -100 |
| RSRP | dBm/15 kHz | -infinity | -84.4 | -103.6 |
| $\hat{E}_s/I_{ot}$ | dB | -infinity | 13.6 | -3.6 |
| $\hat{E}_s/N_{oc}$ | dB | -infinity | 13.6 | -3.6 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | Not sent | | |
| $Thresh_{x, highP}$ | dB | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP (Note 2)}$ | dB | 50 | | |
| Propagation Condition | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: This refers to the value of threshX-Low-r15 which is included in E-UTRA system information, and is a threshold for the NR target cell. | | | | |

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate, E-UTRAN}$ + $T_{SI-E-UTRA}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

## 6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA

### 6.1.2.2.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of lower priority.

### 6.1.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.2.

6.1.2.2.4 Test description

6.1.2.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.2.4.1-1.

**Table 6.1.2.2.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.2.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.2-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.2-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.2-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.2.4.1-2.

**Table 6.1.2.2.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.2.2.4.1-3.

2. Message contents are defined in clause 6.1.2.2.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.1.2.2.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on Cell 1 in the initial phase. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |

| | | | | |
|---|---|---|---|---|
| NR PRACH configuration index | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | 4, 5, 6 | 4 | |
| T1 | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.2.2.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR Cell 1 and E-UTRAN Cell 2 are already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of lower priority than Cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

1a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

2. Set the parameters according to T1 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 9.

5a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

8. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 8a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch on and off the UE and skip to step 9.

8a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

9. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

9a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | |

**Table 6.1.2.2.4.3-1A: SIB2**

| Derivation Path: Table H.2.3-2 with condition lower priority | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | UE applies the default value of infinity | |
| } | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 6.1.2.2-2, 6.1.2.2-3, 6.1.2.2-5, 6.1.2.2-6 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 6.1.2.2-1, 6.1.2.2-4, |
| } | | | |
| } | | | |

**Table 6.1.2.2.4.3-2: SystemInformationBlockType3**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

**Table 6.1.2.2.4.3-3: SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 5 | | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

### 6.1.2.2.5 Test requirement

Tables 6.1.2.2.4.1-3, 6.1.2.2.5-1 and 6.1.2.2.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

**Table 6.1.2.2.5-1: Cell specific test parameters for NR Cell 1**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.2 FR1 | |
| SMTC configuration | | 1, 4 | SMTC pattern 2 | |
| | | 2, 5 | SMTC pattern 1 | |
| | | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.2.1-1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| | | 3, 6 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 4 | -100 | -98 |
| | | 2, 5 | -100 | -98 |
| | | 3, 6 | -97 | -95 |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.59 | -81.39 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4 | -70.46 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.46 | -56.26 |
| | dBm/38.16 MHz | 3, 6 | -64.38 | -50.16 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | Not sent | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| $Thresh_{x, low P (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, LowP}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

**Table 6.1.2.2.5-2: Cell specific test parameters for E-UTRA Cell 2**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2<br>T3 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |

| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
|---|---|---|---|
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA Note 1 | dB | | |
| OCNG_RB Note 1 | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| $Thresh_{x, highP}$ (Note 2) | dB | 48 | |
| $Thresh_{serving, lowP}$ | dB | 44 | |
| $Thresh_{x, lowP}$ | dB | 50 | |
| Propagation Condition | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, highP}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

### 6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion

#### 6.1.2.3.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the low mobility criterion specified in clause 4.2.2.11.2 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

#### 6.1.2.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

#### 6.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.3.

#### 6.1.2.3.4 Test description

##### 6.1.2.3.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.3.4.1-1.

**Table 6.1.2.3.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.2.3-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.3-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.3-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.3-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.3.4.1-2.

**Table 6.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.2.3.4.1-3.
2. Message contents are defined in clause 6.1.2.3.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.1.2.3.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on Cell 1 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to Cell 2. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| | Active cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |

| | | | | | |
|---|---|---|---|---|---|
| T1 end condition | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 2 during T1. |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 1 with higher priority during T2 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 24 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 24 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 6.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR Cell 1 and E-UTRAN Cell 2 are already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of lower priority than Cell 1.

The UE is configured with the relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 6.1.2.3.5-1;
- *cellEdgeEvaluation* [13] criterion is not configured;
- *combineRelaxedMeasCondition* [13] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.
9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.1.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.2.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.3-2, 6.1.2.3-3, 6.1.2.3-5 and 6.1.2.3-6<br>Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.3-1 and 6.1.2.3-4<br><br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

**Table 6.1.2.3.4.3-2: SIB2**

| Derivation Path: TS 38.508-1 [14] Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB3 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.2.3.4.3-3: SystemInformationBlockType3**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

**Table 6.1.2.3.4.3-4: SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 5 | | lower priority E-UTRA |

| | | | |
|---|---|---|---|
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

### 6.1.2.3.5 Test requirement

Tables 6.1.2.3.4.1-3, 6.1.2.3.5-1 and 6.1.2.3.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

**Table 6.1.2.3.5-1: Cell specific test parameters for NR Cell 1**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.2 FR1 | |
| SMTC configuration | | 1, 4 | SMTC pattern 2 | |
| | | 2, 5 | SMTC pattern 1 | |
| | | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| | | 3, 6 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 4 | -100 | -98 |
| | | 2, 5 | -100 | -98 |
| | | 3, 6 | -97 | -95 |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.6 | -81.4 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4 | -70.48 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.48 | -56.26 |
| | dBm/38.16 MHz | 3, 6 | -64.37 | -50.16 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| $Thresh_{x, low P (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| $S_{SearchDeltaP}$ | dB | 1, 2, 3, 4, 5, 6 | 3 | |
| $T_{SearchDeltaP}$ | s | 1, 2, 3, 4, 5, 6 | 5 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | This refers to the value of $Thresh_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell |

**Table 6.1.2.3.5-2: Cell specific test parameters for E-UTRA Cell 2**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2<br>T3 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA Note 1 | dB | | |
| OCNG_RB Note 1 | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| $Thresh_{x, highP}$ (Note 2) | dB | 48 | |
| $Thresh_{serving, lowP}$ | dB | 44 | |
| $Thresh_{x, lowP}$ | dB | 50 | |
| Propagation Condition | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.11.2-1 in clause 4.2.2.11.2 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling low mobility criterion.

## 6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion

### 6.1.2.4.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the not-at-cell edge criterion specified in clause 4.2.2.11.3 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

### 6.1.2.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

### 6.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.4.

### 6.1.2.4.4 Test description

#### 6.1.2.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.4.4.1-1.

**Table 6.1.2.4.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.2.4-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, TDD duplex mode |
| 6.1.2.4-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.4-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| 6.1.2.4-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | LTE 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.4.4.1-2.

**Table 6.1.2.4.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.2.4.4.1-3.

2. Message contents are defined in clause 6.1.2.4.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.1.2.4.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on Cell 1 in the initial phase and fulfil the not at the cell edge criteria. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 24 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 24 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 6.1.2.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR Cell 1 and E-UTRAN Cell 2 are already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of lower priority than Cell 1.

The UE is configured with the relaxed measurement criterion for UE with not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvalutation* [13] criterion is not configured;
- *cellEdgeEvaluation* [13] criterion is configured according to the parameters listed in Table 6.1.2.4.5-1;
- *combineRelaxedMeasCondition* [13] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on Cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.1.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.1.2.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.4-2, 6.1.2.4-3, 6.1.2.4-5 and 6.1.2.4-6<br>Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.4-1 and 6.1.2.4-4<br><br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

**Table 6.1.2.4.4.3-2: SIB2**

| Derivation Path: TS 38.508-1 [14] Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | | | |
| s-SearchTHresholdP-r16 | 16 | Actual value is 16*2 = 32dB | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 6.1.2.4.4.3-3: SystemInformationBlockType3**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |

| | | | |
|---|---|---|---|
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

**Table 6.1.2.4.4.3-4: SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 5 | | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

6.1.2.4.5 Test requirement

Tables 6.1.2.4.4.1-3, 6.1.2.4.5-1 and 6.1.2.4.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

**Table 6.1.2.4.5-1: Cell specific test parameters for NR Cell 1**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.2 FR1 | |
| SMTC configuration | | 1, 4 | SMTC pattern 2 | |
| | | 2, 5 | SMTC pattern 1 | |
| | | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6 | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| | | 3, 6 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 4 | -100 | -98 |
| | | 2, 5 | -100 | -98 |
| | | 3, 6 | -97 | -95 |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.6 | -81.4 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $S_{SearchThresholdP}$ | dB | 1, 2, 3, 4, 5, 6 | 32 | 32 |
| Io | dBm/9.36 MHz | 1, 4 | -70.48 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.48 | -56.26 |
| | dBm/38.16 MHz | 3, 6 | -64.38 | -50.17 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 60 | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| $Thresh_{x, low P (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | |

**Table 6.1.2.4.5-2: Cell specific test parameters for E-UTRA Cell 2**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2<br>T3 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA[Note 1] | dB | | |
| OCNG_RB[Note 1] | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| $Thresh_{x, highP (Note 2)}$ | dB | 48 | |
| $Thresh_{serving, lowP}$ | dB | 44 | |
| $Thresh_{x, lowP}$ | dB | 50 | |
| Propagation Condition | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send

preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.11.3-1 in clause 4.2.2.11.3 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling not-at-cell edge criterion.

## 6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

### 6.1.2.5.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

### 6.1.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting measurement enhancements in high speed scenario.

### 6.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.5.

### 6.1.2.5.4 Test description

#### 6.1.2.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.5.4.1-1.

**Table 6.1.2.5.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.1.2.5-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 6.1.2.5-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6.1.2.5-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 6.1.2.5-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.5.4.1-2.

**Table 6.1.2.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.1.2.5.4.1-3.

2. Message contents are defined in clause 6.1.2.5.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.1.2.5.4.1-3: General test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE camps on Cell 1 in the initial phase. |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6 | Cell1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell1 | The UE shall perform reselection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6 | Cell2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | ms | 1, 2, 3, 4, 5, 6 | 320 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | | 1, 2, 3 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 6.1.2.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA low priority neighbour cell (Cell 2) on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The E-UTRAN Cell 2 is indicated by NR Cell 1 as an HST cell.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* or *RRCConnectionRequest* message to perform a registration procedure for mobility on NR Cell or E-UTRA Cell respectively.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity. *highSpeedMeasFlag-r16* is provided by *SIB1* of Cell 1.
2. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.
3. Set the parameters according to T1 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T1 starts.
4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
5. If the UE responds on Cell 2 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a failure for the event “Re-select Cell 2”.
6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
7. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 13
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.
13. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.
14. Repeat step 3-13 until a test verdict for the event “Re-select Cell 2” has been achieved, resulting in an event verdict: pass or fail. The event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. The test passes if the event pass, otherwise the test fails.

### 6.1.2.5.4.3 Message contents

Same as message contents in 6.1.2.2.4.3 except that

- Table H.2.3-1 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-1.
- Table H.2.3-3 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-3.
- In addition to the message contents mentioned above, exceptions given in Table 6.1.2.5.4.3-4 and Table 6.1.2.5.4.3-5 also apply.

**Table 6.1.2.5.4.3-1: SIB1 (Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon | ServingCellConfigCommonSIB | Table 6.1.2.5.4.3-2 | |
| } | | | |

**Table 6.1.2.5.4.3-2: ServingCellConfigCommonSIB (Table 6.1.2.5.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 with condition HST | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| highSpeedConfig-r16 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| highSpeedMeasFlag-r16 | true | | |
| } | | | |
| } | | | |

**Table 6.1.2.5.4.3-3: SIB5 (Cell 1)**

| Derivation Path: Table H.2.3-3 with Condition lower priority | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB5 ::= SEQUENCE { | | | |
| carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 { | 1 entry | carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA contain same number of entries. And the entries are listed in the same order | |
| CarrierFreqEUTRA-v1610[1] SEQUENCE { | | entry 1 | |
| highSpeedEUTRACarrier-r16 | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.1.2.5.4.3-4: SystemInformationBlockType2 (Cell2)**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| radioResourceConfigCommon SEQUENCE { | | | |
| highSpeedInterRAT-NR-r16 | true | | |
| } | | | |
| } | | | |

**Table 6.1.2.5.4.3-5: SystemInformationBlockType24 (Cell2)**

| Derivation Path: TS 36.508 [25], Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-v1610 SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610 { | 1 entry | | |
| CarrierFreqNR-v1610[1] SEQUENCE { | | entry 1 | |
| highSpeedCarrierNR-r16 | true | | |
| } | | | |
| } | | | |
| } | | | |

6.1.2.5.5 Test requirement

Tables 6.1.2.5.4.1-3, 6.1.2.5.5-1 and 6.1.2.5.5-2 define the primary level settings including test tolerances for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 test case.

**Table 6.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | |

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.2 FR1 | |
| SMTC configuration | | 1, 4 | SMTC pattern 2 | |
| | | 2, 5 | SMTC pattern 1 | |
| | | 3, 6 | SMTC pattern 1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6 | OP.1 defined in A. 2.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| | | 3, 6 | -137 | |
| $N_{\mathrm{oc}}$ | dBm/SCS | 1, 4 | -100 | -98 |
| | | 2, 5 | -100 | -98 |
| | | 3, 6 | -97 | -95 |
| $N_{\mathrm{oc}}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 4 | -103.60 | -84.40 |
| | | 2, 5 | -103.60 | -84.40 |
| | | 3, 6 | -100.60 | -81.40 |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | 1, 4 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4 | -70.46 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.46 | -56.26 |
| | dBm/38.16 MHz | 3, 6 | -64.38 | -50.16 |
| Treselection | S | 1, 2, 3, 4, 5, 6 | 0 | |
| Snonintrasearch | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| $\mathrm{Thresh}_{\mathrm{x,\ high\ (Note\ 2)}}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| $\mathrm{Thresh}_{\mathrm{serving,\ low}}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| $\mathrm{Thresh}_{\mathrm{x,\ low}}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: This refers to the value of $\mathrm{Thresh}_{\mathbf{x,\ high}}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.
Note 3: Void.

**Table 6.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $\mathrm{BW}_{\mathrm{channel}}$ | MHz | 10 | |

| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
|---|---|---|---|
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA[Note 1] | dB | | |
| OCNG_RB[Note 1] | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.40 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 15.60 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 15.60 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| Snonintrasearch | dB | Not sent | |
| $Thresh_{x, high (Note 2)}$ | dB | 48 | |
| $Thresh_{serving, low}$ | dB | 44 | |
| $Thresh_{x, low}$ | dB | 50 | |
| Propagation Condition | | AWGN 1944Hz[Note3] | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell<br>Note 3: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz. | | | |

The cell reselection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16* is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN_HST} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN_HST}$ = 0.96s, as defined in TS 38.133 [6] Table 4.2.2.5-2.

$T_{SI\text{-}E\text{-}UTRA}$ = 1.28s, is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16*.

# 6.2 RRC_INACTIVE state mobility

## 6.2.0 General

The requirements in this clause are applicable when the UE is configured with timing alignment (TA) validation using *cg-SDT-RSRP-ChangeThreshold* for transmitting in uplink using CG-SDT as specified in TS 38.331 [13].

The requirements in this clause are applicable for the UE performing small data tranmissions using configured resources as per TS 38.331 [13].

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available $N_{TA}$ value as specified in 38.133 [6] clause 7.1.2) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clauses 5.5.1 and 5.5.2.

### 6.2.0.1 Minimum conformance requirements for TA validation using CG-SDT

When *cg-SDT-RSRP-ChangeThreshold* is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 in TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available $N_{TA}$ value as specified in TS 38.133 [6] clause 7.1 provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 in TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 6.2.0.1-1 are met for FR1.

**Table 6.2.0.1-1: Valid measurement for FR1**

| Measurement | FR1 |
|---|---|
| $RSRP_1$ | $(T1 - \min(640ms, M1*T_{DRX})) \le T1' \le (T1 + \min(640ms, M1*T_{DRX}))$ |
| $RSRP_2$ | $(T2 - \min(640ms, M1*T_{DRX})) \le T2' \le T2$ |

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when
  - *RRCRelease* with CG-SDT configuration (TS 38.331 [13]) is received
  - the latest TA is received if TA is received while in RRC_INACTIVE state.
- T1' is the time when the UE has completed $RSRP_1$.
- T2 is the time when the UE performs TA validation as defined in clause 5.27.2 in (TS 38.321 [12]) for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- $T_{DRX}$ is the DRX cycle length in ms.

- M1 the scaling factor as defined in TS 38.133 [6] clause 4.2.2.2.

The normative reference for this requirement is TS 38.133 [6] clause 5.5.3.

## 6.2.1 NR SA FR1 TA Validation for CG-SDT

### 6.2.1.1 Test Purpose

The purpose of this test is to partly verify that the UE properly perform TA validation for CG-SDT transmission in 38.133 [6] clause 5.5.3.

### 6.2.1.2 Test Applicability

This test applies to all types of NR UE release 17 and forward, supporting NR SA, CG-SDT and long DRX cycle.

### 6.2.1.3 Minimum Conformance Requirement

The minimum requirements are specified in clause 6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.2.1.

### 6.2.1.4 Test Description

The test includes two sub-tests, Sub-test#1 for testing valid TA where UE can initiate CG-SDT transmission, and Sub-test#2 for testing invalid TA where UE does not initiate CG-SDT transmission. Subtest#2 is only tested if Sub-test#1 has passed. For each sub-test, UE is configured with CG-SDT configuration when entering RRC_INACTIVE state. Sub-test#1 consists of four successive time periods, with time duration of T1, T2, T3 and T4, respectively. Sub-test#2 consists of two successive time periods, with time duration of T5 and T6, respectively. There is one cell, which is the active NR cell in FR1. Figure 6.2.1.4-1 shows the variation of the RSRP over the duration of Sub-test#1, and Figure 6.2.1.4-2 shows the variation of the RSRP over the duration of Sub-test#2.

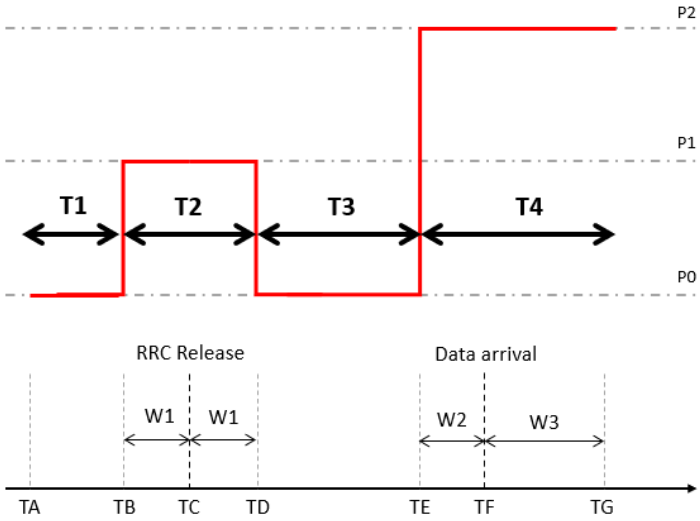



**Figure 6.2.1.4-1: RSRP variation model for Sub-test#1 for NR SA FR1 TA Validation for CG-SDT**

In Sub-test#1:

Prior to the time point TA, the UE shall be fully synchronized to PCell (Cell 1), be registered to the cell and have entered RRC_CONNECTED state.

Before starting the test at time point TA, test equipment configures RSRP to P0.

At time point TB, RSRP is changed from P0 to P1.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P1 to P0.

At time point TE, RSRP is changed from P0 to P2.

Test equipment triggers UL data arrival at UE lower layer at time point TF. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG, which is W3 after TF.

After time point TG, RRC status is changed from RRC INACTIVE to RRC CONNECTED.

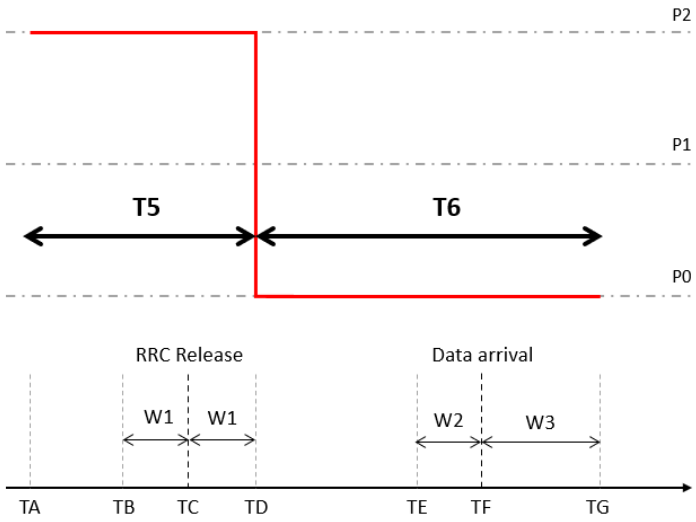



**Figure 6.2.1.4-2: RSRP variation model for Sub-test#2 for NR SA FR1 TA Validation for CG-SDT**

In Sub-test#2:

Prior to the time point TA, the UE shall pass Sub-test#1 and have entered RRC connected mode. Otherwise, Sub-test#2 shall not be executed.

From time point TA to time point TD, RSRP is set to P2.

At time point TC, which is W1 after time point TB, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P2 to P0.

Test equipment triggers UL data arrival at UE lower layer at time point TF. TF is 3360ms after TD. After time point TF, test equipment observes whether UE transmits with CG-SDT no later than TG which is W3 after TF.

W1 equals to 640ms and W2 equals to 640ms, based on requirements in clause 6.2.0. W3 is 860ms.

### 6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.2.1.4.1-1.

**Table 6.2.1.4.1-1: NR configuration for NR SA FR1 TA Validation for CG-SDT**

| Config | Description |
|---|---|
| 6.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.2.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.2.1.4.1-2.

**Table 6.2.1.4.1-2: Initial conditions for NR SA FR1 TA Validation for CG-SDT**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.2.1.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 without fading | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.2.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.2.1.4.1-3. Supplementary timeline events are given in Table 6.2.1.4.1-4.

**Table 6.2.1.4.1-3: General test parameters for NR SA FR1 TA Validation for CG-SDT**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| TDD Configuration | | 1 | N/A | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1,2 | 10: $N_{RB,c}$ = 52 | |
| | | 3 | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | | 1 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| OCNG Patterns | | 1,2,3 | OP.1 | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1,2,3 | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | | 1,2,3 | SMTC.1 | |
| DRX configuration | Ms | 1,2,3 | 640 | |
| T1 | s | 1,2,3 | 0.4 | |
| T2 | s | 1,2,3 | 1.28 | |
| T3 | s | 1,2,3 | 2.72 | |
| T4 | s | 1,2,3 | 1.5 | |
| T5 | s | 1,2,3 | 1.68 | |
| T6 | s | 1,2,3 | 4.22 | |
| cg-SDT-RSRP-ChangeThreshold | dB | 1,2,3 | 8 | |
| cg-SDT-RSRP-ThresholdSSB | dBm | 1,2,3 | -110 | |
| cg-SDT-TimeAlignmentTime | | 1,2,3 | infinity | |
| CG-SDT resource period | ms | | 320 | configuredGrantConfig Peridocity at 38.331 [13] Config 1,2 : sym320x14, config 3 : sym640x14 |
| Propagation condition | | 1,2,3 | AWGN | |

**Table 6.2.1.4.1-4: Supplementary timeline event derivations for NR SA FR1 TA Validation for CG-SDT**

| Time Period | Unit | Test configuration | Value | Derivation |
|---|---|---|---|---|
| T_delay_modeB | ms | 1,2,3 | 4000 | Test configuration for step 4 and step 9 |
| W1 | ms | 1,2,3 | 640 | Test configuration |
| W2 | ms | 1,2,3 | 640 | Test configuration |
| W3 | ms | 1,2,3 | 860 | Test configuration |
| TAtoTB | ms | 1,2,3 | 400 | Sub-test#1: TAtoTB = T1 |

| | | | | |
|---|---|---|---|---|
| | | | | Sub-test#2: TAtoTB = T5 – 2*W1 |
| TBtoTC | ms | 1,2,3 | 640 | TBtoTC = W1 |
| TCtoTD | ms | 1,2,3 | 640 | TCtoTD = W1 |
| TDtoTE | ms | 1,2,3 | 2720 | Sub-test#1: TDtoTE = T3<br>Sub-test#2: TDtoTE = T6 – W2 – W3 |
| TEtoTF | ms | 1,2,3 | 640 | TEtoTF = W2 |
| TFtoTG | ms | 1,2,3 | 860 | TFtoTG = W3 |
| Note 1: These timeline derivations are useful to understand different timeline events other than T1, T2, T3, T4, T5 and T6. Calculations are informative. | | | | |

#### 6.2.1.4.2 Test Procedure

The test parameters for the PCell are given in Table 6.2.1.4.1-1, Table 6.2.1.4.1-3, and Table 6.2.1.5-1, for Sub-test#1 and Sub-test#2, respectively. Prior to the start of each of the Sub-tests, the UE shall be fully synchronized to PCell (Cell 1). According to Table 6.2.1.5-1, in time intervals T1 to T6 the SS configures the SS-RSRP by fixing $N_{oc}$ and adjusting SNR correspondingly.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On, Test Loop Function On and Activate UE Test Loop Mode B according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell according to T1 in Table 6.2.1.5-1. Propagation conditions are set according to clause C.2.3. Sub-test#1 starts. T1 starts.

3. When T1 expires the SS shall change the SS-RSRP value to T2 as specified in Table 6.2.1.5-1. T2 starts.

4. W1=640ms seconds after the start of T2 (time event TC), the SS shall send CLOSE UE TEST LOOP message for UE Test Loop Mode B and configuring T_delay_modeB as per Table 6.2.1.4.3-5, and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message containing CG-SDT configuration for the UE to change its RRC state to RRC_INACTIVE, according to section 6.2.1.4.3.

5. When T2 expires the SS shall change the SS-RSRP value to T3 as specified in Table 6.2.1.5-1. T3 starts.

6. When T3 expires the SS shall change the SS-RSRP value to T4 as specified in Table 6.2.1.5-1. T4 starts.

7. T_delay_modeB expires after the start of T4, at time event TF. If the UE transmits PUSCH at the next CG-SDT resource no later than TG, which is W3 seconds after TF, then the number of successful tests for CG-SDT Sub-test#1 is increased by one. Otherwise, the number of failed tests for CG-SDT Sub-test#1 is increased by one and proceed with step 12.

8. The SS shall transmit *RRCRelease*. Set the parameters of NR Cell according to T5 in Table 6.2.1.5-1. Propagation conditions are set according to clause C.2.3. Afterwards, the SS shall ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On, Test Loop Function On and Activate UE Test Loop Mode B according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Sub-test#2 starts. T5 starts.

9. W1=640ms seconds before the end of T5 (time event TC), the SS shall send CLOSE UE TEST LOOP message for UE Test Loop Mode B and configuring T_delay_modeB as per Table 6.2.1.4.3-5, and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message containing CG-SDT configuration for the UE to change its RRC state to RRC_INACTIVE, according to section 6.2.1.4.3.

10. When T5 expires the SS shall change the SS-RSRP value to T6 as specified in Table 6.2.1.5-1. T6 starts.

11. T_delay_modeB expires after the start of T6, at time event TF. If the UE transmits PUSCH at the next CG-SDT resource no later than TG, which is W3 seconds after TF, then the number of failed tests for CG-SDT Sub-test#2 is increased by one. Otherwise, the number of successful tests for CG-SDT Sub-test#2 is increased by one. Proceed with step 12.

12. The SS shall switch off and then on the UE and then proceed with step 13.

13. Repeat steps 1-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved for both Sub-tests. If Sub-test#1 fails, there is no need to achieve any confidence level for Sub-test#2.

6.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 6.2.1.4.3-1: Common Exception messages for NR SA FR1 TA Validation for CG-SDT**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | 38.508-1 [14] Table 4.6.1-16 with conditions NR_RRC_INACTIVE and SDT |

**Table 6.2.1.4.3-2: *SDT-MAC-PHY-CG-Config-r17* for NR SA FR1 TA Validation for CG-SDT**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SDT-MAC-PHY-CG-Config-r17::= SEQUENCE { | | | |
| cg-SDT-ConfigLCH-RestrictionToAddModList-r17 SEQUENCE (SIZE(1..maxLC-ID)) OF CG-SDT-Config-LCH-restriction-r17 { | 1 entry | | |
| logicalChannelIdentity-r17 | LogicalChannelIdentity with condition DRB1 | | |
| configuredGrantType1Allowed-r17 | true | | |
| allowedCG-List-r17 | Not present | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE { | | | |
| setup | BWP-UplinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-SUL-r17 | Not present | | |
| cg-SDT-ConfigInitialBWP-DL-r17 | | | |
| setup | BWP-DownlinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-TimeAlignmentTimer-r17 | infinity | | |
| cg-SDT-RSRP-ThresholdSSB-r17 | 46 | -110dBm | |
| cg-SDT-TA-ValiditationConfig-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cg-SDT-RSRP-ChangeThreshold-r17 | dB8 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.2.1.4.3-3: *BWP-UplinkDedicatedSDT-r17* for NR SA FR1 TA Validation for CG-SDT**

| Derivation Path: TS 38.331 [13], clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicatedSDT-r17::= SEQUENCE { | | | |
| pusch-Config-r17 CHOICE { | | | |
| setup | PUSCH-Config | | |
| } | | | |
| configuredGrantConfigToAddModList-r17 SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig | 1 entry | | |
| } | | | |

**Table 6.2.1.4.3-4: *ConfiguredGrantConfig* for NR SA FR1 TA Validation for CG-SDT**

| Derivation Path: TS 38.331 [13], clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConfiguredGrantConfig ::= SEQUENCE { | | | |
| periodicity | sym320x14 | | Config 1,2 |
| | sym640x14 | | Config 3 |
| } | | | |

**Table 6.2.1.4.3-5: CLOSE UE TEST LOOP for NR SA FR1 TA Validation for CG-SDT**

| Derivation Path: TS 38.509 [16], clause 6.3.1 and 38.508-1 [14] Table 4.7A.2 | | |
|---|---|---|
| **Information Element** | **Value/remark** | **Comment** |
| Protocol discriminator | 1 1 1 1 | |
| Skip indicator | 0 0 0 0 | |
| Message type | 1 0 0 0 0 0 0 0 | |
| UE test loop mode | 0 0 0 0 0 0 0 1 | UE test loop mode B |
| UE test loop mode B LB setup | | |
| IP PDU delay | 0 0 0 0 0 1 0 0 | T_delay_modeB duration in seconds (4 seconds) |

### 6.2.1.5 Test Requirement

Table 6.2.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 TA Validation for CG-SDT.

**Table 6.2.1.5-1: Cell-specific test parameters for NR SA FR1 TA Validation for CG-SDT**

| Parameter | Config | Unit | SSB#0 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| $N_{oc}$ | 1,2 | dBm/15kHz | -100 | -100 | -100 | -100 | -100 | -100 |
| | 3 | dBm/15kHz | -100 | -100 | -100 | -100 | -100 | -100 |
| $N_{oc}$ | 1,2 | dBm/SSB SCS | -100 | -100 | -100 | -100 | -100 | -100 |
| | 3 | dBm/SSB SCS | -97 | -97 | -97 | -97 | -97 | -97 |
| $\hat{E}_s/I_{ot}$ | 1,2 | dB | 0 | 12 | 0 | 14 | 14 | 0.25 |
| | 3 | dB | 0 | 12 | 0 | 14 | 14 | 0 |
| SS RSRP | 1,2 | dBm/SSB SCS | -100 | -88 | -100 | -86 | -86 | -99.75 |
| | 3 | dBm/SSB SCS | -97 | -85 | -97 | -83 | -83 | -97 |
| Io | 1,2 | dBm/9.36MHz | -69.04 | -59.78 | -69.04 | -57.88 | -57.88 | -68.91 |
| | 3 | dBm/38.16MHz | -62.93 | -53.68 | -62.93 | -51.78 | -51.78 | -62.93 |
| $\hat{E}_s/N_{oc}$ | 1,2 | dB | 0 | 12 | 0 | 14 | 14 | 0.25 |
| | 3 | dB | 0 | 12 | 0 | 14 | 14 | 0 |

The UE behaviour in each test during time durations shall be as follows:

During Sub-test#1, UE shall transmit PUSCH at CG-SDT resource within 860ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit PUSCH at CG-SDT resources after TF until the end of the test at time point TG.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.3 RRC_CONNECTED state mobility

## 6.3.1 Handover

### 6.3.1.0 Minimum conformance requirements

#### 6.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

When the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within $D_{handover}$ seconds from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay, which is 50ms

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission of the PRACH in E-UTRAN, excluding $T_{RRC_procedure_delay}$.

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + 20 \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then $T_{search}$ = 80 ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to 30 ms.

NOTE: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is know if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 36.133 [23] clause 9.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.2.1.

#### 6.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.2.2.

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + 20 + T_{\Delta} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥[-2] dB, then $T_{search}$ = 3 *$T_{rs}$ ms if the target cell SSB BW is 12PRBs, otherwise $T_{search}$ = $T_{rs}$ ms.If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = [5] *$T_{rs}$ ms if the target cell SSB BW is 12PRBs, otherwise $T_{search}$ = 3* $T_{rs}$ ms.

Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = $T_{rs}$.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs=5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause [9.2.5] for intra-frequency handover and Clause [9.3.1] for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

#### 6.3.1.0.3 Minimum conformance requirements for NR – UTRAN handover

When the UE receives a RRC message implying handover to UTRAN the UE shall be ready to start the transmission of the new UTRA uplink DPCCH within Dhandover msfrom the end of the last NR TTI containing the RRC *MobilityfromNRCommand* command.

where:

- Dhandover equals the RRC procedure delay, which is 50 ms plus the interruption time stated in TS 38.133 [6] clause 6.1.2.2.3.

The interruption time is the time between the end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission on the uplink DPCCH in UTRAN, excluding the RRC procedure delay. The interruption time depends on whether the target cell is known to the UE or not.

The target cell is known if it has been measured by the UE during the last 5 seconds otherwise it is unknown. The UE shall always perform a UTRA synchronisation procedure as part of the handover procedure.

If the target cell is known the interruption time shall be less than Tinterrupt1

$$T_{interrupt1} = T_{IU}+T_{sync}+50+ 10*F_{max} + T_{MC} \text{ ms}$$

If the target cell is unknown the interruption time shall be less than $T_{interrupt2}$

$$T_{interrupt2} = T_{IU}+T_{sync}+150 + 10*F_{max} + T_{MC} \text{ ms}$$

This requirement shall be met, provided that there is one target cell in the *MobilityfromNRCommand* command. Performance requirements for E-UTRA to UTRA soft handover are not specified. When UE is connected to an NR cell, UTRA SFN timing measurements are not reported. This implies that the timing of the DPCH of the UTRA target cells in the active set cannot be configured by UTRAN to guarantee that all target cells fall within the UE reception window of T0 +/- 148 chips.

Where:

- $T_{IU}$ is the interruption uncertainty when changing the timing from the NR to the new UTRAN cell. $T_{IU}$ can be up to one UTRA frame (10 ms).
- $F_{max}$ denotes the maximum number of radio frames within the transmission time intervals of all transport channels that are multiplexed into the same CCTrCH on the UTRA target cell. If HS-PDSCH is configured in the UTRA target cell, Fmax is 4 radio frames.
- $T_{sync}$ is the time required for measuring the downlink DPCCH channel as stated in TS 25.214, clause 4.3.1.2. In case higher layers indicate the usage of a post-verification period $T_{sync}$=0 ms. Otherwise $T_{sync}$=40 ms.
- $T_{MC}$ is 0ms if a single UTRA cell is configured as the handover target, otherwise 20ms if handover to UTRA with 1, 2 or 3 UTRA carriers with secondary HS-PDSCH is configured.

The phase reference is the primary CPICH.

The requirements in this clause assume that N312 has the smallest possible value i.e. only one insync is required.

#### 6.3.1.0.4 Minimum conformance requirements for NR FR1- NR FR1 DAPS handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell. A DAPS handover is intra-frequency if the centre frequency of the SSB of the source cell and the centre frequency of the SSB of the target cell are the same, and the subcarrier spacing of the two SSBs are also the same.

Note 1: For intra-frequency DAPS handover, no requirement applies if active DL and UL BWP of target cell is not confined within the active DL and UL BWP of the source cell respectively.

Note 2: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapped with the BWP of source cell in frequency domain.

An FR1 DAPS handover is synchronous if it meets the conditions in table 6.3.1.0.4-1, otherwise it is asynchronous

**Table 6.3.1.0.4-1: Sync conditions for FR1 DAPS handover**

| Type of handover | Maximum receive timing difference between source and target cell (μs) for sync DAPS handover | Maximum transmit timing difference between source and target cell (μs) for sync DAPS handover |
|---|---|---|
| Intra-frequency Note 1,2,3 | 6μs | 7.6 μs |
| Intra-band inter-frequency Note 1,2,3 | 6μs | 7.6 μs |
| Inter-band inter-frequency | 33 μs | 34.6 μs |
| Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified.<br>Note 2: For DAPS handover on a TDD band, a UE is not expected to transmit in the uplink earlier than $N_{RX-TX}$ after the end of the last received downlink symbol in the same cell where $N_{RX-TX}$=25600Tc.<br>Note 3: For DAPS handover on a TDD band, a UE is not expected to receive in the downlink earlier than $N_{TX-RX}$ after the end of the last transmitted uplink symbol in the same cell where $N_{TX-RX}$=25600Tc. | | |

When the UE receives a RRC message implying DAPS handover to NR FR1 the UE shall be ready to start the transmission of the new uplink PRACH channel in NR within $D_{handover1}$ seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{RRC_procedure}$ is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

$T_{search}$, $T_{IU}$, $T_{processing}$, $T_{\Delta}$ and $T_{margin}$ are defined in TS 38.133 [6] clause 6.1.1.2.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within $D_{handover2}$.

$$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$$

Where:

$T_{RRC_procedure}$ is the RRC procedure delay as specified in clause 12 in TS 38.331 [13].

$T_{interrupt2}$ is defined in TS 38.133 [6] clause 6.3.1.0.4.

During $D_{handover1}$, the UE is allowed an interruption of up to $T_{interrupt1}$ on source cell.

For FR1-to-FR1 intra-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-2.

**Table 6.3.1.0.4-2: $T_{interrupt1}$ for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | Interruption length $T_{interrupt1}$ (slots Note 1), synchronous DAPS HO | Interruption length $T_{interrupt1}$ (slots Note 1), asynchronous DAPS HO |
|---|---|---|---|
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 4 | 5 |
| Note 1: The same SCS of source cell and target cell is assumed. | | | |

| | |
|---|---|
| Note 2: | It is assumed that the BWP of target cell is not larger than the BWP of source cell. It is assumed that the CBW of target cell is not larger than the CBW of source cell |
| Note 3: | Void |

For FR1-to-FR1 intra-band inter-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-3.

**Table 6.3.1.0.4-3: $T_{interrupt1}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | $T_{interrupt1}$ (slots[Note 1]), synchronous DAPS HO | $T_{interrupt1}$ (slots[Note 1]), asynchronous DAPS HO |
|---|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 2+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 1 | 0.5 | 2 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 3+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 2 | 0.25 | 4 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 5+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: $T_{SMTC_duration}$ measured in subframes is the longest SMTC duration between source cell and target cell.<br>Note 3: Void<br>Note 4: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7]. | | | |

For FR1-to-FR1 inter-band handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-4.

**Table 6.3.1.0.4-4: $T_{interrupt1}$ for FR1-to-FR1 inter-band DAPS HO**

| $\mu$ | NR Slot length (ms) of source cell | $T_{interrupt1}$ (slots) | |
|---|---|---|---|
| | | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 5 | 5 |

For FR1-to-FR1 intra-frequency handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-5 when the BWP of target cell is smaller than the BWP of source cell, and $T_{interrupt2}$ is specified in Table 6.3.1.0.4-6 when the same BWP is used for target cell and source cell.

**Table 6.3.1.0.4-5: $T_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots[Note 1]) | $T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO |
|---|---|---|---|
| 0 | 1 | 2 | 3 |
| 1 | 0.5 | 4 | 5 |
| 2 | 0.25 | 8 | 9 |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: It is assumed that the BWP of target cell is smaller than the BWP of source cell. | | | |

**Table 6.3.1.0.4-6: $T_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots[Note 1]) | $T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO |
|---|---|---|---|
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 4 | 5 |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: It is assumed that the BWP of target cell is the same as the BWP of source cell.<br>Note 3: Void | | | |

For FR1-to-FR1 intra-band inter-frequency handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-7.

**Table 6.3.1.0.4-7: $T_{interrupt2}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO**

| $\mu$ | NR Slot length (ms) | $T_{interrupt2}$ (slots[Note 1]) for synchronous DAPS HO | $T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO |
|---|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 2+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 1 | 0.5 | 2 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 3+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 2 | 0.25 | 4 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ | 5+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| Note 1: The same SCS of source cell and target cell is assumed.<br>Note 2: $T_{SMTC_duration}$ measured in subframes is the longest SMTC duration between source cell and target cell.<br>Note 3: Void.<br>Note 4: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7]. | | | |

For FR1-to-FR1 inter-band handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-8.

**Table 6.3.1.0.4-8: $T_{interrupt2}$ for FR1-to-FR1 inter-band DAPS HO**

| $\mu$ | NR slot length (ms) of target cell | $T_{interrupt2}$ (slots) | |
|---|---|---|---|
| | | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 5 | 5 |

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

## 6.3.1.1 NR SA FR1 handover with known target cell

### 6.3.1.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra-frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

### 6.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.1.

### 6.3.1.1.4 Test description

#### 6.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.1.4.1-1.

**Table 6.3.1.1.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.1.4.1-2

**Table 6.3.1.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.1.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | -1 | Original Value 0dB, post TT Analysis, its -1 dB |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 6.3.1.1.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells as given in tables 6.3.1.1.4.1-3 and 6.3.1.1.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send measurement report A3. An RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an RRCReconfiguration message, configuring measurement object.
4. UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.15-1.
6. UE shall transmit a MeasurementReport message triggered by Event A3.

7. SS shall transmit the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.1.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

12. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -1dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange |

### 6.3.1.1.5 Test requirements

Table 6.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency handover test case**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR2.1 TDD | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | -98 | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | -98 | | |
| | Config 3 | | -95 | | | -95 | | |
| $\hat{E}_s/I_{ot}$ | Config 1,2 | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| | Config 3 | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| $\hat{E}_s/N_{oc}$ | Config 1,2 | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| | Config 3 | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | Infinity | -88 | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | Infinity | -84.99 | -84.99 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -57.67 | -61.41 | -57.67 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -51.56 | -51.56 | -55.31 | -51.56 | -51.56 |
| Propagation condition | | - | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 62 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 72 ms.

## 6.3.1.2 NR SA FR1 handover with unknown target cell

### 6.3.1.2.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra-frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

#### 6.3.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

#### 6.3.1.2.4 Test description

##### 6.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.2.4.1-1.

**Table 6.3.1.2.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.2.4.1-2

**Table 6.3.1.2.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.2.4.1-4 below.

**Table 6.3.1.2.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

#### 6.3.1.2.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells on the carrier as given in tables 6.3.1.2.4.1-3 and 6.3.1.2.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.2.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 92 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

### 6.3.1.2.5 Test requirements

Table 6.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.2.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf. 2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 FR1 | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -0.64 | -Infinity | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.95 | -61.41 | -57.95 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -51.84 | -55.31 | -51.84 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 82 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 92 ms.

### 6.3.1.3 NR SA FR1-FR1 handover with unknown target cell

#### 6.3.1.3.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 inter-frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

#### 6.3.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.3.

#### 6.3.1.3.4 Test description

##### 6.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.3.4-1.

**Table 6.3.1.3.4.1-1: Inter-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.3.4.1-2

**Table 6.3.1.3.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.3.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 6.3.1.3.4.1-3 and 6.3.1.3.5-1 below.

**Table 6.3.1.3.4.1-3: General test parameters Inter-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

### 6.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.3.4.1-3 and 6.3.1.3.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.3.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

### 6.3.1.3.5 Test requirements

Table 6.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.3.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | Config 1,2 | | SMTC.1 FR1 | | | |
| | Config 3 | | SMTC.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -63.85 |
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 132 ms.

## 6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell

### 6.3.1.4.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

### 6.3.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.4.

### 6.3.1.4.4 Test description

#### 6.3.1.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.4.4.1-1.

**Table 6.3.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.3.1.4-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.1.4-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.4-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.4-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.1.4-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.1.4-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.4.4.1-2.

**Table 6.3.1.4.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 6.3.1.4.4.1-3.

2. Message contents are defined in clause 6.3.1.4.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.3.1.4.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| b2-Threshold1 | | dBm | As specified in Table 6.3.1.4.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2EUTRAN | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in TS 38.133 [6], table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 6.3.1.4.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the next instant after the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.4.5-1 and 6.3.1.4.5-2. T1 starts.

3. The SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.
6. UE shall transmit a MeasurementReport message triggered by Event B2.
7. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.
8. The start of T3 is the next instant after the last TTI containing the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. The UE shall transmit *RRCConnectionReconfigurationComplete* message on Cell 2.
11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-RAT and GAP NEEDED<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RAT<br>Table H.3.3-1 |
| Specific message contents exceptions for Test Configuration 6.3.1.4-1, 6.3.1.4-2, 6.3.1.4-4 and 6.3.1.4-5 | Table H.3.1-3 with Condition SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.1.4-3 and 6.3.1.4-6 | Table H.3.1-3 with Condition SSB.2 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.1.4.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN known cell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PRACH-Config-DEFAULT ::= SEQUENCE { | | | |
| prach-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | Config 1, 2, 3 |
| | 53 | | Config 4, 5, 6 |
| } | | | |
| } | | | |

**Table 6.3.1.4.4.3-3: *RRCConnectionReconfiguration*: Inter-RAT handover to E-UTRAN known cell**

| Derivation Path: TS 36.508 [25], Table 4.6.1-8 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| securityConfigHO | Not present | | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v890-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v920-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1020-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1130-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1250-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1310-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1430-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1510-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1530-IEs | |
| securityConfigHO-v1530 { | | | |
| handoverType-v1530 CHOICE { | fivegc-ToEPC-r15 | | |
| fivegc-ToEPC-r15 { | | | |
| securityAlgorithmConfig-r15 { | | | |
| cipheringAlgorithm | eea0 | | |
| integrityProtAlgorithm | eia1 | | |
| } | | | |
| nextHopChainingCount-r15 | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.1.4.5 Test requirement

Tables 6.3.1.4.4.1-3, 6.3.1.4.5-1 and 6.3.1.4.5-2 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 6.3.1.4.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | | 1, 4 | FDD | | |
| | | 2, 3, 5, 6 | TDD | | |
| TDD Configuration | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | | | 1, 4 | TRS.1.1 FDD | | |
| | | | 2, 5 | TRS.1.1 TDD | | |
| | | | 3, 6 | TRS.1.2 TDD | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -94 | | |
| | | | 3, 6 | -91 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -100 | -104 | -100 |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -100 | -104 | -100 |
| | | | 3, 6 | -97 | -101 | -97 |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | 12 | 0 | 0 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88 | -104 | -100 |
| | | | 3, 6 | -85 | -101 | -97 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.78 | -73.04 | -69.04 |
| | | dBm/38.16 MHz | 3, 6 | -53.68 | -66.93 | -62.93 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.1.4.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | | |

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Duplex mode | | 1, 2, 3 | FDD | | |
| | | 4, 5, 6 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 | | |
| PRACH Configuration[Note2] | | 1, 2, 3 | 4 | | |
| | | 4, 5, 6 | 53 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD | | |
| | | 4, 5, 6 | 5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD | | |
| | | 4, 5, 6 | 5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1, 2, 3 | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD | | |
| | | 4, 5, 6 | 5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note4] | | | | | |
| OCNG_RB[Note4] | | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 9.55 | 9.55 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 9.55 | 9.55 |
| RSRP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -88.45 | -88.45 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -88.45 | -88.45 |
| Io[Note6] | dBm/Ch BW | 1, 2, 3, 4, 5, 6 | -67.21 +10log ($N_{RB,c}$ /100) | -57.20 +10log ($N_{RB,c}$ /100) | -57.20 +10log ($N_{RB,c}$ /100) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix[Note7] | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 35 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 85 ms.

### 6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell

#### 6.3.1.5.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in section 6.1.2.1 of TS 38.133 [6].

#### 6.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

#### 6.3.1.5.4 Test description

##### 6.3.1.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.5.4.1-1.

**Table 6.3.1.5.4.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests**

| Configuration | Description |
|---|---|
| 6.3.1.5-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.1.5-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.5-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.1.5-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.1.5-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.1.5-6 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.5.4.1-2.

**Table 6.3.1.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.3.1.5.4.1-3.

2. Message contents are defined in clause 6.3.1.5.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2. Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.3.1.5.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| T1 | | s | ≤5 | |
| T2 | | s | 1 | |

### 6.3.1.5.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

An RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last subframe containing the RRC message implying handover is sent to the UE. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last subframe containing the RRC Reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCConnectionReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.1.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.3-1 |

**Table 6.3.1.5.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN unknown cell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PRACH-Config-DEFAULT ::= SEQUENCE { | | | |
| prach-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | Config 1, 2, 3 |
| | 53 | | Config 4, 5, 6 |
| } | | | |
| } | | | |

6.3.1.5.5 Test requirement

Tables 6.3.1.5.4.1-3, 6.3.1.5.5-1 and 6.3.1.5.5-2 define the primary level settings including test tolerances for inter-RAT E-UTRAN handover: unknown target cell test.

**Table 6.3.1.5.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 4 | FDD | |
| | | | 2, 3, 5, 6 | TDD | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | |
| | | | 3, 6 | TDDConf. 2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$[Note2] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$[Note2] | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | dB | 1, 2, 3, 4, 5, 6 | 0 | 0 |
| SS-RSRP[Note3] | dBm/SCS | 1, 2, 4, 5 | -98 | -98 |
| | | 3, 6 | -95 | -95 |
| Io[Note3] | dBm/9.36 MHz | 1, 2, 4, 5 | -67.04 | -67.04 |
| | dBm/38.16 MHz | 3, 6 | -60.94 | -60.94 |
| Propagation condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.1.5.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration[Note2] | | 1, 2, 3 | 4 | |
| | | 4, 5, 6 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD | |
| | | 4, 5, 6 | 5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD | |
| | | 4, 5, 6 | 5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1, 2, 3 | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |

| | | | | |
|---|---|---|---|---|
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note4 | | | | |
| OCNG_RB Note4 | | | | |
| $N_{oc}$ Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/I_{ot}$ Note6 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| RSRP Note6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| SCH_RP Note6 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -91 |
| Io Note6 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -62.43 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note7 | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24]. | | | | |
| Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24]. | | | | |
| Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively. | | | | |
| Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27]. | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 115 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 165 ms.

## 6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell

### 6.3.1.6.1 Test purpose

To verify that the UE can make correct inter-RAT UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

### 6.3.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support UTRA FDD.

### 6.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.6.

### 6.3.1.6.4 Test description

#### 6.3.1.6.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.6.4.1-1.

**Table 6.3.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.3.1.6-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD |
| 6.3.1.6-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD |
| 6.3.1.6-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.6.4.1-2.

**Table 6.3.1.6.4.1-2: Initial conditions for NR SA FR1 – UTRAN handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | UE Part | A.3.2.3.2 | |
| Exceptions to connection diagram | SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA<br>Faders in Figure A.3.1.8.2 are removed.<br>LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX | | |

1. The general test parameter settings are set up according to Table 6.3.1.6.4.1-3.

2. Message contents are defined in clause 6.3.1.6.4.3.

3. The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.0 and C.1.

**Table 6.3.1.6.4.1-3: General test parameters for SA inter-RAT UTRAN handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| UTRA RF Channel Number | | | 2 | 1 UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| Inter-RAT (UTRAN FDD) measurement quantity | | | CPICH Ec/N0 | |
| b2-Threshold1 | | dBm | As specified in Table 6.3.1.6.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2UTRA-FDD | | dB | -18 | Absolute UTRAN CPICH Ec/Io threshold for event B2 |
| Hysteresis | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 6.3.1.6.4.2 Test procedure

The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement

report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.6.5-1 and 6.3.1.6.5-2. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message to configure Event B2 measurement reporting.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2.
7. SS shall transmit a *MobilityFromNRCommand* message implying handover to Cell 2.
8. T3 starts when the last TTI containing the *MobilityFromNRCommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. The UE shall transmit HANDOVER TO UTRAN COMPLETE message on Cell 2.
11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
12. The SS shall set Cell 2 primary scrambling code = ((current Cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.1.6.4.3 Message contents

**Table 6.3.1.6.4.3-1: RRCReconfiguration (Step 3)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.6.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.6.4.3-2: MeasConfig (Table 6.3.1.6.4.3-1)**

| Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |

| | | | |
|---|---|---|---|
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO | | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectUTRA-FDD-r16 | MeasObjectUTRA-FDD | Table 6.3.1.6.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT(*13, 60*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA | Actual value of thresholds are:<br><br>UTRA threshold = (13-49)/2 = -18dB<br>NR threshold = 60-156 = -96dBm | 6.6.1.6-1, 6.6.1.6-2 |
| | ReportConfigInterRAT(*13, 63*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA | Actual value of thresholds are:<br><br>UTRA threshold = (13-49)/2 = -18dB<br>NR threshold = 63-156 = -93dBm | 6.6.1.6-3 |
| } | | | |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 | | |
| } | | | |

**Table 6.3.1.6.4.3-3: MeasObjectUTRA-FDD (Table 6.3.1.6.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectUTRA-FDD-r16 ::= SEQUENCE { | | | |
| carrierFreq-r16 | ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2 | | |
| } | | | |

**Table 6.3.1.6.4.3-4: MeasurementReport (Step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | Table 6.3.1.6.4.3-5 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.3.1.6.4.3-5: MeasResults (Table 6.3.1.6.4.3-4)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B2_UTRA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 { | 1 entry | | |
| MeasResultUTRA-FDD-r16[1] SEQUENCE { | | entry 1 | |
| physCellId-r16 | PhysCellIdUTRA-FDD-r16 of UTRA Cell 2 | | |
| measResult-r16 SEQUENCE { | | | |
| utra-FDD-EcN0-r16 | INTEGER (0..49) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.6.4.3-6: MobilityFromNRCommand (Step 7)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.1-8 with condition HO-TO-UTRA_FDD |
|---|

6.3.1.6.5 Test requirement

Tables 6.3.1.6.5-1 and 6.3.1.6.5-2 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 6.3.1.6.5-1: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 1)**

| **Parameter** | | **Unit** | **Configuration** | **Cell 1** | | |
|---|---|---|---|---|---|---|
| | | | | **T1** | **T2** | **T3** |
| RF channel number | | | 1, 2, 3 | 1 | | |
| Duplex mode | | | 1 | FDD | | |
| | | | 2, 3 | TDD | | |
| TDD Configuration | | | 2 | TDDConf.1.1 | | |
| | | | 3 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1 | SR.1.1 FDD | | |
| | | | 2 | SR.1.1 TDD | | |
| | | | 3 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1 | CR.1.1 FDD | | |
| | | | 2 | CR.1.1 TDD | | |
| | | | 3 | CR.2.1 TDD | | |
| TRS configuration | | | 1 | TRS.1.1 FDD | | |
| | | | 2 | TRS.1.1 TDD | | |
| | | | 3 | TRS.1.2 TDD | | |
| OCNG pattern[Note1] | | | 1, 2, 3 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2, 3 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2, 3 | SMTC.1 | | |
| SSB configuration | | | 1, 2 | SSB.1 FR1 | | |
| | | | 3 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2 | -96 | | |

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| | | 3 | -93 | | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3 | -101.54 | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, | -101.54 | | |
| | | 3 | -98.54 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3 | 12 | -4 | -4 |
| $\hat{E}_s/I_{ot}$ Note3 | dB | 1, 2, 3 | 12 | -4 | -4 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -89.54 | -105.54 | -105.54 |
| | | 3 | -86.54 | -102.54 | -102.54 |
| Io Note3 | dBm/9.36 MHz | 1, 2 | -61.32 | -72.13 | -72.13 |
| | dBm/38.16 MHz | 3 | -55.22 | -66.03 | -66.03 |
| Propagation condition | | 1, 2, 3 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.1.6.5-2: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 2)**

| Parameter | Unit | Cell 2 (UTRA) | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| UTRA RF Channel Number | | 2 | | |
| CPICH_Ec/Ior | dB | -10 | | |
| PCCPCH_Ec/Ior | dB | -12 | | |
| SCH_Ec/Ior | dB | -12 | | |
| PICH_Ec/Ior | dB | -15 | | |
| DCH_Ec/Ior | dB | N/A | N/A | Note 1 |
| OCNS_Ec/Ior | dB | -0.941 | 0.941 | Note 2 |
| $\hat{I}_{or}/I_{oc}$ | dB | -infinity | -1.8 | -1.8 |
| $I_{oc}$ | dBm/3,84 MHz | -70 | -70 | -70 |
| CPICH_Ec/Io | dB | -infinity | -14 | -14 |
| Propagation Condition | | AWGN | | |

Note 1: The DPCH level is controlled by the power control loop
Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to $I_{or}$.

The UE shall start to transmit the UL DPCCH to Cell 2 less than 190 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms, which is specified in clause 5.3.1.1.1.

$T_{interrupt}$ = 140 ms in the test; $T_{interrupt}$ is defined in clause 5.3.1.1.2. This gives a total of 190 ms.

## 6.3.1.7 NR SA FR1 synchronous DAPS handover

### 6.3.1.7.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency DAPS handover requirements in synchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.7.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-frequency DAPS handover.

### 6.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.7.

### 6.3.1.7.4 Test description

#### 6.3.1.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.7.4.1-1.

**Table 6.3.1.7.4.1-1: NR SA FR1 synchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.7-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.7-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.7-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.7.4.1-2

**Table 6.3.1.7.4.1-2: Initial conditions for NR SA FR1 synchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.7.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.7.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.7.4.1-3: General test parameters for NR SA FR1 synchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | -1 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |
| T4 | | ms | $D_{handover2}$ | $D_{Handover2}$ is defined in TS 38.133 [6] clause 6.1.3.2.1 |
| T5 | | ms | 100 | |

### 6.3.1.7.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.7.4.1-3 and 6.3.1.7.5-1 respectively. No measurement gap is configured in the test case. Both Cell 1 and Cell 2 belong to the same TAG.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration message*. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.7.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.7.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    a) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    b) The UE doesn't send periodical CSI report on Cell 1 during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.7.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.7.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.7.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.7.4.3-2: ServingCellConfig (Table 6.3.1.7.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 6.3.1.7.4.3-3: MeasConfig (Table 6.3.1.7.4.3-1)**

| Derivation path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-1) specified in Table H.3.1-4 | Acutal value of A3-offset is -1dB | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.7.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTRA-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.7.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.7.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 6.3.1.7.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.7.4.3-6: RadioBearerConfig (Table 6.3.1.7.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 6.3.1.7.4.3-7: CellGroupConfig (Table 6.3.1.7.4.3-6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.7.4.3-8: RRCReconfiguration (Step 12)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |
|---|

### 6.3.1.7.5 Test requirements

Table 6.3.1.7.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.7.5-1: Cell specific test parameters for NR SA FR1 synchronous DAPS handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 – T5 | T1 | T2 – T5 |
| NR RF Channel Number | | | 1 | | | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | | | |
| | Config 2 | | CSI-RS.1.1 TDD | | | |
| | Config 3 | | CSI-RS.2.1 TDD | | | |
| reportConfigType | | | periodic | N/A | | |
| reportQuantity | | | cri-RI-PMI-CQI | N/A | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | N/A | | |
| | Config 3 | | 10 | N/A | | |
| CSI reporting offset | Config 1,2 | slot | 3 | N/A | | |
| | Config 3 | | 5 | N/A | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -2.41 | -Infinity | 1.36 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 10 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | -Infinity | -85 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -51.56 | -55.31 | -51.56 |
| Propagation condition | | | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1}$= $T_{RRC_procedure}$ + $T_{search}$ + $T_{IU}$ + $T_{processing}$ + $T_{\Delta}$ + $T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;

- $T_{search}$ = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

- $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in TS 38.133 [6] clause 6.1.1.2.2.

- $T_{processing}$ = 20 ms, is the time for UE processing specified in TS 38.133 [6] clause 6.1.1.2.2.

- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in TS 38.133 [6] clause 6.1.1.2.2.

- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in TS 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to Cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from Cell 1 and Cell 2. UE is not expected to transmit UL to both Cell 1 and Cell 2 in the same TTI.

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2}$= $T_{RRC_procedure}$ + $T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;

- $T_{interrupt2}$ = 1 ms for sync intra-frequency DAPS handover, is the allowed interruption length during $D_{handover2}$ as in TS 38.133 [6] clause 6.1.3.2.2;

This gives a total of 11 ms.

UE shall not report CSI to Cell 1 during T5.

## 6.3.1.8 NR SA FR1 asynchronous DAPS handover

### 6.3.1.8.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency DAPS handover requirements in asynchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.8.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-frequency asynchronous DAPS handover.

### 6.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.8.

### 6.3.1.8.4 Test description

#### 6.3.1.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.8.4.1-1.

**Table 6.3.1.8.4.1-1: NR SA FR1 asynchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.8-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.8-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| | Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.8-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.8.4.1-2

**Table 6.3.1.8.4.1-2: Initial conditions for NR SA FR1 asynchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.8.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.8.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.8.4.1-3: General test parameters for NR SA FR1 asynchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | -1 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 7 μs | Asynchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |
| T4 | | ms | $D_{handover2}$ | $D_{Handover2}$ is defined in TS 38.133 [6] clause 6.1.3.2.1 |
| T5 | | ms | 100 | |

### 6.3.1.8.4.2 Test procedure

Same test procedure as described in section 6.3.1.7.4.2.

### 6.3.1.8.4.3 Message contents

Same message contents as described in section 6.3.1.7.4.3.

### 6.3.1.8.5 Test requirements

Table 6.3.1.8.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.8.5-1: Cell specific test parameters for NR SA FR1 asynchronous DAPS handover**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 – T5 | T1 | T2 – T5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| NR RF Channel Number | | | 1 | | | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| CSI-RS CSI configuration for reporting | Config 1 | | CSI-RS.1.1 FDD | | | |
| | Config 2 | | CSI-RS.1.1 TDD | | | |
| | Config 3 | | CSI-RS.2.1 TDD | | | |
| reportConfigType | | | periodic | N/A | | |
| reportQuantity | | | cri-RI-PMI-CQI | N/A | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | N/A | | |
| | Config 3 | | 10 | N/A | | |
| CSI reporting offset | Config 1,2 | slot | 3 | N/A | | |
| | Config 3 | | 5 | N/A | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}^{Note2}$ | | dBm/15kHz | -98 | | | |
| $N_{oc}^{Note2}$ | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -2.41 | -Infinity | 1.36 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -88 |
| | Config 3 | | -87 | -87 | -Infinity | -85 |
| $Io^{Note3}$ | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -51.56 | -55.31 | -51.56 |
| Propagation condition | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Same test requirements as described in section 6.3.1.7.5 except:

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;
- $T_{interrupt2}$ = 2 slots for test configuration 6.3.1.8-1/2 and $T_{interrupt2}$ = 3 slots for test configuration 6.3.1.8-3, is the allowed interruption length during $D_{handover2}$ as in TS 38.133 [6] clause 6.1.3.2.2;

This gives a total of 10 ms + 2 slots for test configuration 6.3.1.8-1/2 and 10 ms + 3 slots for test configuration 6.3.1.8-3.

## 6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

### 6.3.1.9.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in synchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.9.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-band inter-frequency DAPS handover.

### 6.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.9.

### 6.3.1.9.4 Test description

#### 6.3.1.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.9.4.1-1.

**Table 6.3.1.9.4.1-1: NR SA FR1 Intra-band inter-frequency synchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.9-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.9-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.9-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.9.4.1-2

**Table 6.3.1.9.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |
| Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3 | | | |

1. Message contents are defined in clause 6.3.1.9.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.9.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.9.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | -3 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 0 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |
| T4 | | ms | 10 + $T_{interrupt2}$ | $T_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6 |
| T5 | | ms | 100 | |

### 6.3.1.9.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.9.4.1-3 and 6.3.1.9.5-1 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. Cell 2 is continuously scheduled in DL during T4.During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.9.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.9.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.9.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    c) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    d) The UE doesn't send periodical CSI report during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.9.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.9.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.9.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.9.4.3-2: ServingCellConfig (Table 6.3.1.9.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 6.3.1.9.4.3-3: MeasConfig (Table 6.3.1.9.4.3-1)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-3) specified in Table H.3.1-4 | Acutal value of A3-threshold is -3 dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.9.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---|---|---|
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.9.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.9.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 6.3.1.9.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.9.4.3-6: RadioBearerConfig (Table 6.3.1.9.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 6.3.1.9.4.3-7: CellGroupConfig (Table 6.3.1.9.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.9.4.3-8: RRCReconfiguration (Step 12)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |
|---|

6.3.1.9.5 Test requirements

Table 6.3.1.9.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.9.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2-T5 | T1 | T2-T5 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | | | |
| | Config 2 | | CSI-RS.1.1 TDD | | | |
| | Config 3 | | CSI-RS.2.1 TDD | | | |
| reportConfigType | | | | | periodic | |
| reportQuantity | | | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | 5 | |
| | Config 3 | | 10 | | 10 | |
| CSI reporting offset | Config 1,2 | slot | 3 | | 3 | |
| | Config 3 | | 5 | | 5 | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 8 | - Infinity | 11.7 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | - Infinity | 11.7 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | - Infinity | -86.3 |
| | Config 3 | dBm/SCS | - 86.99 | -86.99 | - Infinity | -83.29 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | - 61.41 | -61.41 | -70.05 | -58.06 |
| | Config 3 | dBm/ 38.16MHz | - 55.31 | -55.31 | -63.94 | -51.96 |
| Propagation condition | | | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- $T_{search}$ = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in TS 38.133 [6] clause 6.1.1.2.2.

- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to Cell 1. $T_{interrupt1}$ is defined in TS 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to Cell 2, interruption to Cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to Cell 1. $T_{interrupt2}$ is defined in TS 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish Cell 1 release in T4 and shall not send any CSI reports to Cell 1 during T5.

## 6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

### 6.3.1.10.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in asynchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.10.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-band inter-frequency DAPS handover.

### 6.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.10.

### 6.3.1.10.4 Test description

#### 6.3.1.10.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.10.4.1-1.

**Table 6.3.1.10.4.1-1: NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.10-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.10.4.1-2

**Table 6.3.1.10.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.10.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |
| Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3. | | | |

1. Message contents are defined in clause 6.3.1.10.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.3.1.10.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.10.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | -3 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 10 μs | Asynchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |
| T4 | | ms | $10 + T_{interrupt2}$ | $T_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6 |
| T5 | | ms | 100 | |

### 6.3.1.10.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.10.4.1-3 and 6.3.1.10.5-1 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.10.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.10.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.10.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

13. When T4 expires, T5 starts.

15. If

    e) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    f) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.10.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.10.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.10.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.10.4.3-2: ServingCellConfig (Table 6.3.1.10.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 6.3.1.10.4.3-3: MeasConfig (Table 6.3.1.10.4.3-1)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-3) specified in Table H.3.1-4 | Acutal value of A3-threshold is -3 dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.10.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.10.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.10.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 6.3.1.10.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.10.4.3-6: RadioBearerConfig (Table 6.3.1.10.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 6.3.1.10.4.3-7: CellGroupConfig (Table 6.3.1.10.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.10.4.3-8: RRCReconfiguration (Step 12)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |
|---|

### 6.3.1.10.5 Test requirements

Table 6.3.1.10.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.10.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1 | T2 -T5 |
| NR RF Channel Number | | | 1 | 2 |
| Duplex mode | Config 1 | | FDD | |
| TDD configuration | Config 1 | | Not Applicable | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1 | | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 15 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$[Note2] | | dBm/15kHz | -98 | | | |
| $N_{oc}$[Note2] | Config 1 | dBm/SCS | -98 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 8 | - Infinity | 11.7 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | - Infinity | 11.7 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | - Infinity | -86.3 |
| Io[Note3] | Config 1,2 | dBm/ 9.36MHz | -61.41 | -61.41 | -70.05 | -58.06 |
| Propagation condition | | | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;
- $T_{search}$ = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in TS 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to Cell 1. $T_{interrupt1}$is defined in TS 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to Cell 2, interruption to Cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to Cell 1. $T_{interrupt2}$ is defined in TS 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish Cell 1 release in T4 and shall not send any CSI reports to Cell 1 during T5.

## 6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

### 6.3.1.11.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in synchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.11.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-band inter-frequency DAPS handover.

### 6.3.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.11.

### 6.3.1.11.4 Test description

#### 6.3.1.11.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.11.4.1-1.

**Table 6.3.1.11.4.1-1: NR SA FR1 Inter-band inter-frequency synchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.11-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.11-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

| Config | Description |
|---|---|
| 6.3.1.11-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.11-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.11-9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.11.4.1-2

**Table 6.3.1.11.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.11.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.11.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.11.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.11.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | PCell on RF channel number 1 |
| | Neighbouring cell | | Cell 2 | Neighbour cell on RF channel number 2 |
| Final condition | Active cell | | Cell 2 | PCell on RF channel number 2 |
| | Neighbouring cell | | Cell 1 | Neighbour cell on RF channel number 1 |
| A3-Offset | Config 1,2,4,5,9 | dB | -7 (Note 1) | |
| | Config 3,6 | dB | -10 (Note 1) | |
| | Config 7,8 | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | µs | 33 | Synchronous cells |
| DRX | | | OFF | |
| Measurement gap pattern Id | | | #0 | Gaps are configured before T2. |
| T1 | | s | 5 | |
| T2 | | s | <5 | |
| T3 | | s | <0.5 | |

| | | | |
|---|---|---|---|
| T4 | ms | $10+T_{interrupt2}$ | $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO |
| T5 | ms | 100 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | |

### 6.3.1.11.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.11.4.1-3, 6.3.1.11.5-1 and 6.3.1.11.5-2 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

- $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    g) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    h) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.11.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.11.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.11.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.11.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.11.4.3-2: ServingCellConfig (Table 6.3.1.11.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.3.1.11.4.3-3: MeasConfig (Table 6.3.1.11.4.3-1)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-7) specified in Table H.3.1-4 | Acutal value of a3-Offset is -7 dB | 6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9. |
| | ReportConfigNR(-10) specified in Table H.3.1-4 | Acutal value of a3-Offset is -10 dB | 6.3.1.11-3, 6.3.1.11-6 |
| | ReportConfigNR(-4) specified in Table H.3.1-4 | Acutal value of a3-Offset is -4 dB | 6.3.1.11-7, 6.3.1.11-8 |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.11.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.11.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.11.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 6.3.1.11.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.11.4.3-6: RadioBearerConfig (Table 6.3.1.11.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |

| | | | |
|---|---|---|---|
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 6.3.1.11.4.3-7: CellGroupConfig (Table 6.3.1.11.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.11.4.3-8: RRCReconfiguration (Step 12)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |
|---|

6.3.1.11.5 Test requirements

Table 6.3.1.11.5-1, Table 6.3.1.11.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.11.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 1)**

| **Parameter** | | **Unit** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2 – T5** |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4,7 | | FDD | |
| | Config 2,3,5,6,8,9 | | TDD | |
| TDD configuration | Config 1,4,7 | | Not Applicable | |
| | Config 2,5,8 | | TDDConf.1.1 | |
| | Config 3,6,9 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4,7 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5,8 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6,9 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,4,7 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5,8 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6,9 | | 40: $N_{RB,c}$ = 106 | |
| TRS configuration | Config 1,4,7 | | TRS.1.1 FDD | |
| | Config 2,5,8 | | TRS.1.1 TDD | |
| | Config 3,6,9 | | TRS.1.2 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4,7 | | SR.1.1 FDD | |
| | Config 2,5,8 | | SR.1.1 TDD | |
| | Config 3,6,9 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1,4,7 | | CR.1.1 FDD | |
| | Config 2,5,8 | | CR.1.1 TDD | |

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 – T5 |
| | Config 3,6,9 | | CR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 | | CSI-RS.1.1 FDD | |
| | Config 2,5,8 | | CSI-RS.1.1 TDD | |
| | Config 3,6,9 | | CSI-RS.2.1 TDD | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5,7,8 | slot | 5 | |
| | Config 3,6,9 | | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | slot | 3 | |
| | Config 3,6,9 | | 5 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2,4,5,7,8 | | SSB.1 FR1 | |
| | Config 3,6,9 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6,9 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6,9 | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | -98 |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
| | Config 3,6,9 | | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 |
| SSB_RP | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
| | Config 3,6,9 | dBm/SCS | -91 | -91 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/ 9.36MHz | -64.59 | -64.59 |
| | Config 3,6,9 | dBm/ 38.16MHz | -58.49 | -58.49 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.1.11.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| NR RF Channel Number | | | 2 | |
| Duplex mode | Config 1,2,3 | | FDD | |
| | Config 4,5,6,7,8,9 | | TDD | |
| TDD configuration | Config 1,2,3 | | Not Applicable | |

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| | Config 4,5,6 | | TDDConf.1.1 | |
| | Config 7,8,9 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,3 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 4,5,6 | | 10: $N_{RB,c}$ = 52 | |
| | Config 7,8,9 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,2,3 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 4,5,6 | | 10: $N_{RB,c}$ = 52 | |
| | Config 7,8,9 | | 40: $N_{RB,c}$ = 106 | |
| TRS configuration | Config 1,2,3 | | TRS.1.1 FDD | |
| | Config 4,5,6 | | TRS.1.1 TDD | |
| | Config 7,8,9 | | TRS.1.2 TDD | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 | | SR.1.1 FDD | |
| | Config 4,5,6 | | SR.1.1 TDD | |
| | Config 7,8,9 | | SR2.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 | | CR.1.1 FDD | |
| | Config 4,5,6 | | CR.1.1 TDD | |
| | Config 7,8,9 | | CR2.1 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 | | CSI-RS.1.1 FDD | |
| | Config 2,5,8 | | CSI-RS.1.1 TDD | |
| | Config 3,6,9 | | CSI-RS.2.1 TDD | |
| SMTC Configuration | | | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 | | SSB.1 FR1 | |
| | Config 7,8,9 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| | Config 7,8,9 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| | Config 7,8,9 | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | -98 |
| $N_{oc}$ Note2 | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
| | Config 7,8,9 | | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 4 |
| SSB_RP | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
| | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| Io Note3 | Config 1,2,3,4,5,6 | dBm/ 9.36MHz | -70.05 | -64.59 |
| | Config 7,8,9 | dBm/ 38.16MHz | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;
- $T_{search}$ = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in TS 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than $D_{handover2}$ from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC_procedure} + T_{interrupt2}$, where:

$T_{RRC_procedure}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

## 6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

### 6.3.1.12.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in asynchronous scenario specified in TS 38.133 [6] clause 6.1.3.2.

### 6.3.1.12.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-band inter-frequency DAPS handover.

### 6.3.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.12.

### 6.3.1.12.4 Test description

#### 6.3.1.12.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.12.4.1-1.

**Table 6.3.1.12.4.1-1: NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 6.3.1.12-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.12-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.1.12-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

| Config | Description |
|---|---|
| 6.3.1.12-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 6.3.1.12-9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.12.4.1-2

**Table 6.3.1.12.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.12.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.12.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.12.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.1.12.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | Config 1,2,4,5,9 | dB | -7(Note 1) | |
| | Config 3,6 | dB | -10(Note 1) | |
| | Config 7,8 | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | Config 1,2,4,5 | ms | 0.5 | Asynchronous cells |
| | Config3,6,7,8,9 | ms | 0.25 | |
| DRX | | | OFF | |
| Measurement gap pattern Id | | | #0 | Gaps are configured before T2. |
| T1 | | s | 5 | |
| T2 | | s | <5 | |
| T3 | | s | <0.5 | |
| T4 | | ms | $10+T_{interrupt2}$ | $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for asynchronous DAPS HO. |

| | | | |
|---|---|---|---|
| T5 | ms | 100 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | |

#### 6.3.1.12.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.12.4.1-3, 6.3.1.12.5-1 and 6.3.1.12.5-2 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    i) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    j) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.1.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.1.12.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.1.12.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.3.1.12.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.12.4.3-2: ServingCellConfig (Table 6.3.1.12.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 6.3.1.12.4.3-3: MeasConfig (Table 6.3.1.12.4.3-1)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-7) specified in Table H.3.1-4 | Acutal value of a3-Offset is -7 dB | 6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9. |
| | ReportConfigNR(-10) specified in Table H.3.1-4 | Acutal value of a3-Offset is -10 dB | 6.3.1.11-3, 6.3.1.11-6 |
| | ReportConfigNR(-4) specified in Table H.3.1-4 | Acutal value of a3-Offset is -4 dB | 6.3.1.11-7, 6.3.1.11-8 |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.12.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.12.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | Table 6.3.1.12.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 6.3.1.12.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.12.4.3-6: RadioBearerConfig (Table 6.3.1.12.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 6.3.1.12.4.3-7: CellGroupConfig (Table 6.3.1.12.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.1.12.4.3-8: RRCReconfiguration (Step 12)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |
|---|

6.3.1.12.5 Test requirements

Table 6.3.1.12.5-1, Table 6.3.1.12.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.3.1.12.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 1)**

| **Parameter** | | **Unit** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2 – T5** |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4,7 | | FDD | |
| | Config 2,3,5,6,8,9 | | TDD | |
| TDD configuration | Config 1,4,7 | | Not Applicable | |
| | Config 2,5,8 | | TDDConf.1.1 | |
| | Config 3,6,9 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4,7 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5,8 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6,9 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,4,7 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5,8 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6,9 | | 40: $N_{RB,c}$ = 106 | |
| TRS configuration | Config 1,4,7 | | TRS.1.1 FDD | |
| | Config 2,5,8 | | TRS.1.1 TDD | |
| | Config 3,6,9 | | TRS.1.2 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4,7 | | SR.1.1 FDD | |
| | Config 2,5,8 | | SR.1.1 TDD | |
| | Config 3,6,9 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1,4,7 | | CR.1.1 FDD | |
| | Config 2,5,8 | | CR.1.1 TDD | |
| | Config 3,6,9 | | CR.2.1 TDD | |

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 – T5 |
| OCNG Patterns | | | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 | | CSI-RS.1.1 FDD | |
| | Config 2,5,8 | | CSI-RS.1.1 TDD | |
| | Config 3,6,9 | | CSI-RS.2.1 TDD | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5,7,8 | slot | 5 | |
| | Config 3,6,9 | | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | slot | 3 | |
| | Config 3,6,9 | | 5 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2,4,5,7,8 | | SSB.1 FR1 | |
| | Config 3,6,9 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6,9 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6,9 | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | -98 |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
| | Config 3,6,9 | | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 |
| SSB_RP | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
| | Config 3,6,9 | dBm/SCS | -91 | -91 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/ 9.36MHz | -64.59 | -64.59 |
| | Config 3,6,9 | dBm/ 38.16MHz | -58.49 | -58.49 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.1.12.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| NR RF Channel Number | | | 2 | |
| Duplex mode | Config 1,2,3 | | FDD | |
| | Config 4,5,6,7,8,9 | | TDD | |
| TDD configuration | Config 1,2,3 | | Not Applicable | |
| | Config 4,5,6 | | TDDConf.1.1 | |
| | Config 7,8,9 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,3 | MHz | 10: $N_{RB,c}$ = 52 | |

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| | Config 4,5,6 | | 10: $N_{RB,c}$ = 52 | |
| | Config 7,8,9 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,2,3 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 4,5,6 | | 10: $N_{RB,c}$ = 52 | |
| | Config 7,8,9 | | 40: $N_{RB,c}$ = 106 | |
| TRS configuration | Config 1,2,3 | | TRS.1.1 FDD | |
| | Config 4,5,6 | | TRS.1.1 TDD | |
| | Config 7,8,9 | | TRS.1.2 TDD | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 | | SR.1.1 FDD | |
| | Config 4,5,6 | | SR.1.1 TDD | |
| | Config 7,8,9 | | SR2.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 | | CR.1.1 FDD | |
| | Config 4,5,6 | | CR.1.1 TDD | |
| | Config 7,8,9 | | CR2.1 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 | | CSI-RS.1.1 FDD | |
| | Config 2,5,8 | | CSI-RS.1.1 TDD | |
| | Config 3,6,9 | | CSI-RS.2.1 TDD | |
| SMTC Configuration | | | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 | | SSB.1 FR1 | |
| | Config 7,8,9 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| | Config 7,8,9 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| | Config 7,8,9 | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | -98 |
| $N_{oc}$ Note2 | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
| | Config 7,8,9 | | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 4 |
| SSB_RP | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
| | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| Io Note3 | Config 1,2,3,4,5,6 | dBm/ 9.36MHz | -70.05 | -64.59 |
| | Config 7,8,9 | dBm/ 38.16MHz | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;
- $T_{search}$ = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in TS 38.133 [6] clause 6.1.1.2.2.
- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in TS 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than $D_{handover2}$ from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for asynchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC_procedure} + T_{interrupt2}$, where:

$T_{RRC_procedure}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

## 6.3.1.13 to 6.3.1.17

## 6.3.1.18 NR SA FR1 handover with unknown target cell operating with 12 PRB SSB bandwidth

### 6.3.1.18.1 Test purpose

To verify the UEs ability to perform the NR FR1-NR FR1 intra-frequency handover requirements for unknown target cell operating with 12 PRB SSB bandwidth as specified in TS 38.133[6] clause 6.1.1.2.

### 6.3.1.18.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards supporting in less than 5 MHz bandwidth.

### 6.3.1.18.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.18.

### 6.3.1.18.4 Test description

#### 6.3.1.18.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.18.4.1-1.

**Table 6.3.1.18.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 6.3.1.18-1 | Source cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 15PRB CBW, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 15PRB CBW, FDD duplex mode |
| 6.3.1.18-2 | Source cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 12PRB CBW, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 12PRB CBW, FDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations<br>Note2: Configuration 2 is only applied for the testing on band n100 | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.18.4.1-2

**Table 6.3.1.18.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.1.18.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.1.18.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. General test parameters as specified in Table 6.3.1.18.4.1-3 below:

**Table 6.3.1.18.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | unknown target cell operating with 12 PRB SSB bandwidth |
| Final condition | Active cell | | Cell 2 | unknown target cell operating with 12 PRB SSB bandwidth |

### 6.3.1.18.4.2 Test procedure

Same as 6.3.1.2.4.2

### 6.3.1.18.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.1.18.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

### 6.3.1.18.5 Test requirements

Cell specific test parameters as specified in Table 6.3.1.2.5-1 with config 1 apply except those specified in Table 6.3.1.18.5-1.

**Table 6.3.1.18.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $BW_{channel}$ | Config 1 | MHz | 3: $N_{RB,c}$ = 15 | | | |
| | Config 2 | | 3: $N_{RB,c}$ = 12 | | | |
| BWP BW | Config 1 | MHz | 3: $N_{RB,c}$ = 15 | | | |
| | Config 2 | | 3: $N_{RB,c}$ = 12 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.2 FDD | | | |
| | Config 2 | | SR.1.2 FDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| CORESET Reference Channel | Config 1 | | CR.1.3 FDD | | | |
| | Config 2 | | CR.1.2 FDD | | | |
| SSB Configuration | Config 1,2 | | SSB.13 FR1 | | | |
| Io[Note1] | Config 1 | dBm/ 2.7MHz | -66.81 | -64.11 | -66.81 | -64.11 |
| | Config 2 | dBm/ 2.16MHz | -67.78 | -65.07 | -67.78 | -65.07 |
| Propagation condition | | - | AWGN | | AWGN | |
| Note 1: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in TS 38.133 [6] clause 6.1.1.2.2.

This gives a total of 132 ms.

## 6.3.2 RRC connection mobility control

### 6.3.2.1 RRC re-establishment

#### 6.3.2.1.0 Minimum conformance requirements

##### 6.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re-establish_delay} = T_{UE_re-establish_delay} + T_{UL_grant}$$

$T_{UL_grant}$: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [13] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fullfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fullfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range of the target NR cell. If the UE is not configured with intra-

frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in table 6.3.2.1.0.1-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range of the target NR cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in table 6.3.2.1.0.1-2.

$T_{SMTC}$: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*, $T_{smtc}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{SI-NR}$ = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [13] for the target NR cell.

$T_{PRACH}$: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{PRACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$N_{freq}$: It is the total number of NR frequencies to be monitored for RRC re-establishment; $N_{freq}$ = 1 if the target intra-frequency NR cell is known, else $N_{freq}$ = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

**Table 6.3.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| Serving cell SSB Ês/Iot (dB) | Frequency range of target NR cell | $T_{identify_intra_NR}$ (ms) | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x $T_{SMTC}$) | MAX (800 ms, 10 x $T_{SMTC}$) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 80 x $T_{SMTC}$)) |
| < -8 | FR1 | N/A | 800 Note1 |
| < -8 | FR2 | N/A | 3520 Note1 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |

**Table 6.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB Ês/Iot (dB) | Frequency range of target NR cell | $T_{identify_inter_NR,\ i}$ (ms) | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x $T_{SMTC,\ i}$) | MAX (800 ms, 13 x $T_{SMTC,\ i}$) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 104 x $T_{SMTC,\ i}$)) |
| < -8 | FR1 | N/A | 800 Note1 |
| < -8 | FR2 | N/A | 4000 Note1 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1.2.1.

## 6.3.2.1.1 NR SA FR1 RRC re-establishment

### 6.3.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits.

### 6.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.1.

#### 6.3.2.1.1.4 Test description

##### 6.3.2.1.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.1.4.1-1

**Table 6.3.2.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.3.2.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.1.4.1-2

**Table 6.3.2.1.1.4.1-2: Initial conditions for NR Intra-frequency RRC Re-establishment in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.2.1.1.4.1-3.
2. Message contents are defined in clause 6.3.2.1.1.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 µs | Synchronous cells |
| | | | 3 | 3 µs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3 | OFF | |
| PRACH configuration | | 1, 2, 3 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | s | 1, 2, 3 | 2 | |

#### 6.3.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, Cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 6.3.2.1.1.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2 within 1840 ms (= 220ms + 1.6 s) from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

**Table 6.3.2.1.1.4.3-1: Common Exception messages intra-frequency RRC re-establishment**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-1 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 6.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

### 6.3.2.1.1.5 Test requirement

Table 6.3.2.1.1.5-1 defines the primary level settings including test tolerances for NR Intra-frequency RRC Re-establishment in FR1 test case.

**Table 6.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 FDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 FDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| | | 2 | | | | | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 7 | -infinity | -infinity | 4 | 4 | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 2 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 3 | -88 | -infinity | -infinity | -91 | -91 | -91 |
| Io | dBm/9.36 MHz | 1 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| | dBm/9.36 MHz | 2 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| | dBm/38.16 MHz | 3 | -54.65 | -58.50 | -58.50 | -54.65 | -58.50 | -58.50 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The RRC re-establishment delay is defined as the time from the the moment UE declares RLF, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to a known NR intra-frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR}$ = 200 ms

$T_{SI}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms for RRC re-establishment delay, allow 1840ms (240 ms + 1.6 s) from the beginning of T2 in the test case.

### 6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment

#### 6.3.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits.

#### 6.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.1.2.

#### 6.3.2.1.2.4 Test description

##### 6.3.2.1.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.2.4.1-1

**Table 6.3.2.1.2.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 6.3.2.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.2.4.1-2

**Table 6.3.2.1.2.4.1-2: Initial conditions for NR Inter-frequency RRC Re-establishment in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.2.1.2.4.1-3.
2. Message contents are defined in clause 6.3.2.1.2.4.3.

There are two NR carriers and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.3.2.1.2.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |

| | | | | |
|---|---|---|---|---|
| N311 | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | ms | 1, 2, 3 | 0 | Radio link failure timer |
| T311 | ms | 1, 2, 3 | 5000 | RRC re-establishment timer |
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3 | OFF | |
| PRACH configuration | | 1, 2, 3 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | s | 1, 2, 3 | 5 | |

#### 6.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, Cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of Cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of Cell 2 by the end of T1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 6.3.2.1.2.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.2.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.2.5-1. T3 starts
7. If the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

**Table 6.3.2.1.2.4.3-1: Common Exception messages inter-frequency RRC re-establishment**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-1 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-2 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-3 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for inter-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 6.3.2.1.2.4.3-3: *MeasConfig* for inter-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

### 6.3.2.1.2.5 Test requirement

Table 6.3.2.1.2.5-1 defines the primary level settings including test tolerances for NR Inter-frequency RRC Re-establishment in FR1 test case.

**Table 6.3.2.1.2.5-1: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| RF Channel Number | | 1, 2, 3 | 1 | | | 2 | | |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| | | 2 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -88 |
| Io | dBm/9.36 MHz | 1 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -62.26 |
| | dBm/9.36 MHz | 2 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -62.26 |
| | dBm/38.16 MHz | 3 | -58.50 | -63.94 | -63.94 | -63.94 | -63.94 | -56.15 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to an unknown NR inter-frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 2$

$T_{identify_intra_NR}$ = 800 ms

$T_{identify_inter_NR}$ = 800 ms

$T_{SI}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target inter-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

### 6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing

#### 6.3.2.1.3.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits and to verify the requirements in TS 38.133 [6] clause 6.2.1

#### 6.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.3.

#### 6.3.2.1.3.4 Test description

##### 6.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 6.3.2.1.3.4.1-1

**Table 6.3.2.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.3.2.1.3-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.1.3-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.1.3-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.3.4.1-2

**Table 6.3.2.1.3.4.1-2: Initial conditions for NR SA FR1 RRC re-establishment without serving cell timing**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.2.1.3.4.1-3.
2. Message contents are defined in clause 6.3.2.1.3.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.3.2.1.3.4.1-3: General test parameters for NR SA FR1 RRC re-establishment without serving cell timing**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |

| | | | | |
|---|---|---|---|---|
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| N310 | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | ms | 1, 2, 3 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3 | OFF | |
| PRACH configuration | | 1, 2, 3 | PRACH.1 FR1 | |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 6.24 | Time for the UE to detect RLF (Summation of Tevaluate_out_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | s | 1, 2, 3 | 3 | |

#### 6.3.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, Cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 6.3.2.1.3.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2 within 2.2 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, trigger UE handover back to Cell 1(if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.2.1.3.4.3-1: Common Exception messages for NR SA FR1 RRC re-establishment without serving cell timing**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-1 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.3-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.1.3.4.3-2: *RLF-TimersAndConstants for intra-frequency RRC re-establishment***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms6000 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 6.3.2.1.3.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

#### 6.3.2.1.3.5 Test requirement

Table 6.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 RRC re-establishment without serving cell timing test case.

**Table 6.3.2.1.3.5-1: Cell specific test parameters for NR SA FR1 RRC re-establishment without serving cell timing**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 | | | OP.1 | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TRS Configuration | | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| | | 2 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 |
| | dBm/9.36 MHz | 2 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 |
| | dBm/38.16 MHz | 3 | -58.50 | -63.94 | -63.94 | -63.94 | -63.94 | -58.50 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to an unknown NR intra-frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR}$ = 800 ms

$T_{SI}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

## 6.3.2.2 Random access

### 6.3.2.2.0 Minimum conformance requirements

#### 6.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.

#### 6.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

### 6.3.2.2.1 NR SA FR1 contention based random access

#### 6.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 6.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.1.

#### 6.3.2.2.1.4 Test description

##### 6.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.1.4.1-1.

**Table 6.3.2.2.1.4.1-1: Contention based random access test in FR1 for NR standalone supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 6.3.2.2.1-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.1-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.1.4.1-2.

**Table 6.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.3.2.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

### 6.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

#### 6.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.2.2.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 6.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | FR1 |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | |
| | kHz 30 | | |
| } | | | |

**Table 6.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | FR1 |
| msg1-FDM | one | | FR1 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 6.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 6.3.2.2.1.5 Test requirement

Table 6.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.1.5-2, 6.3.2.2.1.5-3 and 6.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 6.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for NR Standalone**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR1 | As defined in A.3.1, |
| | Config 2 | | SSB.2 FR1 | except for number of |

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| | | | | | SSBs per SS-burst and SS/PBCH block index as below |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | | | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 1 | | Config 1 | | FDD | |
| | | Config 2 | | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 | | SR.1.1 FDD | As defined in A.1.1 |
| | | Config 2 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | |
| | | Config 2 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1 | dBm/15kHz | -95 | |
| | | Config 2 | | -98 | |
| | SS-RSRP | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP | Config 1 | dBm/15kHz | -115 | |
| | | Config 2 | | -118 | |
| | SS-RSRP | | dBm/ SCS | -115 | |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 2 | | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{cMAX,f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | FR1 PRACH configuration 1 | As defined in A. 7.1. |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: Void.
Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

**Table 6.3.2.2.1.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.1.5-3 Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 6.3.2.2.1.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $880*T_c$ |
| | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 6.3.2.2.2 NR SA FR1 non-contention based random access

#### 6.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 6.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RS-CFRA-ForHO.

#### 6.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.2.

#### 6.3.2.2.2.4 Test description

##### 6.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.2.4.1-1.

**Table 6.3.2.2.2.4.1-1: Non-Contention based random access test in FR1 for NR standalone supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 6.3.2.2.2-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.2-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.2.4.1-2.

**Table 6.3.2.2.2.4.1-2: Initial conditions for Non-Contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.3.2.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 6.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Ensure the UE will choose SSB with index 0 to complete this procedure. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3.

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

   7.1. Repeat steps 1-3.

   7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

6.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.2.2.2.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 6.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |
| } | | | |

**Table 6.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | |
| | kHz 30 | | |
| } | | | |

**Table 6.3.2.2.2.4.3-3: CellGroupConfig for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicted | | | |
| uplink | RACH-ConfigDedicated for Non-Contention Based Random Access | Table 6.3.2.2.2.4.3-4 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.2.2.2.4.3-4: RACH-ConfigDedicated for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 40 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_51 | | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.2.2.2.4.3-5: RACH-ConfigGeneric for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 6.3.2.2.2.4.3-6: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 6.3.2.2.2.5 Test requirement

Table 6.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.2.5-2, 6.3.2.2.2.5-3 and 6.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 6.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for NR Standalone**

| Parameter | | | Unit | Subtest 1 | Subtest 2 | Comments |
|---|---|---|---|---|---|---|
| SSB Configuration | | Config 1 | | SSB.1 FR1 | SSB.1 FR1 | As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | | Config 2 | | SSB.2 FR1 | SSB.2 FR1 | |
| Number of SSBs per SS-burst | | | | 2 | 2 | Different from the definition in A.3.10 |
| SS/PBCH block index | | | | 0,1 | 0,1 | Different from the definition in A.3.10 |
| CSI-RS Configuration | | Config 1 | | N/A | CSI-RS.1.1 FDD | As defined in A.3.1.4 |
| | | Config 2 | | | CSI-RS.2.1 TDD | |
| Duplex Mode for Cell 1 | | Config 1 | | FDD | FDD | |
| | | Config 2 | | TDD | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.2.1 | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1 | | TRS.1.1 FDD | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OCNG pattern 1 | OCNG pattern 1 | As defined in A. 2.1. |
| PDSCH parameters Note 4 | | Config 1 | | SR.1.1 FDD | SR.1.1 FDD | As defined in A.1.1. |
| | | Config 2 | | SR.2.1 TDD | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 TDD | CR.1.1 TDD | |
| | | Config 2 | | CR.2.1 TDD | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 TDD | CCR.1.1 TDD | |
| | | Config 2 | | CCR.2.1 TDD | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | | |
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | -98 | |
| | | Config 2 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | 3 | |
| | SS-RSRP Note 3 | Config 1 | dBm/15kHz | -95 | -95 | |
| | | Config 2 | | -98 | -98 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | -98 | |
| | | Config 2 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | -17 | |
| | SS-RSRP Note 3 | Config 1 | dBm/15kHz | -115 | -115 | |
| | | Config 2 | | -118 | -118 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -115 | -115 | |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 2 | | -62.2/38.16MHz | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{cMAX,f,c}$) | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A. 7.1. |
| Propagation Condition | | | - | AWGN | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

| | |
|---|---|
| Note 2: | Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters. |
| Note 3: | Void. |
| Note 4: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. |

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

**Table 6.3.2.2.2.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.2.5-3 Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 6.3.2.2.2.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $880*T_c$ |
| | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 6.3.2.2.3 NR SA FR1 2-step contention based random access

#### 6.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 6.3.2.2.3.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards and twoStepRACH-r16.

#### 6.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.3.

#### 6.3.2.2.3.4 Test description

##### 6.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.3.4.1-1.

**Table 6.3.2.2.3.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 6.3.2.2.3-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.3-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.3.4.1-2.

**Table 6.3.2.2.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.3.2.2.3.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

##### 6.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB_RP above the configured rsrp-ThresholdSSB.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   6.6 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

#### 6.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 6.3.2.2.3.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 6.3.2.2.3.4.3-1: *Same as Table 4.3.2.2.3.4.3-1***

**Table 6.3.2.2.3.4.3-2: *Same as Table 4.3.2.2.3.4.3-2***

#### 6.3.2.2.3.5 Test requirement

Table 6.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR1 for NR Standalone.

**Table 6.3.2.2.1.5-1: General test parameters**

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1 | | SSB.1 FR1 | As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | | Config 2 | | SSB.2 FR1 | |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | | | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 2 | | Config 1 | | FDD | |
| | | Config 2 | | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 | | SR.1.1 FDD | As defined in A.1.1 |
| | | Config 2 | | SR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1 | dBm/15kHz | -95 | |
| | | Config 2 | | -98 | |
| | SS-RSRP | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | | Config 1 | dBm/15kHz | -115 | |

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| | SS-RSRP | Config 2 | | -118 | |
| | SS-RSRP | | dBm/ SCS | -115 | |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 2 | | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{\mathrm{cMAX,f,c}}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 1 | As defined in A.7A.1. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

**Table 6.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.3.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| $2 \leq \Delta P < 3$ | ± 3.2 dB |

**Table 6.3.2.2.3.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $880*T_c$ |
| | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 6.3.2.2.4 NR SA FR1 2-step non-contention based random access

#### 6.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 6.3.2.2.4.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards and twoStepRACH-r16.

#### 6.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.4.

#### 6.3.2.2.4.4 Test description

##### 6.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.4.4.1-1.

**Table 6.3.2.2.4.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 6.3.2.2.4-1 | 1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.3.2.2.4-2 | 2 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.4.4.1-2.

**Table 6.3.2.2.4.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.3.2.2.4.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 6.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles)

and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

#### 6.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 6.3.2.2.4.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 6.3.2.2.4.4.3-1: *Same as Table 4.3.2.2.3.4.3-1***

**Table 6.3.2.2.4.4.3-2: *Same as Table 4.3.2.2.3.4.3-2***

**Table 6.3.2.2.4.4.3-3: *Same as Table 4.3.2.2.3.4.3-3***

#### 6.3.2.2.4.5 Test requirement

Table 6.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone.

**Table 6.3.2.2.1.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR1 | As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 2 | | SSB.2 FR1 | |
| Number of SSBs per SS-burst | | | 2 | Different from the definition in A.3.1 |
| SS/PBCH block index | | | 0,1 | Different from the definition in A.3.1 |
| Duplex Mode for Cell 2 | Config 1 | | FDD | |

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| | | Config 2 | | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 | | SR.1.1 FDD | As defined in A.1.1 |
| | | Config 2 | | SR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | Config 1 | dBm/15kHz | -95 | |
| | | Config 2 | | -98 | |
| | SS-RSRP | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -98 | |
| | | Config 2 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP | Config 1 | dBm/15kHz | -115 | |
| | | Config 2 | | -118 | |
| | SS-RSRP | | dBm/ SCS | -115 | |
| Io Note 2 | | Config 1 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| | | Config 2 | | -62.2/38.16MHz | |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 2 | As defined in A.7A.1. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be -25 dBm for test configuration 1 and -22 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

**Table 6.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 6.3.2.2.4.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 dB |

**Table 6.3.2.2.4.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $880*T_c$ |
| | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 6.3.2.3 RRC connection release with redirection

### 6.3.2.3.0 Minimum conformance requirements

#### 6.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB_RP and SSB Ês/Iot according to Annex B.2.5 for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depend on the frequency range of the target NR cell. It is defined in table 6.3.2.3.0.1-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and $T_{meas}$ is the measurement time due to cell selection criteria evaluation.

$T_{SI\text{-}NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. $T_{SI\text{-}NR} = 0$ provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

$T_{RACH}$: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in TS 38.133 [6] Table 6.3.3.2-2 or TS 38.133 [6] Table 6.3.3.2-3 for FR1 and in TS 38.133 [6] Table 6.3.3.2-4 for FR2.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with $T_{rs}$ = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

**Table 6.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| Frequency range of target NR cell | $T_{identify\text{-}NR}$ |
|---|---|
| FR1 | MAX (680 ms, 11 x $T_{rs}$) |
| FR2 | MAX (880 ms, 8 x 11 x $T_{rs}$) |
| Note : If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.1.

### 6.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within $T_{connection_release_redirect_E\text{-}UTRA}$.

The time delay ($T_{connection_release_redirect_E\text{-}UTRA}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay ($T_{connection_release_redirect_E\text{-}UTRA}$) shall be less than:

$$T_{connection_release_redirect_E\text{-}UTRA} = T_{RRC_procedure_delay} + T_{identify\text{-}E\text{-}UTRA} + T_{SI\text{-}E\text{-}UTRA} + T_{RACH}$$

The target E-UTRA FDD or TDD cell shall be considered detectable when for each relevant SSB:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [23].

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

$T_{identify\text{-}E\text{-}UTRA}$: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

$T_{SI\text{-}E\text{-}UTRA}$: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released. $T_{SI\text{-}E\text{-}UTRA}$ = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRA cell before the RRC connection is released by the old NR cell.

$T_{RACH}$: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.2.

### 6.3.2.3.1 NR SA FR1 RRC connection release with redirection

#### 6.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR to NR.

#### 6.3.2.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.1.

#### 6.3.2.3.1.4 Test description

##### 6.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.1.4.1-1.

**Table 6.3.2.3.1.4.1-1: Redirection from NR to NR test configurations**

| Configuration | Description |
|---|---|
| 6.3.2.3.1-1 | Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.3.2.3.1-2 | Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.3.2.3.1-3 | Source cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.1.4.1-2.

**Table 6.3.2.3.1.4.1-2: Initial conditions for Redirection from NR to NR test case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameters for PCell and neighbour cell are given in Table 6.3.2.3.1.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.1.4.3.

3. There are two carriers and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 6.3.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 6.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.2.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.2.3.1.4.3-1: RRCRelease for NR RRC redirection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR | Frequency of Cell 2 | |
| ssbSubcarrierSpacing | kHz15 | | Config 1,2 |
| | kHz30 | | Config 3 |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |
| | sf5 | | SMTC.2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.3.2.3.1.4.3-2: SIB2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionInfoCommon SEQUENCE { | | | |
| rangeToBestCell | Not present | | |
| } | | | |

### 6.3.2.3.1.5 Test requirement

Table 6.3.2.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case.

**Table 6.3.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| SSB Configuration | Config 1 | | SSB.1 FR1 | | | |
| | Config 2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR 2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR 2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | Config 1,2 | | SMTC.1 | | | |
| | Config 3 | | SMTC.2 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -64.59 |
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify\text{-}NR}$ = 680 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

$T_{RACH}$ = 170 ms in the test.

This gives a total of 2240 ms.

### 6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection

#### 6.3.2.3.2.1 Test purpose

This test is to verify RRC connection release with redirection from NR to E-UTRAN.

#### 6.3.2.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.2.

#### 6.3.2.3.2.4 Test description

##### 6.3.2.3.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.2.4.1-1.

**Table 6.3.2.3.2.4.1-1: Redirection from NR to E-UTRAN test configurations**

| Configuration | Description |
|---|---|
| 6.3.2.3.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.3.2.3.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |

| | |
|---|---|
| 6.3.2.3.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.3.2.3.2-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.3.2.3.2-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.3.2.3.2-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.2.4.1-2.

**Table 6.3.2.3.2.4.1-2: Initial conditions for Redirection from NR to E-UTRAN test case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameters settings are given in Table 6.3.2.3.2.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.2.4.3.

3. There are two cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 6.3.2.3.2.4.1-3: General test parameters for Redirection from NR to E-UTRAN test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 6.3.2.3.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall start T2 timer when the last TTI containing the *RRCRelease* message is sent to UE.

5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.2.5-1 for Cell 1 and Table 6.3.2.3.2.5-2 for Cell 2.

6. The UE shall transmit RRCConnectionRequest message.

7. If the UE transmits the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.

9. The SS shall set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.2.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.2.3.2.4.3-1: RRCRelease for Inter-RAT RRC redirection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| eutra SEQUENCE { | | | |
| eutraFrequency | ARFCN-ValueEUTRA | Frequency of Cell 2 | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.3.2.3.2.5 Test requirement

Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2 define the primary level settings for Redirection from NR to E-UTRAN test case.

**Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 1)**

| **Parameter** | | **Unit** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| SSB Configuration | Config 1,4 | | SSB.1 FR1 | |
| | Config 2,5 | | SSB.1 FR1 | |
| | Config 3,6 | | SSB.2 FR1 | |
| CSI-RS for tracking | Config 1,4 | | TRS.1.1 FDD | |
| | Config 2,5 | | TRS.1.1 TDD | |
| | Config 3,6 | | TRS.1.2 TDD | |
| TDD configuration | Config 1,4 | | Not Applicable | |
| | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | |
| | Config 2,5 | | SR.1.1 TDD | |
| | Config 3,6 | | SR2.1 TDD | |
| CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | |

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| | Config 3,6 | | CR2.1 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| SMTC configuration | Config 1,2,4,5 | | SMTC.1 FR1 | |
| | Config 3,6 | | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 1 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -64.59 | -64.59 |
| | Config 3,6 | dBm/ 38.16MHz | -58.49 | -58.49 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration Note1 | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration Note1 | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration Note2 | | 1, 2, 3 | 4 | |
| | | 4, 5, 6 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note3 | | 1, 2, 3 | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD | |
| | | 4, 5, 6 | 5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD | |
| | | 1, 2, 3 | 5MHz: R.11 FDD | |

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | | 10MHz: R.6 FDD<br>20MHz: R.10 FDD | |
| | | 4, 5, 6 | 5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1, 2, 3 | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 4 |
| RSRP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -94 |
| Io[Note6] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -70.22 | -64.76 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_E\text{-}UTRA} = T_{RRC_procedure_delay} + T_{identify\text{-}E\text{-}UTRA} + T_{SI\text{-}E\text{-}UTRA} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify\text{-}E\text{-}UTRA}$ = 800 ms in the test.

$T_{SI\text{-}E\text{-}UTRA}$ = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target E-UTRAN cell.

$T_{RACH}$ = 15 ms in the test.

This gives a total of 2205 ms.

## 6.3.2.4 LTM PDCCH-order Random Access

### 6.3.2.4.0 Minimum conformance requirements

When PRACH transmission is triggered by PDCCH order on target LTM cell,

- During RACH transmission, the UE is allowed an interruption on activated serving cell's DL slot(s) overlapped with RACH occasion depending on UE capability.
- Before and after PRACH transmission, UE is allowed an interruption on any activated serving cell as follows:
  - an interruption on any active serving cell:
    - of up to the duration shown in table 6.3.2.4.0-1, if PRACH bandwidth is outside active UL BWP but within one of configured UL BWPs of any active serving cell, or
    - of up to ceil(Y/NR Slot length)+1 slots, where Yms as reported in UE capability, if PRACH bandwidth is outside any of the configured UL BWPs of any active serving cell

**Table 6.3.2.4.0-1: Interruption duration due to PDCCH ordered RACH on target LTM cell when PRACH bandwidth is outside active UL BWP but within one of configured UL BWPs of any active serving cell**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |
| 2 | 0.25 | 4 |
| 3 | 0.125 | 6 |

The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$. The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna. $N_{\text{TA}}$ for PRACH is defined as 0.

$(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. $N_{\text{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\text{TA offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range. $N_{\text{TA offset}}$ is defined in Table 6.3.2.4.0-2.

**Table 6.3.2.4.0-2: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR1 FDD or TDD band with neither E-UTRA–NR nor NB-IoT–NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case | 0 (Note 1) |
| FR1 TDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| Note 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band.<br>Note 2: Void | |

### 6.3.2.4.1 NR SA FR1 PDCCH-order RACH on neighbour cell when RACH BW is within active UL BWP

#### 6.3.2.4.1.1 Test Purpose

This test is to verify the requirement for PDCCH-order RACH on neighbour cell in FR1 when RACH BW is within active UL BWP specified in TS 38.213 [8] clause 8.1 and UE transmit timing in TS 38.133 [6] clause 7.1 for UE supporting *rach-EarlyTA-Measurement-r18*.

#### 6.3.2.4.1.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less, L1-RSRP measurement and report, as well as interruptions caused by PDCCH order from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of 3 subtests, and the UE is required to pass one among them.

#### 6.3.2.4.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.4.1.

#### 6.3.2.4.1.4 Test description

##### 6.3.2.4.1.4.1 Initial conditions

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table 6.3.2.4.1.4-1. No gap patterns are configured in the test case.

**Table 6.3.2.4.1.4-1: PDCCH order RACH on Neighbour cell in FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Candidate cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Candidate cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Candidate: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.4.1.4-2.

**Table 6.3.2.4.1.4-2: Initial conditions for PDCCH-order RACH on Neighbour cell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.4.1.4-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | No fader. | | |

1. Message contents are defined in clause 6.3.2.4.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). Cell 2 is the NR FR1 neighbour cell. The UE has to report L3 measurement results and performs SSB based L1-RSRP measurement on Cell 2.

##### 6.3.2.4.1.4.2 Test procedure

This test case contains 3 tests (Test 1, 2, and 3) and UE may have to pass one of the tests based on the defined conditions.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.3.2.4.1.5-1 and 6.3.2.4.1.5-2.

3. The UE shall establish a connection setup with SS Cell 1, the random access procedure within the connection setup is used in the test.

4. The SS shall transmit an RRCReconfiguration message to configure event A3 triggered measurement reporting.

5. The UE shall transmit a MeasurementReport message triggered by Event A3.

6. The SS sends LTM-Candidate-r18 for Cell 2.

7. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2, and UE shall report a valid L1-RSRP result of Cell 2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 3.

8. Test 1: Joint TCI state configuration

   8.1. T1 starts from UE transmitting a valid L1 report of Cell 2.

   8.2. The SS sends TCI state activation MAC CE to active CandidateTCI-State#1 of Cell 2 no later than T1 + 100 ms.

   8.3. The start of T2 is the instant when DCI 1_0 PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE. The SS change the parameters according to T2 in Table 6.3.2.4.1.5-1 and 6.3.2.4.1.5-2. The SS shall schedule on Cell 1 continuously for both UL and DL at available slots.

   8.4. The UE shall transmit the PRACH preamble to Cell 2. If the UE transmits the PRACH preamble in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{\mathrm{SSB}}$ (specified in clause 6.3.2.4.1.5) from the beginning of T2, then count a success for the event "PRACH occasion". Otherwise count a fail for the event "PRACH occasion".

   8.5. If the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ (specified in clause 6.3.2.4.1.5) of the first detected path of DL SSB of Cell 2, then count a success for the event "PRACH timing". Otherwise, count a fail for the event "PRACH timing".

   8.6. During T2, if UL DTX is only observed by the SS within [the overlapped slot to transmit PRACH] and 2 symbols before and after the PRACH occasion, and DL DTX is only observed by the SS within the overlapped slot to transmit PRACH, then count a success for the event "Pcell DTX". Otherwise, count a fail for the event "Pcell DTX".

   8.7. Repeat step 1-8 until a test verdict has been achieved.

9. Test 2: Separate TCI state configuration

   Test steps are the same as Step 8 with following exceptions:

   9.2. The SS sends TCI state activation MAC CE to active CandidateTCI-State#1 and CandidateTCI-UL-State #1 of Cell 2 no later than T1 + 100 ms.

   Repeat step 1-7 and 9 until a test verdict has been achieved.

10. Test 3: No candidate TCI state configurations

    Test steps are the same as Step 8 with following exceptions:

    The SS shall not send any TCI state activation MAC CE to active TCI state of Cell 2.

    Repeat step 1-7 and 10 until a test verdict has been achieved.

The rate of correct events observed during repeated tests shall be at least 90%.

Each of the events "PRACH occasion", "Pcell DTX" as well as "PRACH timing" are evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 6.3.2.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.3.2.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 with conditions INTRA-FREQ, SSB Index<br>Table A.7.1-2<br>Table H.3.12-1 with Condition L1-RSRP<br>Table H.3.12-2 with Condition L1-RSRP<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO (Test 1 and 2)<br>Table H.3.12-4<br>Table H.3.12-5 for Cell 1<br>Table H.3.12-6, Table H.3.12-7 and Table H.3.12-13 with SSB-Index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint and Early DL Sync for Test 1<br>Table H.3.12-10 with Condition Separate for Test 2<br>Table H.3.12-12 for Cell 2<br>PDCCH configuration: Table A.1.3.1-1 CCR 1.2 FDD for test 1, Table A.1.3.2-1 CCR 1.2 TDD for test 2 and Table A.1.3.2-2 CCR 2.4 FDD for test 3 with following exceptions: aggregation level 16, allocated RB 48. |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.4.1.4.3-2: ReportConfigNR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -12 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | True | | |
| } | | | |
| } | | | |

**Table 6.3.2.4.1.4.3-3: CandidateTCI-State-r18**

| Derivation path: Table H.3.12-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CandidateTCI-State-r18 ::= SEQUENCE { | | | |
| tci-StateId-r18 | TCI-StateId-LTM(Id) | | |
| qcl-Type1-r18 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| referenceSignal-r18 CHOICE { | | | |
| ssb-Index | 0 | | Id = 0 or 2 |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) specified in TS 38.508-1[14], table 7.3.1-11 | | Id = 1 or 3 |
| } | | | |
| qcl-Type-r18 | typeA | | |
| } | | | |
| qcl-Type2-r18 | Not present | | |
| PathlossReferenceRS-Id-r18 | Not present | | Id = 2 or 3 |
| | 0 | | Id = 0 or 1 |
| tag-Id-ptr-r18 | Not present | | |
| ul-powerControl-r18 | Not present | | |
| } | | | |

#### 6.3.2.4.1.5 Test requirement

Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table 6.3.2.4.1.5-1, and 6.3.2.4.1.5-2.

**Table 6.3.2.4.1.5-1: General test parameters for PDCCH order RACH in FR1**

| Parameter | | Unit | Value | | | Comment |
|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | |
| Initial conditions | Active cell | | Cell 1 | | | |
| | Neighbouring cell | | Cell 2 | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 1 | | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | -6 | | | |
| Hysteresis | | dB | 0 | | | |
| Time To Trigger | | ms | 0 | | | |
| Filter coefficient | | | 0 | | | L3 filtering is not used |
| DRX | | | OFF | | | DRX is not used |
| Time offset between cells | | | 2 μs | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | | Same as Cell 1 |
| | PRACH configuration | | FR1 PRACH configuration 5 | | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | | |
| | n-TimingAdvanceOffset | Tc | 25600 | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | |
| | spCellInclusion | | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DlorJointTCI.State.0 | DlorJointTCI.State.2 | N/A | As specified in TS 38.133 [6] clause A.3.16B. Configured for early TCI state activation for test 1 and test 2. |
| Ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | N/A | As specified in TS 38.133 [6] clause A.3.16B. Configured for early TCI state activation for test 2. |
| Ltm-ConfigComplete | | | True | | | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | | | |
| T2 | | s | ≤0.5 | | | |

**Table 6.3.2.4.1.5-2: Cell specific test parameters for PDCCH order RACH test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | N/A | |
| | Config 3 | | SR.2.1 TDD | | N/A | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | N/A | |
| | Config 3 | | CR.2.1 TDD | | N/A | |
| CP length | | | Normal | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | -0.64 | -0.64 | -0.64 | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
| | Config 3 | dBm/ 38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |

| Propagation condition | - | AWGN | AWGN |
|---|---|---|---|
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{SSB}$ from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: $N_{T,2} + T_{BWPswitchDelay} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB\ preparation}$, where:

- $N_{T,2}$ is a time duration of $N_2$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming $\mu$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [9].

- $T_{BWPswitchDelay}$ = 0, $T_{switch}$ = 0, $\Delta_{RF/BB\ preparation}$ = 0

- $\Delta_{Delay}$ = 0.5ms

- $T_{SSB}$ = 0 for UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*, otherwise $T_{SSB} = T_{first-SSB_RACH} + T_{SSB-proc}$ , where $T_{first-SSB_RACH}$ is the time to first SSB after 1 slot from the end of the slot that UE receives PDCCH-order , and $T_{SSB-proc}$ = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and *N* symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [8], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

a. The $N_{TA_offset}$ value (in $T_c$ units) is 25600

b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in TS 38.133 [6] Table 7.1.2-1.

The rate of correct events observed during repeated tests shall be at least 90%.

### 6.3.2.4.2 NR SA FR1 PDCCH-ordered RACH to an inter-frequency candidate cell for LTM

#### 6.3.2.4.2.1 Test Purpose

This test is to verify the requirement for the NR FR1-NR FR1 PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM. This test is for UE supporting PDCCH-ordered RACH to an inter-frequency candidate cell, whose SSB is outside active BWPs of the UE.

#### 6.3.2.4.2.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less, L1-RSRP measurement and report, as well as interruptions caused by PDCCH order from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of 2 subtests, and the UE is required to pass one among them.

#### 6.3.2.4.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.4.2.

#### 6.3.2.4.2.4 Test description

##### 6.3.2.4.2.4.1 Initial conditions

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency from the PCell. Test configurations are given in Table 6.3.2.4.2.4-1. Measurement gap patterns are configured in the test case and the SSB of Cell2 is outside the active BWP of Cell 1. The PCell is continuously scheduled during the whole test.

**Table 6.3.2.4.2.4-1: Inter-frequency PDCCH-ordered RACH from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.4.2.4-2.

**Table 6.3.2.4.2.4-2: Initial conditions for PDCCH-order RACH on Neighbour cell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.4.2.4-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | No fader. | | |

1. Message contents are defined in clause 6.3.2.4.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). Cell 2 is the NR FR1 neighbour cell.

#### 6.3.2.4.2.4.2 Test procedure

This test case contains 2 tests and UE is required to pass one among Test 1, Test 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.3.2.4.2.5-1 and 6.3.2.4.2.5-2.
3. The UE shall establish a connection setup with SS Cell1, the random access procedure within the connection setup is used in the test.
4. The SS shall transmit an RRCReconfiguration message to configure event A3 triggered measurement reporting.
5. The UE shall transmit a MeasurementReport message triggered by Event A3.
6. The SS sends LTM-Candidate-r18 for Cell 2.
7. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2, and UE shall report a valid L1-RSRP result of Cell 2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2.

8. Test 1: Joint TCI state configuration

8.1. T1 starts when UE receiving candidate cell TCI state activation MAC CE to active CandidateTCI-State#1 for Cell 2.

8.2. The start of T2 is the instant when DCI 1_0 PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE. The SS change the parameters according to T2 in Table 6.3.2.4.2.5-1 and 6.3.2.4.2.5-2. The SS shall schedule on Cell 1 continuously for both UL and DL at available slots.

8.3. The UE shall transmit the PRACH preamble to Cell 2. If the UE transmits the PRACH preamble in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{\mathrm{SSB}}$ (specified in clause 6.3.2.4.2.5) from the beginning of T2, then count a success for the event "PRACH occasion". Otherwise count a fail for the event "PRACH occasion".

8.4. If the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ (specified in clause 6.3.2.4.2.5) of the first detected path of DL SSB of Cell 2, then count a success for the event "PRACH timing". Otherwise, count a fail for the event "PRACH timing".

8.5. During T2, if UL DTX is only observed by the SS within the overlapped slot to transmit PRACH and 2 symbols before and after the PRACH occasion, and DL DTX is only observed by the SS within the overlapped slot to transmit PRACH, then count a success for the event "Pcell DTX". Otherwise, count a fail for the event "Pcell DTX".

8.6. Repeat step 1-8 until a test verdict has been achieved.

9. Test 2: No candidate TCI state configurations

Test steps are the same as Step 8 with following exceptions:

T1 is skipped in Test 2. The SS shall not send any TCI state activation MAC CE to active TCI state of Cell 2.

Repeat step 1-7 and 9 until a test verdict has been achieved.

The rate of correct events observed during repeated tests shall be at least 90%.

Each of the events "PRACH occasion", "Pcell DTX" as well as "PRACH timing" are evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

Note: PDCCH order is not expected on the frame with SFN mod 8 =3.

#### 6.3.2.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.3.2.4.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with conditions INTER-FREQ, SSB Index<br>Table A.7.1-1 with PRACH.6 FR1<br>Table 9.1.2-1 in 38.133 [6] pattern ID 1<br>Table H.3.12-1 with Condition L1-RSRP<br>Table H.3.12-2 with Condition L1-RSRP<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO (Test 1)<br>Table H.3.12-4<br>Table H.3.12-5 for Cell 1<br>Table H.3.12-6, Table H.3.12-7 and Table H.3.12-13 with SSB-Index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint and Early DL Sync for Test 1<br>Table H.3.12-10 with Condition Separate for Test 2<br>Table H.3.12-12 for Cell 2<br>PDCCH configuration: Table A.1.3.1-1 CCR 1.2 FDD for test 1, Table A.1.3.2-1 CCR 1.2 TDD for test 2 and Table A.1.3.2-2 CCR 2.4 FDD for test 3 with following exceptions: aggregation level 16, allocated RB 48. |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.4.2.4.3-2: ReportConfigNR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -22 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | True | | |
| } | | | |
| } | | | |

**Table 6.3.2.4.2.4.3-3: *MeasGapConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with condition GAP_FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR1 CHOICE { | | | |
| setup SEQUENCE { | | | |
| mgrp | ms80 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.2.4.2.4.3-4: CandidateTCI-State-r18**

| Derivation path: Table H.3.12-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CandidateTCI-State-r18 ::= SEQUENCE { | | | |
| tci-StateId-r18 | TCI-StateId-LTM(Id) | | |
| qcl-Type1-r18 ::= SEQUENCE { | | | |
| referenceSignal-r18 CHOICE { | | | |
| ssb-Index | 0 | | Id = 0 or 2 |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) specified in TS 38.508-1[14], table 7.3.1-11 | | Id = 1 or 3 |
| } | | | |
| qcl-Type-r18 | typeA | | |
| } | | | |
| qcl-Type2-r18 | Not present | | |
| PathlossReferenceRS-Id-r18 | Not present | | Id = 2 or 3 |
| | 0 | | Id = 0 or 1 |
| tag-Id-ptr-r18 | Not present | | |
| ul-powerControl-r18 | Not present | | |
| } | | | |

6.3.2.4.2.5 Test requirement

Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table 6.3.2.4.2.5-1 and 6.3.2.4.2.5-2.

**Table 6.3.2.4.2.5-1: General test parameters for Inter-frequency PDCCH-ordered RACH test from FR1 to FR1 from FR1 to FR1**

| **Parameter** | | **Unit** | **Value** | | **Comment** |
|---|---|---|---|---|---|
| | | | **Test 1** | **Test 2** | |
| Initial conditions | Active cell | | Cell 1 | | |
| | Neighbouring cell | | Cell 2 | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 1 | | |
| A3-Offset | | dB | -11 | | Original value is -6 dB, change to -11 dB after TT Analysis |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| Measurement gap periodicity | | ms | 80 | | |
| DRX | | | OFF | | DRX is not used |
| Access Barring Information | | - | Not Sent | | No additional delays in random access procedure. |
| Time offset between cells | | | 2 μs | | RTD between cells is less than CP |
| reportQuantityRS-Indexes | | | Rsrp | | |
| maxNrofRS-IndexesToReport | | | 1 | | |
| includeBeamMeasurements | | | True | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 2 | | Cell 2 |
| | PRACH configuration | | FR1 PRACH configuration 6 | | |

| | | | | | |
|---|---|---|---|---|---|
| | bwp-GenericParameters | | ULBWP.0.1 | | |
| | n-TimingAdvanceOffset | Tc | 25600 | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DLorJoint TCI.State.0 | N/A | As specified in TS 38.133 [6] clause A.3.16B.<br>In test 1, CandidateTCI-State#1 is configured for early TCI state activation.<br><br>In test 2, CandidateTCI-State#1 is configured for TCI state indication in cell switch command. |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | ≤0.1 | | |
| T2 | | s | ≤0.2 | | |

**Table 6.3.2.4.2.5-2: Cell specific test parameters for NR FR1-FR1 Inter-frequency PDCCH-ordered RACH test**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1-T2 | T1-T2 |
| NR RF Channel Number | | | 1 | 2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | |
| TRS configuration for serving cell | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH configuration | | | FR1 PRACH configuration 6 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |

| | | | | |
|---|---|---|---|---|
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 4 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -94 |
| | Config 3 | dBm/SCS | -87 | -91 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -64.59 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -58.49 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{SSB}$ from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: $N_{T,2} + T_{BWPswitchDelay} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB\ preparation}$, where:

- $N_{T,2}$ is a time duration of $N_2$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming $\mu$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [9].

- $T_{BWPswitchDelay}$ = 0, $T_{switch}$ = 0

- $\Delta_{Delay}$ = 0.5ms

- $\Delta_{RF/BB\ preparation}$ is defined in 6.2.2C

- $T_{SSB}$ = 0 for UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*, otherwise $T_{SSB} = T_{first-SSB_RACH} + T_{SSB-proc}$, where $T_{first-SSB_RACH}$ is the time to first SSB occasion overlapped with MGL after 2ms and 1 slot from the end of the slot that UE receives PDCCH-order, and $T_{SSB-proc}$ = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside ceil (Y/NR Slot length) +1 slots before and after PRACH transmission and the same slot of PRACH, where Y as reported in *pdcch-RACH-SwitchingTimeList-r18*.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

a. The $N_{TA_offset}$ value (in $T_c$ units) is 25600

b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in TS 38.133 [6] Table 7.1.2-1.

The rate of correct events observed during repeated tests shall be at least 90%.

### 6.3.2.4.3 NR SA FR1 PDCCH-order RACH on neighbour cell without L1-RSRP measurement when RACH BW is within active UL BWP

#### 6.3.2.4.3.1 Test Purpose

This test is to verify the requirement for PDCCH-order RACH on neighbour cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP specified in TS 38.213 [8] clause 8.1 and UE transmit timing in TS 38.133 [6] clause 7.1 for UE supporting *rach-EarlyTA-Measurement-r18.*

#### 6.3.2.4.3.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less and interruptions caused by PDCCH order from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of 3 subtests, and the UE is required to pass one among them.

#### 6.3.2.4.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.4.3.

#### 6.3.2.4.3.4 Test description

##### 6.3.2.4.3.4.1 Initial conditions

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table 6.3.2.4.3.4-1. No gap patterns are configured in the test case.

**Table 6.3.2.4.3.4-1: PDCCH order RACH on Neighbour cell in FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Candidate cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Candidate cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Candidate: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.4.3.4-2.

**Table 6.3.2.4.3.4-2: Initial conditions for PDCCH-order RACH on Neighbour cell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.4.3.4-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | No fader. | | |

1. Message contents are defined in clause 6.3.2.4.3.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). Cell 2 is the NR FR1 neighbour cell. The UE has to report L3 measurement results on Cell 2.

#### 6.3.2.4.3.4.2 Test procedure

This test case contains 3 tests (Test 1, 2, and 3) and UE may have to pass one of the tests based on the defined conditions.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.3.2.4.3.5-1 and 6.3.2.4.3.5-2.

3. The UE shall establish a connection setup with SS Cell 1, the random access procedure within the connection setup is used in the test.

4. The SS shall transmit an RRCReconfiguration message to configure event A3 triggered measurement reporting.

5. The UE shall transmit a MeasurementReport message triggered by Event A3.

6. The SS sends LTM-Candidate-r18 for Cell 2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 3.

7. Test 1: Joint TCI state configuration

   7.1. T1 starts from UE transmitting a L3 report of Cell 2.

   7.2. The SS sends TCI state activation MAC CE to active CandidateTCI-State#1 of Cell 2 no later than T1 + 100 ms.

   7.3. The start of T2 is the instant when DCI 1_0 PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE. The SS change the parameters according to T2 in Table 6.3.2.4.3.5-1 and 6.3.2.4.3.5-2. The SS shall schedule on Cell 1 continuously for both UL and DL at available slots.

   7.4. The UE shall transmit the PRACH preamble to Cell 2. If the UE transmits the PRACH preamble in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{\mathrm{SSB}}$ (specified in clause 6.3.2.x.3.5) from the beginning of T2, then count a success for the event "PRACH occasion". Otherwise count a fail for the event "PRACH occasion".

   7.5. If the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ (specified in clause 6.3.2.4.3.5) of the first detected path of DL SSB of Cell 2, then count a success for the event "PRACH timing". Otherwise, count a fail for the event "PRACH timing".

   7.6. During T2, if UL DTX is only observed by the SS within the overlapped slot to transmit PRACH and 2 symbols before and after the PRACH occasion, and DL DTX is only observed by the SS within the overlapped slot to transmit PRACH, then count a success for the event "Pcell DTX". Otherwise, count a fail for the event "Pcell DTX".

   7.7. Repeat step 1-7 until a test verdict has been achieved.

8. Test 2: Separate TCI state configuration

   Test steps are the same as step 7 with following exceptions:

   8.2. The SS sends TCI state activation MAC CE to active CandidateTCI-State#1 and CandidateTCI-UL-State #1 of Cell 2 no later than T1 + 100 ms.

   Repeat step 1-6 and 8 until a test verdict has been achieved.

9. Test 3: No candidate TCI state configurations

   Test steps are the same as Step 7 with following exceptions:

   The SS shall not send any TCI state activation MAC CE to active TCI state of Cell 2.

Repeat step 1-6 and 9 until a test verdict has been achieved.

The rate of correct events observed during repeated tests shall be at least 90%.

Each of the events "PRACH occasion", "Pcell DTX" as well as "PRACH timing" are evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 6.3.2.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.3.2.4.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 with conditions INTRA-FREQ<br>Table A.7.1-2<br>Table H.3.12-1<br>Table H.3.12-2<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO (Test 1 and 2)<br>Table H.3.12-6, Table H.3.12-7 and Table H.3.12-13 with SSB-Index = 0<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint and Early DL Sync for Test 1<br>Table H.3.12-10 with Condition Separate for Test 2<br>Table H.3.12-12 for Cell 2<br>PDCCH configuration: Table A.1.3.1-1 CCR 1.2 FDD for test 1, Table A.1.3.2-1 CCR 1.2 TDD for test 2 and Table A.1.3.2-2 CCR 2.4 FDD for test 3 with following exceptions: aggregation level 16, allocated RB 48. |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.4.3.4.3-2: ReportConfigNR**

| Derivation path: Table H.3.12-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CandidateTCI-State-r18 ::= SEQUENCE { | | | |
| tci-StateId-r18 | TCI-StateId-LTM(Id) | | |
| qcl-Type1-r18 ::= SEQUENCE { | | | |
| referenceSignal-r18 CHOICE { | | | |
| ssb-Index | 0 | | Id = 0 or 2 |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) specified in TS 38.508-1[14], table 7.3.1-11 | | Id = 1 or 3 |
| } | | | |
| qcl-Type-r18 | typeA | | |
| } | | | |
| qcl-Type2-r18 | Not present | | |
| PathlossReferenceRS-Id-r18 | Not present | | Id = 2 or 3 |
| | 0 | | Id = 0 or 1 |
| tag-Id-ptr-r18 | Not present | | |
| ul-powerControl-r18 | Not present | | |
| } | | | |

**Table 6.3.2.4.3.4.3-3: CandidateTCI-State-r18**

| Derivation path: Table H.3.12-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CandidateTCI-State-r18 ::= SEQUENCE { | | | |
| tci-StateId-r18 | TCI-StateId-LTM(Id) | | |
| qcl-Type1-r18 ::= SEQUENCE { | | | |
| referenceSignal-r18 CHOICE { | | | |
| ssb-Index | 0 | | Id = 0 or 2 |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) specified in TS 38.508-1[14], table 7.3.1-11 | | Id = 1 or 3 |
| } | | | |
| qcl-Type-r18 | typeA | | |
| } | | | |
| qcl-Type2-r18 | Not present | | |
| PathlossReferenceRS-Id-r18 | Not present | | Id = 2 or 3 |
| | 0 | | Id = 0 or 1 |
| tag-Id-ptr-r18 | Not present | | |
| ul-powerControl-r18 | Not present | | |
| } | | | |

6.3.2.4.3.5 Test requirement

Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table 6.3.2.4.3.5-1 and 6.3.2.4.3.5-2.

**Table 6.3.2.4.3.5-1: General test parameters for PDCCH order RACH in FR1**

| **Parameter** | | **Unit** | **Value** | | | **Comment** |
|---|---|---|---|---|---|---|
| | | | **Test 1** | **Test 2** | **Test 3** | |
| Initial conditions | Active cell | | Cell 1 | | | |
| | Neighbouring cell | | Cell 2 | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 1 | | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | -6 | | | |
| Hysteresis | | dB | 0 | | | |
| Time To Trigger | | ms | 0 | | | |
| Filter coefficient | | | 0 | | | L3 filtering is not used |
| DRX | | | OFF | | | DRX is not used |
| Time offset between cells | | | 2 µs | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | | Same as Cell 1 |
| | PRACH configuration | | FR1 PRACH configuration 5 | | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | | |
| | n-TimingAdvanceOffset | Tc | 25600 | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DlorJointTCI.State.0 | DlorJointTCI.State.2 | N/A | As specified in TS 38.133 [6] clause A.3.16B. Configured for early TCI state activation for test 1 and test 2. |
| Ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | N/A | As specified in TS 38.133 [6] clause A.3.16B. Configured for early TCI state activation for test 2. |
| Ltm-ConfigComplete | | | True | | | Candidate cell's configuration is complete configuration |

| | | | |
|---|---|---|---|
| T1 | s | 0.3 | |
| T2 | s | ≤0.5 | |

**Table 6.3.2.4.3.5-2: Cell specific test parameters for PDCCH order RACH test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | N/A | |
| | Config 3 | | SR.2.1 TDD | | N/A | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | N/A | |
| | Config 3 | | CR.2.1 TDD | | N/A | |
| CP length | | | Normal | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | -0.64 | -0.64 | -0.64 | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Io[Note3] | Config 1,2 | dBm/ 9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
| | Config 3 | dBm/ 38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| Propagation condition | | - | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after $N_{T,2}$ + 0.5ms + $T_{SSB}$ from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: $N_{T,2} + T_{BWPswitchDelay} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB\ preparation}$, where:

- $N_{T,2}$ is a time duration of $N_2$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming $\mu$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [9].

- $T_{BWPswitchDelay}$ = 0, $T_{switch}$ = 0, $\Delta_{RF/BB\ preparation}$ = 0

- $\Delta_{Delay}$ = 0.5ms

- $T_{SSB}$ is the time to first SSB occasion, after 1slot from the end of the slot of the PDCCH plus 2ms (SSB processing time).

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and *N* symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [8], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB of Cell 2.

a. The $N_{TA_offset}$ value (in $T_c$ units) is 25600

b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in TS 38.133 [6] Table 7.1.2-1.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.3.3 Conditional handover

### 6.3.3.0 Minimum conformance requirements

#### 6.3.3.0.1 Minimum conformance requirements for NR FR1 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

- a condition exists at the measurement reference point which will trigger the conditional handover, or
- a condition exists at the measurement reference point which will trigger the NES-based conditional handover

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

The NES-based conditional handover delay requirements shall apply if UE receives a RRC message implying NES-based conditional handover before receiving the NES indication in DCI 2-9 command.

UE is not expected to receive a NES indication in DCI 2-9 command before receiving a RRC message implying NES-based conditional handover. When UE receives a RRC message implying NES-based conditional handover but no NES indication in DCI 2-9 command, no NES-based conditional handover requirement is applied. The NES indication is specified in clause 5.5.4 in TS 38.331 [13].

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a handover to a target cell and interruption time starts.

For conditional intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

For NES-based conditional intra-frequency handover:

- If UE successfully decodes DCI 2-9 command earlier than the time at the end of $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, then the measurement time delay equal to $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$
- If UE successfully decodes DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, and the condition of NES-based CHO keeps existing till UE receiving the DCI 2-9 command, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until UE successfully decodes DCI 2-9 command.When TTT or L3 filtering is used an additional delay can be expected.
- If UE successfully decodes DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, and the condition of NES-based CHO is not met when receiving the DCI 2-9 command, then the measurement time delay equals to the time span from the end of $T_{Event_DU}$ until a condition keeps existing for $T_{SSB\ measurement\ period_intra}$ which will immediately trigger the NES-based conditional handover after DCI 2-9.A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover.

For conditional handover, it starts after UE realizes the condition of CHO is met and identity of the target cell is determined.

For NES-based conditional handover,

- It starts after UE realizes the condition of CHO is met and identity of the target cell is determined provided that UE has already successfully decoded DCI 2-9.

- Otherwise, it starts after UE successfully decodes DCI 2-9.

And $T_{CHO_execution}$ can be up to 10ms.[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell. [TS 38.133 [6], clause 9.2.2]

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.2.5.1-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.2.5.1-3.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in TS 38.133[6] Table 9.2.5.2-1.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

**Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range 1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 [Note 2]x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.<br>NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 9.2.5.1-3: Time period for time index detection (Frequency range 1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 [Note 2] x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1<br>NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

[TS 38.133, clause 9.2.5.2]

The measurement period for intra-frequency measurements without gaps is as shown in TS 38.133 [6] Table 9.2.5.2-1.

**Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps(FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

### 6.3.3.0.2 Minimum conformance requirements for NR FR1 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover. - a condition exists at the measurement reference point which will trigger the conditional handover, or

- a condition exists at the measurement reference point which will trigger the NES-based conditional handover

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

The NES-based conditional handover delay requirements shall apply if UE receives a RRC message implying NES-based conditional handover before receiving the NES indication in DCI 2-9 command.

UE is not expected to receive a NES indication in DCI 2-9 command before receiving a RRC message implying NES-based conditional handover. When UE receives a RRC message implying NES-based conditional handover but no NES indication in DCI 2-9 command, no NES-based conditional handover requirement is applied. The NES indication is specified in clause 5.5.4 in TS 38.331 [13].

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a handover to a target cell and interruption time starts.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$ defined in clause 9.3.4.

For NES-based conditional inter-frequency handover:

- If UE successfully decodes DCI 2-9 command earlier than the time at the end of $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, and the condition of NES-based CHO keeps existing till UE receiving the DCI 2-9 command, then the measurement time delay equal to $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$

- If UE successfully decodes DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until UE successfully decodes DCI 2-9 command.

- If UE successfully decodes DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, and the condition of NES-based CHO is not met when receiving the DCI 2-9 command, then the measurement time delay equals to the time span from the end of $T_{Event_DU}$ until a condition keeps existing for $T_{SSB\ measurement\ period_inter}$ which will immediately trigger the NES-based conditional handover after DCI 2-9.When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover.

For conditional handover, it starts after UE realizes the condition of CHO is met and identity of the target cell is determined.

For NES-based conditional handover,

- It starts after UE realizes the condition of CHO is met and identity of the target cell is determined provided that UE has already successfully decoded DCI 2-9.

- Otherwise, it starts after UE successfully decodes DCI 2-9.

And $T_{CHO_execution}$ can be up to 10ms.[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

[TS 38.133, clause 9.3.2]

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 for FR1, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index.}$

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-1.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-3.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-1.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

**Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range 1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $Max(600ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(600ms, Ceil(8*1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $8 \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 9.3.4-3: Time period for time index detection (Frequency range 1)**

| Condition NOTE1,2 | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | $Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(120ms, Ceil(3 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $3 \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter-frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

**Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | $Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $8 \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

### 6.3.3.0.3 Minimum conformance requirements for SA NR-DC FR1 Conditional handover including target MCG and target SCG

[TS 38.133, clause 6.1.6.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

This clause defines requirements for the delay within which the UE shall be able to conditional handover from NR cell to NR cell and changeNR PSCell in the meantime.

When the UE receives a RRC message implying conditional handover with PSCell,

- The UE shall be ready to start the transmission of the new uplink PRACH channel of the target PCell within $D_{CHOwithPSCell_PCell}$ ms from the end of the last TTI containing the RRC command, and
- The UE shall be capable of transmitting PRACH preamble towards the target PSCell no later than $D_{CHOwithPSCell_PSCell}$ ms from the end of the last TTI containing the RRC command.

$D_{CHOwithPSCell_PCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$

$D_{CHOwithPSCell_PSCell}$ is the PSCell change delay as stated below.

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in clause 6.1.4.4.2 of TS 38.133 [6].

$T_{CHO_execution}$ is the conditional execution preparation time in clause 6.1.4.4.3 of TS 38.133 [6].

$T_{interrupt}$ is the interruption time as stated in clause below.

[TS 38.133, clause 6.1.6.1.1]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

- $T_{IU}$, $T_{\Delta}$ and $T_{margin}$ are the same as defined in clause 6.1.4.4.4 of TS 38.133 [6].
- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period.

  For FR1-FR1 NR-DC to FR1-FR1 NR-DC, $T_{processing}$ = 30 ms if SMTC of the target unknown PSCell is configured in *targetcellSMTC-SCG-r16* but not configured in *reconfigurationWithSync*. Otherwise, $T_{processing}$ = 25 ms.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.4 for inter-frequency handover.

[TS 38.133, clause 6.1.6.1.2]

The requirements in this section shall apply for PSCell change during conditional handover with PSCell from NR DC to NR-DC.

When conditional handover with PSCell from NR-DC to NR-DC is commanded, the PSCell change time shall be less than $D_{CHOwithPSCell_PSCell}$:

- $D_{CHOwithPSCell_PSCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ ms

Where:

- $T_{RRC_delay}$, $T_{Event_DU}$, $T_{measure}$, $T_{CHO_execution}$ are the same as defined above.
- $T_{processing}$ is the same as defined above. $T_{search_PSCell}$ and $T_{PSCell_DU}$ are the same as defined in clause 8.9.2. - $T_{search_PCell_Conditional}$ is the time for obtaining the timing reference of target PCell. If SMTC of the target unknown PSCell is configured in *targetcellSMTC-SCG-r16* but not configured in *reconfigurationWithSync*, $T_{search_PCell_Conditional} = T_{\Delta} + T_{margin}$, where $T_{\Delta}$ and $T_{margin}$ are specified above Otherwise, $T_{search_PCell_Conditional}$ = 0 ms.
- $T_{\Delta_PSCell}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta_PSCell}$ = 1*Trs ms for a known or unknown PSCell.
- $T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

The $T_{rs}$ definition from clause 8.9.2 is modified as following for requirements in this section:

- $T_{rs}$ is the SMTC periodicity of the target NR cell if target PSCell is unknown and SMTC configuration of target unknown PSCell is present in either *targetcellSMTC-SCG-r16* or *reconfigurationWithSync*, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

PSCell known and unknown condition is as defined in clause 8.9.2.

[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

#### 6.3.3.0.4 Minimum conformance requirements for NR-DC SA FR1 Conditional handover including target MCG and candidate SCG

[TS 38.133, clause 6.1.7.1]

The purpose of NR Conditional handover including target MCG and candidate SCG for CPC is to change the NR PCell to another NR cell and change the PSCell along with PCell handover. The requirements in this clause are applicable to:

- FR1-FR1 NR-DC to FR1-FR1 NR-DC,

When the CHO execution condition is met but no CPC execution condition is met, and the UE has an available complementary CHO-only configuration, the UE executes CHO without CPC and the delay requirements for CHO defined in section 6.1.4 of TS 38.133[6] shall apply.

When the CHO execution condition is met but no CPC execution condition is met, and the UE has Rel-17 complementary CHO with SCG configuration, the UE executes Rel-17 CHO with SCG execution and the delay requirements for CHO with SCG defined in section 6.1.6 apply.

When the UE receives a RRC message implying conditional handover including target MCG and candidate SCG for CPC,

- The UE shall be ready to start the transmission of the new uplink PRACH channel of the target PCell within $D_{CHOwithCPC_PCell}$ ms from the end of the last TTI containing the RRC command, and

- The UE shall be capable of transmitting PRACH preamble towards the target PSCell no later than $D_{CHOwithCPC_PSCell}$ ms from the end of the last TTI containing the RRC command.

Where:

- $D_{CHOwithCPC_PCell}$ is the PCell conditional handover delay stated below.
- $D_{CHOwithCPC_PSCell}$ is the PSCell conditional change delay stated below.

[TS 38.133, clause 6.1.7.1.1 PCell conditional handover delay]

$D_{CHOwithCPC_PCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PCell} + T_{PCell_DU} + 2$ ms

- $T_{RRC_delay}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13] for processing the RRC command.
- $T_{Event_DU}$ in PCell and PSCell handover delay requirement is the delay uncertainty which is the time from when the UE successfully decodes the RRC command for CHO including target MCG and candidate SCG for CPC until conditions exist at the measurement reference point which will trigger the CHO and CPC.
- $T_{measure_PCell}$ is the measurements time stated in clause 6.1.7.1.1.1.
- $T_{measure_PSCell}$ is the measurements time stated in clause 6.1.7.1.2.1.
- $T_{UE_preparation}$ is the UE preparation time for conditional handover with conditional PSCell change, and starts at simultaneous execution of PCell handover and PSCell change to a target PCell and a target PSCell respectively after UE realizes the conditions of conditional PCell handover and conditional PSCell change are met and identities of the target PCell and PSCell are determined. $T_{UE_preparation}$ is up to 10ms.
- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period.

  For FR1-FR1 NR-DC to FR1-FR1 NR-DC, $T_{processing}$ = 25 ms.

- $T_{\Delta_PCell}$ is time for fine time tracking and acquiring full timing information of the target PCell. $T_{\Delta_PCell} = 1*T_{rs}$ ms.
- $T_{rs}$ is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in handover message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.
- $T_{PCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PCell. $T_{PCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

[TS 38.133, clause 6.1.7.1.1.1 Measurement time]

The measurement time delay for PCell is defined from the end of $T_{Event_DU}$ until UE realizes the condition of PCell handover is met and identity of new PCell is determined.

For intra-frequency PCell handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency PCell handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PCell handover or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PCell handover. If a cell, which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PCell handover or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PCell handover, becomes undetectable for a period and then the cell becomes detectable again and triggers a PCell handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.7.1.2 PSCell conditional change delay]

$D_{CHOwithCPC_PSCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ ms

- $T_{RRC_delay}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13] for processing the RRC command.
- $T_{Event_DU}$ in PCell and PSCell handover delay requirement is the delay uncertainty which is the time from when the UE successfully decodes the RRC command for CHO including target MCG and candidate SCG for CPC until conditions exist at the measurement reference point which will trigger the CHO and CPC.
- $T_{measure_PCell}$ is the measurements time stated in clause 6.1.7.1.1.1.
- $T_{measure_PSCell}$ is the measurements time stated in clause 6.1.7.1.2.1.
- $T_{UE_preparation}$ is the UE preparation time for conditional handover with conditional PSCell change, and starts at simultaneous execution of PCell handover and PSCell change to a target PCell and a target PSCell respectively after UE realizes the conditions of conditional PCell handover and conditional PSCell change are met and identities of the target PCell and PSCell are determined. $T_{UE_preparation}$ is up to 10ms.
- $T_{processing}$ is as specified above.
- $T_{\Delta_PSCell}$ is time for fine time tracking and acquiring full timing information of the target PSCell. $T_{\Delta_PSCell} = 1*T_{rs}$ ms.
  - $T_{rs}$ is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.
- $T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

[TS 38.133, clause 6.1.7.1.2.1 Measurement Time]

The measurement time delay for PSCell is defined from the end of $T_{Event_DU}$ until UE realizes the condition of PSCell change is met and identity of new PSCell is determined.

For intra-frequency PSCell change, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency PSCell change, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PCell handover or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PCell handover. If a cell, which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PCell handover or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PCell handover, becomes undetectable for a period and then the cell becomes detectable again and triggers a PCell handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

## 6.3.3.1 NR SA FR1 conditional handover

### 6.3.3.1.1 Test purpose

To verify the requirement for the NR FR1 intra-frequency conditional handover requirements specified in TS 38.133 [6] clause 6.1.4.2

### 6.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

#### 6.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.1.

#### 6.3.3.1.4 Test description

##### 6.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.1.4.1-1.

**Table 6.3.3.1.4.1-1: NR SA FR1 conditional handover test configurations**

| Config | Description |
|---|---|
| 6.3.3.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.1.4.1-2

**Table 6.3.3.1.4.1-2: Initial conditions for NR SA FR1 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.3.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.1.4.1-3: General test parameters NR SA FR1 conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset in condition | | dB | -1 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration index | | | FR1 PRACH configuration 1 | As specified in table Table 6.3.3.2-3 in TS 38.211 [7] |

| | | | |
|---|---|---|---|
| Time offset between cells | | 3 μs | Synchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤2 | |

#### 6.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.1.4.1-3 and 6.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of Cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than $T_{RRC}$ ms before the beginning of T2. No interruption shall be observed in time period T1, where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.1.5-1. T2 starts.

7. If

   a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.1-1
   - $X = T_{interrupt}$ for test configuration 6.3.3.1-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.1-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.3.1.4.3 Message contents

**Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.3.3.1.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.3.1.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 6.3.3.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.1.4.3-2: MeasConfig (Table 6.3.3.1.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 6.3.3.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.3.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 6.3.3.1.4.3-3: MeasObjectNR (Table 6.3.3.1.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.1.4.3-4: ReportConfigNR (Table 6.3.3.1.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -2 | actuall value = -2*0.5 = -1dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.1.4.3-5: ConditionalReconfiguration (Table 6.3.3.1.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.1.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration | | |

| | | | |
|---|---|---|---|
| | Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

### 6.3.3.1.5 Test requirements

Table 6.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.1.5-1: Cell specific test parameters for NR SA FR1 conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -2.41 | -Infinity | 1.36 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 10 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | -Infinity | -85 |
| Io[Note3] | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -50.56 | -55.31 | -50.56 |
| Propagation condition | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2.
where:

- $T_{measure}$ = 800 ms, is the measurements time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in TS 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 872 ms

The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

## 6.3.3.2 NR SA FR1-FR1 conditional handover

### 6.3.3.2.1 Test purpose

To verify the requirement for the NR conditional FR1-NR FR1 inter-frequency conditional handover requirements specified in TS 38.133 [6] clause 6.1.4.2.

### 6.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

### 6.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.2.

### 6.3.3.2.4 Test description

#### 6.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.2.4.1-1.

**Table 6.3.3.2.4.1-1: NR SA FR1-FR1 conditional handover test configurations**

| Config | Description |
|---|---|
| 6.3.3.2-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.2-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.2-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.2.4.1-2

**Table 6.3.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.3.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.2.4.1-3: General test parameters NR SA FR1-FR1 conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset in handover condition | | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |

### 6.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carrier and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.2.4.1-3 and 6.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of Cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than $T_{RRC}$ ms before the beginning of T2. No interruption shall be observed in time period T1, where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.2.5-1. T2 starts.

7. If

   c) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   d) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.2-1
   - $X = T_{interrupt}$ for test configuration 6.3.3.2-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.2-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.3.2.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.3.2.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 6.3.3.2.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.2.4.3-2: MeasConfig (Table 6.3.3.2.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 6.3.3.2.4.3-3 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 6.3.3.2.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.3.3.2.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 6.3.3.2.4.3-3: MeasObjectNR-f1 (Table 6.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 1 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.2.4.3-4: MeasObjectNR-f2 (Table 6.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 2 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.2.4.3-5: ReportConfigNR (Table 6.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -8 | actuall value = -8*0.5 = -4dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.2.4.3-6: ConditionalReconfiguration (Table 6.3.3.2.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.2.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

### 6.3.3.2.5 Test requirements

Table 6.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.2.5-1: Cell specific test parameters for NR SA FR1-FR1 conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| Gap pattern ID | | | gp0 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 6.70 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 6.70 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -91.30 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -88.30 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -62.51 |
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -56.40 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2.
where:

- $T_{measure}$ = 920 ms, is the measurements time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in TS 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 992 ms

The interruption during T2 shall not exceed $T_{interrupt}$ = 62ms.

### 6.3.3.3 NR SA FR1 conditional handover including target MCG and target SCG

Editor's Note: This test case is incomplete in following aspects:

- Message contents is TBD.

#### 6.3.3.3.1 Test purpose

The purpose of this test is to verify that UE can make correct NR-DC to NR-DC conditional handover including target MCG in FR1 and target SCG in FR1 as specified in clauses 6.1.6.1 of TS 38.133 [6].

#### 6.3.3.3.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards.

#### 6.3.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.3.

#### 6.3.3.3.4 Test description

##### 6.3.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.3.4.1-1.

**Table 6.3.3.3.4.1-1: Supported test configurations for NR-DC FR1 conditional handover including target MCG and target SCG**

| Config | Description |
|---|---|
| 1 | Source Cells (PCell and PSCell): FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target Cells (PCell and PSCell): FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source Cells (PCell and PSCell): FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target Cells (PCell and PSCell): FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source Cells (PCell and PSCell): FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target Cells (PCell and PSCell): FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.3.4.1-2

**Table 6.3.3.3.4.1-2: Initial conditions for NR-DC FR1 conditional handover including target MCG and target SCG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The power levels and settings for NR Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 3 and Cell 4 are NR FR1 target PCell and target PSCell respectively, and their power levels and settings are also set according to Annex C.1.2 and C.1.3.

2. The test parameters are given in Table 6.3.3.3.4.1-3 and 6.3.3.3.4.1-4 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.3.4.1-3: General test parameters for NR-DC FR1 PCell handover at conditional handover including target MCG and target SCG**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 3 | |

| | | | | |
|---|---|---|---|---|
| Final condition | Active cell | | Cell 3 | |
| A3-Offset in handover condition | | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Cell 1 and Cell 3 are synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |

**Table 6.3.3.3.4.1-4: General test parameters for NR-DC FR1 PSCell change at conditional handover including target MCG and target SCG**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 2 | |
| | Neighbouring cell | | Cell 4 | |
| Final condition | Active cell | | Cell 4 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Cell 2 and Cell 4 are Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤10 | |

### 6.3.3.3.4.2 Test procedure

The test scenario comprises four NR cells, source PCell (Cell 1) and source PSCell (Cell 2), target PCell (Cell 3), and target PSCell (Cell 4). Cell 1 and Cell 3 are on radio channel 1 in FR1. Cell 2 and Cell 4 are on radio channel 2 in FR1.The test consists of two successive time periods, with time durations of T1 and T2 respectively. General test parameters and cell specific parameters are given in Tables 6.3.3.3.4.1-3, 6.3.3.3.4.1-4, 6.3.3.3.5-1 and 6.3.3.3.5-2. No measurement gap is configured in the test case.

At the start of T1, the UE shall be connected to Cell 1 (source PCell) on radio channel 1 and Cell 2 (source PSCell) on radio channel 2. UE is not aware of any timing information of Cell 3 (target PCell) and Cell 4 (target PSCell).

NR shall configure a condition implying conditional handover to Cell 3 and Cell 4 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. UE shall be able to do inter-frequency conditional handover from NR-FR1 Cell 1 to NR-FR1 Cell 3 and intra-frequency PSCell change from NR-FR1 Cell 2 to NR-FR1 Cell 4.

$T_{RRC}$ = 16ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell 3 and Cell 4 become detectable. The condition for conditional PCell handover is met during T2. During T2, the UE performs measurement on Cell 3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active PCell and Cell 2 is the active PSCell. Set Cell 3 and Cell 4 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.3.4-1 and 6.3.3.3.4-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1, Cell 2 and monitoring corresponding ACK/NACK feedback sent by the UE.

3. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) and Cell 4 physical cell identity = ((current Cell 4 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for Cell 3 which is event A3 and subsequent PSCell change from Cell 2 to Cell 4.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting at T1 to power setting at T2 as specified in Table 6.3.3.3.5-1 and 6.3.3.3.5-2. T2 starts.

7. If

   a) The UE shall start to transmit the PRACH to Cell 3 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ =920 +57 +10=987 ms from the start of T2, and the interruption during T2 shall not exceeed $T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$=10+25+20+2=57ms,

   and

   b) The UE shall start to transmit the PRACH to Cell 4 less than $T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU}$ + 2 ms =920+10+25+0+ (3*20)+ 20+2=1037ms from the start of T2,

   and

   c) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 1 in Table 6.3.3.3.4.1-1
   - $X = T_{interrupt}$ for test configuration 2 in Table 6.3.3.3.4.1-1
   - $X = 2 \cdot T_{interrupt}$ for test configuration 3 in Table 6.3.3.3.4.1-1.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1 and Cell 2.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.3.3.4.3 Message Contents

FFS

### 6.3.3.3.5 Test requirements

Table 6.3.3.3.5-1 and Table 6.3.3.3.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.3.3.3.5-1: Cell specific test parameters for NR-DC FR1 PCell handover at conditional handover including target MCG and target SCG**

| Parameter | | Unit | Cell 1 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |

| | | | |
|---|---|---|---|
| DRx Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 |
| | Config 3 | | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 |
| | Config 3 | | 30 |
| PRACH configuration | | | FR1 PRACH configuration 1 |
| BWP | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1,2 | dBm/9.36MHz | -64.59 | -64.59 | -70.05 | -63.85 |
| | Config 3 | dBm/38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.3.3.5-2: Cell specific test parameters for NR-DC FR1 PSCell change at conditional handover including target MCG and target SCG**

| Parameter | | Unit | Cell 2 | | Cell 4 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 2 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note22 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95+TT | | -95+TT | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -63.85 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | | - | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

$T_{RRC} + T_{Event_DU}$ occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to

- Cell 3 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ =920 +57 +10=987 ms from the start of T2, and the interruption during T2 shall not exceeed $T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$=10+25+20+2=57ms.
- Cell 4 less than $T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU}$ + 2 ms =920+10+25+0+ (3*20)+ 20+2=1037ms from the start of T2,

excluding any transmissions which do not occur due to measurement gaps.

The PCell conditional handover delay can be expressed as specified in clause 6.1.6.1:

$D_{CHOwithPSCell_PCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH as specified in clause 6.1.6.1.1

$T_{interrupt} = T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$ ms

The PSCell conditional handover delay can be expressed as specified in clause 6.1.6.1.2:

$D_{CHOwithPSCell_PSCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU}$ + 2 ms

The rate of the conditional handovers observed during repeated tests shall be at least 90%.

## 6.3.3.4 NR SA FR1 conditional handover including target MCG and candidate SCG

Editor's Note: This test case is incomplete in following aspects:

- Message contents is TBD.

### 6.3.3.4.1 Test purpose

This test is to verify the requirement for conditional handover including target MCG and candidate SCG for CPC in FR1 NR-DC specified in clause 6.1.7.1 of TS 38.133[6]. This test verifies the requirements for PCell conditional handover delay and PSCell conditional change delay as defined in section 6.1.7.1.1 and 6.1.7.1.2 of TS 38.133[6] respectively for FR1-FR1 NR-DC to FR1-FR1 NR-DC CHO with CPC. No measurement gap is configured in this test case.

### 6.3.3.4.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards.

### 6.3.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.4.

6.3.3.4.4 Test description

6.3.3.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.4.4.1-1.

**Table 6.3.3.4.4.1-1: Intra-frequency conditional handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cells (PCell and PSCell): NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cells (PCell and PSCell): NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.4.4.1-2

**Table 6.3.3.4.4.1-2: Initial conditions for NR-DC FR1 conditional handover including target MCG and candidate SCG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The power levels and settings for NR Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 3 and Cell 4 are NR FR1 target PCell and target PSCell respectively, and their power levels and settings are also set according to Annex C.1.2 and C.1.3.

2. The test parameters are given in Table 6.3.3.4.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.4.4.1-3: General test parameters Intra-frequency conditional handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cells | | PCell: Cell 1<br>PSCell: Cell 2 | |
| | Neighbouring cells | | Cell 3, Cell 4 | |
| Final condition | Active cells | | PCell: Cell 3<br>PSCell: Cell 4 | |
| A3-Offset | | dBm | 0 | A3-offset is applied for conditions for both CHO and CPC |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration index | | | FR1 PRACH configuration 1 | As specified in table Table 6.3.3.2-3 in TS 38.211 [7] |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 1 | |
| T3 | | s | ≤2 | |

#### 6.3.3.4.4.2 Test procedure

The test scenario comprises four NR cells, source PCell (Cell 1) and source PSCell (Cell 2), target PCell (Cell 3), and target PSCell (Cell 4). Cell 1 and Cell 3 are on radio channel 1 in FR1. Cell 2 and Cell 4 are on radio channel 2 in FR1. The test consists of three successive time periods, with time durations of T1, T2, and T3, respectively. General test parameters and cell specific parameters are given in Tables 6.3.3.4.4.1-3, 6.3.3.4.5-1 and 6.3.3.4.5-2.

At the start of time duration T1, the UE is connected to Cell 1 (source PCell) and Cell 2 (source PSCell). The UE may not have any timing information of Cell 3 (target PCell) and Cell 4 (target PSCell).

NR shall configure a condition implying conditional handover to Cell 3 with a condition implying conditional PSCell change to Cell 4 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2.

$T_{RRC}$ = 16ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell 3 becomes detectable. At the start of T3, Cell 4 becomes detectable. UE meets the handover condition and meets the PSCell change condition during T3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active PCell and Cell 2 is the active PCSell. Set Cell 3 and Cell 4 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.4.5-1 and 6.3.3.4.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1, Cell 2 and monitoring corresponding ACK/NACK feedback sent by the UE.

3. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) and Cell 4 physical cell identity = ((current Cell 4 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for Cell 3 and Cell 4, where event A3 is the CHO execution condition.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting at T1 to power setting at T2 as specified in Table 6.3.3.4.5-1 and 6.3.3.4.5-2. T2 starts.

7. When T2 expires, the SS shall switch the power settings at T2 to power setting at T3 as per Tables 6.3.3.4.5-1 and 6.3.3.4.5-2. T3 starts.

8. If

   a) The UE shall start to transmit PRACH to Cell 3 less than max ($T_{measure_PCell}$, $T_{measure_PSCell}$) + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta_PCell}$ + $T_{PCell_DU}$ + 2 ms = (800 + 10 + 25 + 20 + 20 + 2) ms = 877 ms from the start of T3 and the interruption during T3 shall not exceeed $T_{processing}$ + $T_{\Delta_PCell}$ + $T_{PCell_DU}$ + 2 ms = (25 + 20 + 20 + 2) ms = 67 ms

   b) The UE shall start to transmit PRACH to Cell 4 less than max ($T_{measure_PCell}$, $T_{measure_PSCell}$) + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta_PSCell}$ + $T_{PSCell_DU}$ + 2 ms = (800 + 10 + 25 + 20 + 20 + 2) ms = 877 ms from the start of T3. The interruption during T3 shall not exceed $T_{processing}$ + $T_{\Delta_PSCell}$ + $T_{PSCell_DU}$ + 2 ms = 25 ms + 20 + 20 ms + 2 ms = 67 ms.
   and

   c) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T3 to the instant the UE transmits the first PRACH preamble, where

      - $X = T_{interrupt} + k_1$ for test configuration 1 in Table 6.3.3.4.4.1-1
      - $X = T_{interrupt}$ for test configuration 2 in Table 6.3.3.4.4.1-1
      - $X = 2 \cdot T_{interrupt}$ for test configuration 3 in Table 6.3.3.4.4.1-1.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. After T3 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1 and Cell 2.

10. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.3.4.4.3 Message Contents

TBD

#### 6.3.3.4.5 Test requirements

Table 6.3.3.4.5-1 and Table 6.3.3.4.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.4.5-1: Cell specific test parameters for FR1-FR1 CHO (Cell 1 and Cell 3)**

| Parameter | | Unit | Cell 1 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR2.1 TDD | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |

| PRACH configuration | | | FR1 PRACH configuration 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | 4 | -Infinity | 5 | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | 4 | -Infinity | 6.5 | 6.5 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -94 | -Infinity | -93 | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -91 | -Infinity | -90 | -90 |
| Io Note3 | Config 1,2 | dBm/9.36 MHz | -64.59 | -64.59 | -64.59 | -70.05 | -62.67 | -62.67 |
| | Config 3 | dBm/38.16 MHz | -58.49 | -58.49 | -58.49 | -63.94 | -56.57 | -56.57 |
| Propagation condition | | - | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.3.4.5-2: Cell specific test parameters for NR-DC FR1 PSCell change at conditional handover including target MCG and candidate SCG**

| Parameter | | Unit | Cell 2 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 2 | | | 2 | | |
| Duplex mode | Config 1 | | FDD | | | | | |

| | | | |
|---|---|---|---|
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| DRx Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR2.1 TDD |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz |
| | Config 3 | | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH configuration | | | FR1 PRACH configuration 1 |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/ 15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/ SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | 4 | -Infinity | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | 4 | -Infinity | -Infinity | 6.5 |
| SSB_RP | Config 1,2 | dBm/ SCS | -94 | -94 | -94 | -Infinity | -Infinity | -93 |
| | Config 3 | dBm/ SCS | -91 | -91 | -91 | -Infinity | -Infinity | -90 |
| Io Note3 | Config 1,2 | dBm/ 9.36 MHz | -64.59 | -64.59 | -64.59 | -70.05 | -70.05 | -62.67 |
| | Config 3 | dBm/ 38.16 MHz | -58.49 | -58.49 | -58.49 | -63.94 | -63.94 | -56.57 |
| Propagation condition | | - | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

$T_{RRC}$ + $T_{Event_DU}$ occurs during T1 and T2, as the conditional handover condition for Cell 3 becomes satisfied at the start of T2, and the conditional PSCell change condition for Cell 4 becomes satisfied at the start of T3. The test shall verify that there are no interruptions during T1 and T2. The UE shall not send PRACH to Cell 3 before the end of T2.
The UE shall start to transmit PRACH to

- Cell 3 less than max ($T_{measure_PCell}$, $T_{measure_PSCell}$) + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta_PCell}$ + $T_{PCell_DU}$ + 2 ms = (800 + 10 + 25 + 20 + 20 + 2) ms = 877 ms from the start of T3 and the interruption during T3 shall not exceeed $T_{processing}$ + $T_{\Delta_PCell}$ + $T_{PCell_DU}$ + 2 ms = (25 + 20 + 20 + 2) ms = 67 ms

- Cell 4 less than max ($T_{measure_PCell}$, $T_{measure_PSCell}$) + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta_PSCell}$ + $T_{PSCell_DU}$ + 2 ms = (800 + 10 + 25 + 20 + 20 + 2) ms = 877 ms from the start of T3. The interruption during T3 shall not exceed $T_{processing}$ + $T_{\Delta_PSCell}$ + $T_{PSCell_DU}$ + 2 ms = 25 ms + 20 + 20 ms + 2 ms = 67 ms.

The rate of the correct conditional handovers observed during repeated tests shall be at least 90%.

## 6.3.3.5 NR conditional handover including target MCG and candidate SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC with complementary conditional handover configuration

Editor's Note: This test case is incomplete in following aspects:

- Message contents is TBD.

- Test applicability is missing

- TT analysis is missing

### 6.3.3.5.1 Test purpose

This test verifies the requirement for conditional handover when the UE is configured with target MCG and candidate SCG for CPC in FR1 NR-DC and additionally configured with a complementary CHO only configuration in FR1. The test verifies that the UE makes the correct decision to proceed with CHO without CPC in case CHO condition is met without CPC condition being met, meanwhile verifying the conditional handover delay requirement in section 6.1.4.2 of TS38.133.

For UE which can pass test case defined in clause A.6.3.3.5, test case defined in clause A.6.3.3.1 can be skipped and corresponding test requirements are deemed to be fulfilled.

#### 6.3.3.5.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards.

#### 6.3.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.5.

#### 6.3.3.5.4 Test description

##### 6.3.3.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.5.4.1-1.

**Table 6.3.3.5.4.1-1: Supported test configurations for NR conditional handover including target MCG and candidate SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC with complementary conditional handover configuration**

| Config | Description |
|---|---|
| 1 | Source cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cells (PCell and PSCell): NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cells (PCell and PSCell): NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cells (PCell and PSCell): NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.5.4.1-2

**Table 6.3.3.5.4.1-2: Initial conditions for NR-DC FR1 conditional handover including target MCG and candidate SCG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The power levels and settings for NR Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 3 and Cell 4 are NR FR1 target PCell and target PSCell respectively, and their power levels and settings are also set according to Annex C.1.2 and C.1.3.

2. The test parameters are given in Table 6.3.3.5.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.5.4.1-3: General test parameters NR conditional handover including target MCG and candidate SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC with complementary conditional handover configuration**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cells | | PCell: Cell 1<br>PSCell: Cell 2 | |
| | Neighbouring cells | | Cell 3, Cell 4 | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Final condition | Active cells | | PCell: Cell 3<br>PSCell: Cell 4 | |
| A3-Offset in condition for PCell | | dB | -10 | |
| A4-Offset in condition for PSCell | | dB | -120 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration index | | | FR1 PRACH configuration 1 | As specified in table 6.3.3.2-3 in TS 38.211 [6] |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |

### 6.3.3.5.4.2 Test procedure

The test scenario comprises four NR cells, source PCell (Cell 1) and source PSCell (Cell 2), target PCell (Cell 3), and target PSCell (Cell 4). Cell 1 and Cell 3 are on radio channel 1 in FR1. Cell 2 and Cell 4 are on radio channel 2 in FR1.The test consists of two successive time periods, with time durations of T1 and T2 respectively. General test parameters and cell specific parameters are given in Tables 6.3.3.5.4.1-3, 6.3.3.5.5-1 and 6.3.3.5.5-2. No measurement gap is configured in the test case.

At the start of T1, the UE shall be connected to Cell 1 (source PCell) on radio channel 1 and Cell 2 (source PSCell) on radio channel 2. UE is not aware of any timing information of Cell 3 (target PCell) and Cell 4 (target PSCell).

NR shall configure a condition implying conditional handover to Cell 3 and Cell 4 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. UE shall be able to do inter-frequency conditional handover from NR-FR1 cell 1 to NR-FR1 cell 3 and intra-frequency PSCell change from NR-FR1 cell 2 to NR-FR1 cell 4.

$T_{RRC}$ = 16ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell3 and Cell 4 become detectable. The condition for conditional PCell handover is met during T2. During T2, the UE performs measurement on Cell3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active PCell and Cell 2 is the active PSCell. Set Cell 3 and Cell 4 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.5.4-1 and 6.3.3.5.4-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1, Cell 2 and monitoring corresponding ACK/NACK feedback sent by the UE.

3. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) and Cell 4 physical cell identity = ((current cell 4 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for Cell 3 which is event A3 and subsequent PSCell change from Cell 2 to Cell 4.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting at T1 to power setting at T2 as specified in Table 6.3.3.5.5-1 and 6.3.3.5.5-2. T2 starts.

7. If

   a) The UE shall start to transmit the PRACH to Cell 3 less than Tmeasure + Tinterrupt + TCHO_execution = 800 +62 +10=872 ms from the start of T2 and the interruption during T2 shall not exceeed Tinterrupt=Tprocessing + TIU + TΔ + Tmargin =40+20+2 = 62 ms.

   The UE shall not send PRACH to Cell 4.

and

b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- $X = T_{interrupt} + k_1$ for test configuration 1 in Table 6.3.3.5.4.1-1
- $X = T_{interrupt}$ for test configuration 2 in Table 6.3.3.5.4.1-1
- $X = 2 \cdot T_{interrupt}$ for test configuration 3 in Table 6.3.3.5.4.1-1.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1 and Cell 2.
9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2.
10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.3.5.4.3 Message Contents

TBD

### 6.3.3.5.5 Test requirements

Table 6.3.3.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.5.5-1: Cell specific test parameters for NR conditional handover including target MCG and candidate SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC with complementary conditional handover configuration (Cell 1 and Cell 3)**

| Parameter | | Unit | Cell 1 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |

| Parameter | | Unit | Cell 1 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 + TT | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 + TT | | | |
| | Config 3 | | -95 + TT | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4 + TT | 4 + TT | -Infinity | 5 + TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4 + TT | 4 + TT | -Infinity | 5 + TT |
| SSB_RP | Config 1,2 | dBm/SCS | -94 + TT | -94 + TT | -Infinity | -93 + TT |
| | Config 3 | dBm/SCS | -91 + TT | -91 + TT | -Infinity | -90 + TT |
| Io Note3 | Config 1,2 | dBm/ 9.36 MHz | -64.59 + TT | -64.59 + TT | -70.05 + TT | -63.85 + TT |
| | Config 3 | dBm/ 38.16 MHz | -58.49 + TT | -58.49 + TT | -63.94 + TT | -57.75 + TT |
| Propagation condition | | - | AWGN | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.3.3.5.5-2: Cell specific test parameters for NR conditional handover including target MCG and candidate SCG from FR1-FR1 NR-DC to FR1-FR1 NR-DC with complementary conditional handover configuration (Cell 2 and Cell 4)**

| Parameter | | Unit | Cell 2 | | Cell 4 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 2 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |

| Parameter | | Unit | Cell 2 | | Cell 4 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4 + TT | 4 + TT | -Infinity | 5 + TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4 + TT | 4 + TT | -Infinity | 5 + TT |
| SSB_RP | Config 1,2 | dBm/SCS | -94 + TT | -94 + TT | -Infinity | -93 + TT |
| | Config 3 | dBm/SCS | -91 + TT | -91 + TT | -Infinity | -90 + TT |
| Io Note3 | Config 1,2 | dBm/ 9.36 MHz | -64.59 + TT | -64.59 + TT | -70.05 + TT | -63.85 + TT |
| | Config 3 | dBm/ 38.16 MHz | -58.49 + TT | -58.49 + TT | -63.94 + TT | -57.75 + TT |
| Propagation condition | | - | AWGN | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

$T_{RRC} + T_{Event_DU}$ occurs during T1 as the conditional handover condition for cell becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 3 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ = 800 +62 +10=872 ms from the start of T2 and the interruption during T2 shall not exceeed $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ =40+20+2 = 62 ms.

The UE shall not send PRACH to Cell 4.

### 6.3.3.6 NR SA FR1 Intra-frequency NES triggering conditional handover

#### 6.3.3.6.1 Test purpose

To verify the requirement for the NR FR1 intra-frequency NES-based conditional handover requirements specified in TS 38.133 [6] clause 6.1.4.2

#### 6.3.3.6.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards and supporting DCI-based enabling/disabling NES-specific CHO execution condition.

#### 6.3.3.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.6.

#### 6.3.3.6.4 Test description

##### 6.3.3.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.6.4.1-1.

**Table 6.3.3.6.4.1-1: NES triggering Intra-frequency conditional handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 6.3.3.6-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.6-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.6-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.6.4.1-2

**Table 6.3.3.6.4.1-2: Initial conditions for NR SA FR1 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.3.6.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.3.6.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.6.4.1-3: General test parameters for NES triggering Intra-frequency conditional handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |

| | | | | |
|---|---|---|---|---|
| Final condition | Active cell | | Cell 2 | |
| A3-Offset in condition | | dB | -1 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| nesEvent | | | true | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration index | | | FR1 PRACH configuration 1 | As specified in Table 6.3.3.2-3 in TS 38.211 [7] |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |

### 6.3.3.6.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.6.4.1-3 and 6.3.3.6.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of Cell 2. The UE is configured with a NES-based condition implying handover to Cell 2 firstly, and then configured with DCI 2-9 with NES-mode indication during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. No interruption shall be observed in time period T1, where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and NES-based event is fulfilled. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisfied. The UE shall send PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure NES-based CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. The SS shall transmit DCI 2-9 command of ‘1’ value for indicating NES-specific CHO execution condition.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.6.5-1. T2 starts.

8. If

   e) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

f) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- $X = T_{interrupt} + k_1$ for test configuration 6.3.3.6-1
- $X = T_{interrupt}$ for test configuration 6.3.3.6-2
- $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.6-3.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.
10. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.3.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.3.6.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.3.6.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 6.3.3.6.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.6.4.3-2: MeasConfig (Table 6.3.3.6.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 6.3.3.6.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.3.3.6.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 6.3.3.6.4.3-3: MeasObjectNR (Table 6.3.3.6.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.6.4.3-4: ReportConfigNR (Table 6.3.3.6.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -2 | actuall value = -2*0.5 = -1dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| nesEvent-r18 | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.6.4.3-5: ConditionalReconfiguration (Table 6.3.3.6.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.6.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

### 6.3.3.6.5 Test requirements

Table 6.3.3.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.6.5-1: Cell specific test parameters for NR FR1-FR1 NES triggering Intra-frequency conditional handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -2.41 | - Infinity | 1.36 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | - Infinity | 10 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | - Infinity | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | - Infinity | -85 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -50.56 | -55.31 | -50.56 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2.
where:

- $T_{measure}$ = 800 ms, is the measurements time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in TS 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms = 62ms, is the interruption time specified in TS 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 872 ms

The interruption during T2 shall not exceed $T_{interrupt}$ = 62ms.

### 6.3.3.7 NR SA FR1-FR1 Inter-frequency NES-based conditional handover

#### 6.3.3.7.1 Test purpose

To verify the requirement for the NES-based NR FR1-NR FR1 inter-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.2

#### 6.3.3.7.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards and supporting DCI-based enabling/disabling NES-specific CHO execution condition.

#### 6.3.3.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.7.

#### 6.3.3.7.4 Test description

##### 6.3.3.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.7.4.1-1.

**Table 6.3.3.7.4.1-1: NES-based inter-frequency conditional handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 6.3.3.7-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.3.7-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.3.7-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.7.4.1-2

**Table 6.3.3.7.4.1-2: Initial conditions for NR SA FR1 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.3.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.3.3.7.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.3.7.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 6.3.3.7.4.1-3: General test parameters for NES-based inter-frequency conditional handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |

| | | | | |
|---|---|---|---|---|
| Final condition | Active cell | | Cell 2 | |
| A3-Offset in handover condition without nesEvent-r18 | | dB | 10 | |
| A3-Offset in handover condition with nesEvent-r18 = true | | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |

#### 6.3.3.7.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.7.4.1-3 and 6.3.3.7.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case. In this test, UE is not indicated to report SSB based RRM measurement result with the associated SSB index for carrier of Cell 2.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE does not have any timing information of Cell 2. The UE is configured with a condition implying handover to Cell 2 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. No interruption shall be observed in time period T1, where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell 2 becomes detectable and meets the NES-based handover condition., and DCI 2-9 command of '1' value for indicating NES-specific CHO execution condition is transmitted to UE at 950ms from the start of T2, i.e., UE receives DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_inter_without_index}$.

From start of T2, the Cell 2 becomes detectable and NES-based event is fulfilled. UE is configured with DCI 2-9 command of '1' value for indicating NES-specific CHO execution condition at 950ms from the start of T2, i.e., UE receives DCI 2-9 command later than the time at the end of $T_{Event_DU} + T_{identify_inter_without_index}$. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisfied. The UE shall send PRACH to Cell 2 less than $950 + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure NES-based CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.7.5-1. T2 starts.

7. At 950ms from the start of T2, the SS shall transmit DCI 2-9 command of '1' value for indicating NES-specific CHO execution condition.

8. If

g) the UE transmits the PRACH preambles to Cell 2 less than 950 + $T_{CHO_execution}$ + $T_{interrupt}$ ms from the beginning of time period T2,

and

h) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- X = $T_{interrupt}$ +$k_1$ for test configuration 6.3.3.7-1
- X = $T_{interrupt}$ for test configuration 6.3.3.7-2
- X = 2·$T_{interrupt}$ for test configuration 6.3.3.7-3.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.
10. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.3.3.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.3.3.7.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.3.3.7.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 6.3.3.7.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.7.4.3-2: MeasConfig (Table 6.3.3.7.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 6.3.3.7.4.3-3 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 6.3.3.7.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-1 | Table 6.3.3.7.4.3-5 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-2 | Table 6.3.3.7.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 2 | | |
| measObjectId | 2 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 6.3.3.7.4.3-3: MeasObjectNR-f1 (Table 6.3.3.7.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 1 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.7.4.3-4: MeasObjectNR-f2 (Table 6.3.3.7.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 2 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 6.3.3.7.4.3-5: ReportConfigNR-1 (Table 6.3.3.7.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 20 | actuall value = 20*0.5 = 10dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.7.4.3-6: ReportConfigNR-2 (Table 6.3.3.7.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -8 | actuall value = -8*0.5 = -4dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| nesEvent-r18 | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.3.7.4.3-7: ConditionalReconfiguration (Table 6.3.3.7.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | The MeasId configured in Table 6.3.3.7.4.3-2 | |
| MeasId[2] | 2 | The MeasId configured in Table 6.3.3.7.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

6.3.3.7.5 Test requirements

Table 6.3.3.7.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.3.7.5-1: Cell specific test parameters for NES-based NR FR1-FR1 inter-frequency conditional handover test case**

| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| Gap pattern ID | | | gp0 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 6.70 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 6.70 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -91.30 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -88.30 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -62.51 |
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -56.40 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 950 ms, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms = 62ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 1022 ms

The interruption during T2 shall not exceed $T_{interrupt}$ = 62ms.

## 6.3.4 LTM PCell Switch

### 6.3.4.0 Minimum conformance requirements

#### 6.3.4.0.1 Minimum conformance requirements for LTM PCell Switch

LTM cell switch delay $D_{LTM}$ is the delay from the end of the last TTI containing the MAC-CE command for cell switch until the time the UE transmits the first UL message on the target cell.

When the target cell and the target joint UL/DL TCI state or separate UL and DL TCI states in the MAC-CE LTM cell switch command are known, the LTM cell switch delay is defined as:

$$D_{LTM} = T_{cmd} + T_{LTM\text{-}interrupt}$$

Where:

$T_{cmd}$ equals to $T_{HARQ}$ + 3ms, where $T_{HARQ}$ is the timing between cell switch command and acknowledgement as specified in TS 38.213[8].

$T_{LTM\text{-}interrupt}$ is as stated in TS 38.133[6] section 6.3.1.3.

The target cell in the LTM cell switch command is known if the following conditions are met:

- During the last 5 seconds before the reception of the cell switch command:
  - The UE has sent a valid L1 or L3 measurement report for the target cell, and
  - One of the SSBs measured from the NR target cell configured for measurement remains detectable according to the cell identification conditions specified in TS 38.133[6] clause 9.2 for intra-frequency cell and in TS 38.133[6] clause 9.3 for inter-frequency cell,
- One of the SSBs measured from the NR target cell configured for measurement remains detectable according to the cell identification conditions specified in TS 38.133[6] clause 9.2 for intra-frequency cell and in TS 38.133[6] clause 9.3 for inter-frequency cell,

Otherwise, the cell is unknown.

The target joint DL/UL TCI state or separate DL and UL TCI states in the LTM cell switch command are known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target DL/UL TCI state to the completion of LTM cell switch, where the RS resource for L1-RSRP measurement is the RS in target DL/UL TCI state or QCLed to the target DL/UL TCI state
  - LTM cell switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target DL/UL TCI state before the LTM cell switch command
  - The target DL/UL TCI state remains detectable during the LTM cell switching period
  - The SSB associated with the target DL/UL TCI state remain detectable during the cell switching period
    - SNR of the TCI state $\geq$ -3dB

Otherwise, the target joint DL/UL TCI state or separate DL and UL TCI state is unknown.

The interruption time $T_{LTM\text{-}interrupt}$ is the time between the end of the last TTI containing the MAC-CE command for LTM cell switch until the time the UE transmits the first UL message on the target cell, excluding $T_{cmd}$ stated in TS 38.133[6] section 6.3.1.2.

$$T_{LTM\text{-}interrupt} = T_{LTM\text{-}RRC\text{-}processing} + T_{LTM\text{-}processing} + T_{first\text{-}RS} + T_{RS\text{-}proc} + T_{LTM\text{-}IU} \text{ ms},$$

Where:

$T_{LTM-RRC-processing}$ is the time for ASN.1 decoding and validity/compliance check for the RRC configuration of the LTM target cell indicated in the LTM cell switch command.

$T_{LTM-RRC-processing}$ = 0, if the UE supports *ltm-FastProcessingConfig-r18* capability, and at least one of the following conditions is met:

- The number of candidate cells in the LTM candidate cell configuration does not exceed *maxNumberConfigs-r18* and the number of the configured serving cells and the cells in the LTM configuration does not exceed *maxNumberStoredConfigCells-r18*, or
- The following conditions are fulfilled for the target cell:
  - UE has received LTM candidate cell TCI state activation command for the target cell at least $T_{HARQ}$ + 13 ms before the LTM cell switch command,
- UE has received PDCCH order for early RACH for the target cell at least $N_{T,2}$+10 ms before the LTM cell switch command, where $N_{T,2}$ is defined in section 8.1 of TS 38.213 [8], and.
  - The number of LTM candidate cells for which TCI state(s) were activated or PDCCH order was received before the cell switch command does not exceed *maxNumberConfigs-r18*, and the total number of serving cells and the cells in the LTM configuration for which TCI state(s) were activated or PDCCH order was received before the cell switch does not exceed *maxNumberStoredConfigCells-r18.*
- [*FFS further conditions*]

Otherwise $T_{LTM-RRC-processing}$ = 10 ms.

$T_{LTM-processing}$ is the time for UE processing, consisting of applying the target cell parameters and L1/L2 change.

If the UE supports *ltm-FastUE-Processing-r18* capability, the value of $T_{LTM-processing}$ equals to

- *fr1-r18* for FR1 to FR1 and FR2 to FR2 LTM cell switch.
- *fr2-r18* for FR1 to FR2 and FR2 to FR1 LTM cell switch.
- *fr1-AndFR2-r18* for FR1 to FR2 and FR2 to FR1 LTM cell switch.

Otherwise, the value of $T_{LTM-processing}$ equals to

- 20 ms for FR1 to FR1 and FR2 to FR2 LTM cell switch.
- 40 ms for FR1 to FR2 and FR2 to FR1 LTM cell switch.

$T_{first-RS}$ is the time for fine time tracking and acquiring full timing information of the target cell.

$T_{RS-proc}$ is the time for SSB processing.

$T_{first-RS}$ = 0 and $T_{RS-proc}$= 0 under the following conditions:

- The target TCI state indicated in the LTM cell switch command is in the serving cell active TCI state list, or
- The UE is configured with LTM L1 intra- and/or inter-frequency measurements for the target cell, and
  - The target TCI state in the cell switch command is in the LTM candidate cell active TCI state list, and
    - the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is at least TCI state activation delay stated in TS 38.133[6] section 8.25.3, and
    - the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is not more than TCI state activation delay stated in section 8.25.3 + 160 ms, or
    - the measurement period of the SSB associated to target TCI state is not larger than 160 ms after the LTM candidate cell TCI state activation MAC-CE is received, or

- The target cell is an FR1 cell, and the UE is not configured with LTM L1 intra- and/or inter-frequency measurements for the target cell, and
  - The target TCI state in the cell switch command is in the LTM candidate cell active TCI state list, and
    - the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is at least TCI state activation delay stated in TS 38.133[6] section 8.25.3, and not more than TCI state activation delay stated in TS 38.133[6] section 8.25.3 + 160 ms, or
  - The time gap between the latest PDCCH ordered RACH preamble transmission on the target cell and the cell switch command is not more than [160 ms].

Otherwise,

$T_{first\text{-}RS}$ is the time to the first SSB transmission on the target cell after $T_{cmd} + T_{LTM\text{-}RRC\text{-}processing} + T_{LTM\text{-}processing}$.

$T_{RS\text{-}proc}$ = 2 ms.

$T_{LTM\text{-}IU}$ is the interruption uncertainty during LTM cell switch.

For RACH-based LTM cell switch, $T_{LTM\text{-}IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{LTM\text{-}IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

For RACH-less LTM cell switch, $T_{LTM\text{-}IU_}$is the uncertainty on transmitting the first uplink transmission on the target cell.

## 6.3.4.1 NR SA FR1 RACH-based Intra-frequency PCell switch from FR1 to FR1

### 6.3.4.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 FR1 RACH-based intra-frequency PCell switch specified in 38.133 [6] clause 6.3.1 for both with and without early TCI state activation.

### 6.3.4.1.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for MCG with RACHwith L1-RSRP measurement and report based on SSB(s) of candidate cell(s) from Release 18 onwards.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

### 6.3.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.4.1.

### 6.3.4.1.4 Test description

#### 6.3.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.4.1.4.1-1.

**Table 6.3.4.1.4.1-1: Intra-frequency cell switch from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.4.1.4.1-2.

**Table 6.3.4.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.4.1.4.1-3.

2. Message contents are defined in clause 6.3.4.1.4.3.

3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.3.4.1.4.1-3: General test parameters for Intra-frequency cell switch from FR1 to FR1**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -6 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| includeBeamMeasurements | | | TRUE | | | | |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 2 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.3.16B. In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | #2 CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.1 | | | | |

#### 6.3.4.1.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table 6.3.4.3.4.1-1. Both cell switch delay and interruption length are tested by using the parameters in table 6.3.4.1.4.1-2, and 6.3.4.1.4.1-3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message, configuring measurement object.

4. UE shall transmit RRCReconfigurationComplete message.

5. If the UE transmit an A3 message report, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.4.1.5-1. T2 starts.

6. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell 2 and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

7. UE shall transmit RRCReconfigurationComplete message.

8. If the UE transmits a valid L1-RSRP result of Cell 2:

   Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 6.3.4.1.5-1. T3 starts.

   Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 6.3.4.1.5-1. T4 starts, go to step10.

9. At the start of T3, the SS shall transmit the candidate cell TCI activation MAC-CE (Refer TS 38.321 [12], clauses 6.1.3.76) for Cell 2. 50ms after the candidate cell TCI state activation MAC-CE transmission, the SS shall switch the power setting from T3 to T4 as specified in Table 6.3.4.1.5-1. T4 starts.

   candidate cell TCI activation MAC-CE:

   - Test 1A: *CandidateTCI-State#1* is activated.

- Test 1B: *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

10. The start of T4 is the instant when the last TTI containing the LTM cell switch command MAC CE(Refer TS 38.321 [12], clauses 6.1.3.75) is sent by Cell 1 to the UE.

    cell switch MAC-CE:

    - Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF

    - Test 1A: CandidateTCI-State#2 is indicated.

    - Test 1B: CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated

    - Test 2A: CandidateTCI-State#1 is indicated.

- Test 2B: CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated

11. If the UE transmits the uplink PRACH channel to Cell 2 less than $D_{LTM}$ from the beginning of time period T4 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.T4 ends.

12. After T4 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18* to cause UE handover back to Cell 1.

13. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1

14. Power off Cell 2 and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.4.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -6dB, includeBeamMeasurements = true and with Condition SSB Index<br>Table H.3.1-5 with Condition SSB Index<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index |

**Table 6.3.4.1.4.3-2: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12.1 with Condition LTM L1-RSRP<br>Table H 3.12-2 with Condition LTM L1-RSRP<br>Table H.3.12-3 for Cell 2 and Condition Candidate config and TCI_INFO<br>Table H.3.12.4<br>Table H.3.12-5 with pucch-ResourceId = 8<br>Table H.3.12-6, H.3.12-7 abd H.3.12-13 with SSB index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for CELL2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for test 1A<br>Table H.3.12-10 with Condition Seperate for test 1B and 2B<br>Table H.3.12-10 with Condition Joint for test 2A<br>Table H.3.12-11 |

**Table 6.3.4.1.4.3-3 *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR1 | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | Config 1, 2 |
| | kHz 30 | | Config 3 |
| } | | | |

**Table 6.3.4.1.4.3-4: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.4.1.5 Test requirements

Table 6.3.4.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.4.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency cell switch test case**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|

| | | | T1~T4 | | T1~T4 | |
|---|---|---|---|---|---|---|
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| CP length | | | Normal | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | FR1 PRACH configuration 6 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | -0.64 | -0.64 | -0.64 | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
| | Config 3 | dBm/ 38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| Propagation condition | | - | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall start to transmit the PRACH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms and is specified in 38.133 [6] clause 6.3.1.2. $T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ ms and is specified in 38.133 [6] clause 6.3.1.2.1

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 0 ms for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 22 ms for Test 2A and 2B
- $T_{LTM\text{-}IU_}$=20ms
- $T_{LTM\text{-}RRC\text{-}processing}$ =10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ =10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ =15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ =20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

## 6.3.4.2 NR SA FR1 RACH-based Inter-frequency LTM PCell switch from FR1 to FR1

### 6.3.4.2.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 FR1 RACH-based inter-frequency PCell switch specified in 38.133 [6] clause 6.3.1 for both with and without early TCI state activation.

### 6.3.4.2.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for MCG with RACHwith L1-RSRP measurement and report based on SSB(s) of candidate cell(s) from Release 18 onwards.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

### 6.3.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.4.2.

6.3.4.2.4 Test description

6.3.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.4.2.4.1-1.

**Table 6.3.4.2.4.1-1: Inter-frequency cell switch from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.4.2.4.1-2

**Table 6.3.4.2.4.1-2: Initial conditions for NR SA FR1 handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.4.2.4.1-3.

2. Message contents are defined in clause 6.3.4.2.4.3.

3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the different frequency than the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.3.4.2.4.1-3: General test parameters for Inter-frequency cell switch from FR1 to FR1**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -7 | | | | Original Value -6dB, post TT Analysis, its -7 dB |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| maxNrofRS-IndexesToReport | | | 1 | | | | |
| includeBeamMeasurements | | | True | | | | |
| DRX | | | OFF | | | | DRX is not used |
| Measurement gap pattern ID | | | gp0 | | | | As specified in Table 9.1.2-1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Measurement gap offset | | | 39 | | | | |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 2 μs | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.3.16B. In test 1A and 1B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are configured for early TCI state activation. |
| | CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | |
| [ltm-UL-TCI-StatesToAddModList] | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.2 | | | | |
| T4 | | s | ≤0.1 | | | | |

### 6.3.4.2.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the different frequency than the PCell. Test configurations are given in table 6.3.4.2.4.1-1. Both cell switch delay and interruption length are tested by using the parameters in table 6.3.4.2.4.1-2, and 6.3.4.2.4.1-2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.4.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message, configuring measurement object.

4. UE shall transmit RRCReconfigurationComplete message.
5. If the UE transmit an A3 message report, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.4.2.5-1. T2 starts.
6. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell 2 and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.
7. UE shall transmit RRCReconfigurationComplete message.
8. If the UE transmits a valid L1-RSRP result of Cell 2:

   Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 6.3.4.2.5-1. T3 starts.

   Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 6.3.4.2.5-1. T4 starts, go to step10.
9. At the start of T3, the SS shall transmit the candidate cell TCI activation MAC-CE (Refer TS 38.321 [12], clauses 6.1.3.76) for Cell 2. 100ms after the candidate cell TCI state activation MAC-CE transmission, the SS shall switch the power setting from T3 to T4 as specified in Table 6.3.4.2.5-1. T4 starts.

   candidate cell TCI activation MAC-CE:

   - Test 1A: *CandidateTCI-State#1* is activated.

   - Test 1B: *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.
10. The start of T4 is the instant when the last TTI containing the LTM cell switch command MAC CE(Refer TS 38.321 [12], clauses 6.1.3.75) is sent by Cell 1 to the UE.

    cell switch MAC-CE:

    - Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF

    - Test 1A: CandidateTCI-State#2 is indicated.

    - Test 1B: CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated

    - Test 2A: CandidateTCI-State#1 is indicated.

- Test 2B: CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated

11. If the UE transmits the uplink PRACH channel to Cell 2 less than $D_{LTM}$ from the beginning of time period T4 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.T4 ends.
12. After T4 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18* to cause UE handover back to Cell 1.
13. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1
14. Power off Cell 2 and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.
15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.4.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1, SMTC pattern 1 for configuration 1 and 2<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1, SMTC pattern 1 for configuration 3<br>Table H.3.1-5 with Condition SSB Index<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index |

**Table 6.3.4.2.4.3-2: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12.1 with Condition LTM L1-RSRP<br>Table H 3.12-2 with Condition LTM L1-RSRP<br>Table H.3.12-3 for Cell 2 and Condition Candidate config and TCI_INFO<br>Table H.3.12.4<br>Table H.3.12-5 with pucch-ResourceId = 8<br>Table H.3.12-6, H.3.12-7 abd H.3.12-13 with SSB index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for CELL2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for test 1A<br>Table H.3.12-10 with Condition Seperate for test 1B and 2B<br>Table H.3.12-10 with Condition Joint for test 2A<br>Table H.3.12-11 |

**Table 6.3.4.2.4.3-3: ReportConfigNR (step3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -14 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| | | | |
| } | | | |
| reportQuantity-RsIndexes SEQUENCE { | | | |
| rsrp | true | | |
| } | | | |
| maxReportCells | 1 | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.4.2.4.3-4 *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR1 | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | Config 1, 2 |
| | kHz 30 | | Config 3 |
| } | | | |

**Table 6.3.4.2.4.3-5: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.4.2.5 Test requirements

Table 6.3.4.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.4.2.5-1: Cell specific test parameters for NR FR1-FR1 Inter-frequency cell switch test case**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
|---|---|---|---|---|
| | | | **T1-T4** | **T1-T4** |
| NR RF Channel Number | | | 1 | 2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |

| | | | | |
|---|---|---|---|---|
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| TRS configuration for serving cell | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH configuration | | | FR1 PRACH configuration 6 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -61.41 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -55.31 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms and is specified in 38.133 [6] clause 6.3.1.2. $T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ ms and is specified in 38.133 [6] clause 6.3.1.2.1

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 0 ms for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 22 ms for Test 2A and 2B
- $T_{LTM\text{-}IU_}$=20ms

- $T_{LTM\text{-}RRC\text{-}processing}$ =10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ =10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ =15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ =20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

### 6.3.4.3 NR SA FR1 RACH-less Intra-frequency PCell switch from FR1 to FR1

#### 6.3.4.3.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 RACH-less intra-frequency Pcell switch specified in 38.133 [6] clause 6.3.1, including cell switch delay and interruption length, for both with and without early TCI state activation.

#### 6.3.4.3.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less with L1-RSRP measurement and report from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of four parts, and the UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B:

- Test 1: for a UE that supports *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE that supports *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE that supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE that does not supports *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE that supports *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE that supports *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18.*

#### 6.3.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.4.3.

#### 6.3.4.3.4 Test description

##### 6.3.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations that the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.4.3.4.1-1.

**Table 6.3.4.3.4.1-1: Intra-frequency cell switch from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.4.3.4.1-2.

**Table 6.3.4.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.3.4.3.4.1-3.
2. Message contents are defined in clause 6.3.4.3.4.3.
3. Two cells are deployed in the test, which are FR1 Pcell (Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the Pcell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.3.4.3.4.1-3: General test parameters for Intra-frequency cell switch from FR1 to FR1**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -6 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| includeBeamMeasurements | | | TRUE | | | | |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 2 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | | | Same as Cell 1 |
| | PRACH configuration | | PRACH.5 FR1 | | | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | | | |
| | n-TimingAdvanceOffset | Tc | 25600 | | | | |
| ltm-CSI-SSB-ResourceList | | | SSB 0 of Cell 2 | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DlorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.10B.<br>In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | CandidateTCI-State#2 | | Candidate DlorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.2 | | | | |
| T5 | | s | ≤0.1 | | | | |

#### 6.3.4.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in Table 6.3.4.3.4.1-1. No measurement gap is configured in the test case.

Both cell switch delay and interruption length are tested by using the parameters in table 6.3.4.3.4.1-2, and 6.3.4.3.4.1-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRCReconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.4.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier of Cell 2 for Test 1A, 1B, 2A and 2B.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. The UE shall transmit a *MeasurementReport* message triggered by Event A3. T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.4.3.5-1. T2 starts.

7. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell 2, and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for Cell 2 in PUCCH format 2 for Test 1A, 1B, 2A and 2B.

8. The UE shall transmit *RRCReconfigurationComplete* message.

9. T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

   - Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 6.3.4.3.5-1. T3 starts.

   - Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 6.3.4.3.5-1 if the UE is capable of *rach-EarlyTA-Measurement-r18*. T4 starts, go to step12. Otherwise, the SS shall switch the power setting from T2 to T5 as specified in Table 6.3.4.3.5-1. T5 starts, go to step14.

10. At the start of T3, the SS shall transmit a Candidate Cell TCI States Activation MAC-CE (Refer to TS 38.321 [12], clauses 5.18.36, 6.1.3.76) of Cell 2.

    - In Test 1A, *CandidateTCI-State#1* is activated.

    - In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are activated.

11. T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission. And the SS shall switch the power setting from T3 to T4 as specified in Table 6.3.4.3.5-1. T4 starts.

    - For the UE that incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped. The SS shall switch the power setting from T3 to T5 as specified in Table 6.3.4.3.5-1. T5 starts, go to step14.

12. At the start of T4, the SS shall transmit a PDCCH order (Refer to TS 38.213 [8], clause 21, and TS 38.212 [31], clause 7.3.1.2.1) to trigger the UE to transmit the PRACH on Cell 2 for Test 1A, 1B, 2A and 2B.

13. T4 ends 5ms after the UE transmits the PRACH to Cell 2. And the SS shall switch the power setting from T4 to T5 as specified in Table 6.3.4.3.5-1. T5 starts.

14. The start of T5 is the instant when the last TTI containing the LTM Cell Switch Command MAC-CE (Refer to TS 38.321 [12], clauses 5.18.35, 6.1.3.75) is sent by Cell 1 to trigger UE switches to Cell 2 for Test 1A, 1B, 2A and 2B. T5 starts.

    - In the cell switch MAC-CE:

      - The target cell is Cell 2.

      - Timing Advance Command is set to 0.

      - In test 1A, *CandidateTCI-State#2* is indicated.

      - In test 1B, *CandidateTCI-State#2* and *CandidateTCI-UL-State#1* are indicated.

      - In test 2A, *CandidateTCI-State#1* is indicated.

      - In test 2B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are indicated.

    - Cell 2 continuously schedules PUSCH for the UE.

15. T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than ($T_{cmd}$ + $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier. The values of $T_{cmd}$, $T_{LTM\text{-}RRC\text{-}processing}$ $T_{LTM\text{-}processing}$, $T_{first\text{-}RS}$ and $T_{RS\text{-}proc}$ are specified in 6.3.4.3.5.

16. If the UE transmits PUSCH to Cell 2 in less than $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$) ms from the beginning of time period T5, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

17. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18*, to cause UE handover back to Cell 1.

18. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1.

19. Power off Cell 2 and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop. Upon setting the new physical cell identity for Cell 2, power on Cell 2 to ensure Cell 2 is available for the following test steps.

20. Repeat steps 2-19 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6 and 7.3 with the following exceptions:

**Table 6.3.4.3.4.3-1: Common Exception messages (Step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -6dB and includeBeamMeasurements = True and with Condition SSB Index<br>Table H.3.1-5 with Condition SSB Index<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>PDCCH configuration: Table A.1.3.1-1 CCR.1.2 FDD for test 1, Table A.1.3.2-1 CCR.1.2 TDD for test 2 and Table A.1.3.2-2 CCR.2.4 TDD for test 3 with following exceptions: aggregation level = 16, allocated RB = 48 |

**Table 6.3.4.3.4.3-2: Common Exception messages (Step 7)**

| Default Message Contents | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with Condition L1-RSRP<br>Table H.3.12-2 with Condition L1-RSRP<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO<br>Table H.3.12-4<br>Table H.3.12-5 for Cell 1 with pucch-ResourceId = 8<br>Table H.3.12-6, Table H.3.12-7 and Table H.3.12-13 with SSB-Index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for Test 1A<br>Table H.3.12-10 with Condition Separate for Test 1B and Test 2B<br>Table H.3.12-10 with Condition Joint for Test 2A<br>Table H.3.12-11<br>Table H.3.12-12 for Cell 2 with l139 = 0 |

**Table 6.3.4.3.4.3-3 *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR1 | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n16 | | |
| } | | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | Config 1, 2 |
| | kHz 30 | | Config 3 |
| } | | | |

**Table 6.3.4.3.4.3-4: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.4.3.5 Test requirement

Table 6.3.4.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.4.3.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency cell switch**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
|---|---|---|---|---|
| | | | **T1~T5** | **T1~T5** |
| NR RF Channel Number | | | 1 | 1 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | Ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |

| | | | | |
|---|---|---|---|---|
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH configuration | | | FR1 PRACH configuration 6 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | -0.64 | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.7 | -58.7 |
| | Config 3 | dBm/ 38.16MHz | -52.6 | -52.6 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit PUSCH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T5.
The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms, as specified in TS 38.133 [6] clause 6.3.1.2. $T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ is defined in TS 38.133 [6] clause 6.3.1.3.

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$=0 for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$=22ms for Test 2A and 2B.
- $T_{LTM\text{-}IU}$ is the uncertainty in transmitting the first uplink transmission on Cell 2.
- $T_{LTM\text{-}RRC\text{-}processing}$ = 10 ms if the UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

## 6.3.4.4 NR SA FR1 RACH-less Intra-frequency PCell switch from FR1 to FR1 without L1-RSRP measurement

### 6.3.4.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 RACH-less intra-frequency Pcell switch specified in 38.133 [6] clause 6.3.1 without L1-RSRP measurement and measurement reporting, including cell switch delay and interruption length.

### 6.3.4.4.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less without L1-RSRP measurement and report from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of four parts, and the UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B:

- Test 1: for a UE that supports *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE that supports *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE that supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE that does not supports *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE that supports *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE that supports *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18.*

### 6.3.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.4.4.

### 6.3.4.4.4 Test description

#### 6.3.4.4.4.1 Initial conditions

Initial conditions are a set of test configurations that the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.4.4.4.1-1.

**Table 6.3.4.4.4.1-1: Intra-frequency cell switch from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.4.4.4.1-2.

**Table 6.3.4.4.4.1-2: Test environment parameters**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.4.4.1-1 | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable Ues without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.3.4.4.4.1-3.
2. Message contents are defined in clause 6.3.4.4.4.3.
3. Two cells are deployed in the test, which are FR1 Pcell (Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the Pcell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.3.4.4.4.1-3: General test parameters for Intra-frequency cell switch from FR1 to FR1**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -6 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| includeBeamMeasurements | | | TRUE | | | | |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 2 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | | | Same as Cell 1 |
| | PRACH configuration | | PRACH.5 FR1 | | | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | | | |
| | n-TimingAdvanceOffset | Tc | 25600 | | | | |
| ltm-CSI-SSB-ResourceList | | | SSB 0 of Cell 2 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.10B. In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.2 | | | | |
| T5 | | s | ≤0.1 | | | | |

#### 6.3.4.4.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in Table 6.3.4.4.4.1-1. No measurement gap is configured in the test case.

Both cell switch delay and interruption length are tested by using the parameters in table 6.3.4.4.4.1-2, and 6.3.4.4.4.1-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRCReconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.4.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier of Cell 2 for Test 1A, 1B, 2A and 2B.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. The UE shall transmit a *MeasurementReport* message triggered by Event A3. T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.4.4.5-1. T2 starts.

7. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell 2 for Test 1A, 1B, 2A and 2B.

8. The UE shall transmit *RRCReconfigurationComplete* message.

9. When T2 expires,

   - Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 6.3.4.4.5-1. T3 starts.

   - Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 6.3.4.4.5-1 if the UE is capable of *rach-EarlyTA-Measurement-r18*. T4 starts, go to step12. Otherwise, the SS shall switch the power setting from T2 to T5 as specified in Table 6.3.4.4.5-1. T5 starts, go to step14.

10. At the start of T3, the SS shall transmit a Candidate Cell TCI States Activation MAC-CE (Refer to TS 38.321 [12], clauses 5.18.36, 6.1.3.76) of Cell 2.

    - In Test 1A, *CandidateTCI-State#1* is activated.

    - In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are activated.

11. T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission. And the SS shall switch the power setting from T3 to T4 as specified in Table 6.3.4.4.5-1. T4 starts.

    - For the UE that incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped. The SS shall switch the power setting from T3 to T5 as specified in Table 6.3.4.4.5-1. T5 starts, go to step14.

12. At the start of T4, the SS shall transmit a PDCCH order (Refer to TS 38.213 [8], clause 21, and TS 38.212 [31], clause 7.3.1.2.1) to trigger the UE to transmit the PRACH on Cell 2 for Test 1A, 1B, 2A and 2B.

13. T4 ends 5ms after the UE transmits the PRACH to Cell 2. And the SS shall switch the power setting from T4 to T5 as specified in Table 6.3.4.4.5-1. T5 starts.

14. The start of T5 is the instant when the last TTI containing the LTM Cell Switch Command MAC-CE (Refer to TS 38.321 [12], clauses 5.18.35, 6.1.3.75) is sent by Cell 1 to trigger UE switches to Cell 2 for Test 1A, 1B, 2A and 2B. T5 starts.

    - In the cell switch MAC-CE:

      - The target cell is Cell 2.

      - Timing Advance Command is set to 0.

      - In test 1A, *CandidateTCI-State#2* is indicated.

      - In test 1B, *CandidateTCI-State#2* and *CandidateTCI-UL-State#1* are indicated.

      - In test 2A, *CandidateTCI-State#1* is indicated.

      - In test 2B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are indicated.

    - Cell 2 continuously schedules PUSCH for the UE.

15. T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than ($T_{cmd}$ + $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier. The values of $T_{cmd}$, $T_{LTM\text{-}RRC\text{-}processing}$ $T_{LTM\text{-}processing}$, $T_{first\text{-}RS}$ and $T_{RS\text{-}proc}$ are specified in 6.3.4.4.5.

16. If the UE transmits PUSCH to Cell 2 in less than $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$) ms from the beginning of time period T5, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

17. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18*, to cause UE handover back to Cell 1.

18. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1.

19. Power off Cell 2 and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop. Upon setting the new physical cell identity for Cell 2, power on Cell 2 to ensure Cell 2 is available for the following test steps.

20. Repeat steps 2-19 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.3.4.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6 and 7.3 with the following exceptions:

**Table 6.3.4.4.4.3-1: Common Exception messages (Step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -6dB and includeBeamMeasurements = True and with Condition SSB Index<br>Table H.3.1-5 with Condition SSB Index<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>PDCCH configuration: Table A.1.3.1-1 CCR.1.2 FDD for test 1, Table A.1.3.2-1 CCR.1.2 TDD for test 2 and Table A.1.3.2-2 CCR.2.4 TDD for test 3 with following exceptions: aggregation level = 16, allocated RB = 48 |

**Table 6.3.4.4.4.3-2: Common Exception messages (Step 7)**

| Default Message Contents | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12-1<br>Table H.3.12-2<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO<br>Table H.3.12-4<br>Table H.3.12-5 for Cell 1 with pucch-ResourceId = 8<br>Table H.3.12-6, Table H.3.12-7 and Table H.3.12-13 with SSB-Index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for Test 1A<br>Table H.3.12-10 with Condition Separate for Test 1B and Test 2B<br>Table H.3.12-10 with Condition Joint for Test 2A<br>Table H.3.12-11<br>Table H.3.12-12 for Cell 2 with I139 = 0 |

**Table 6.3.4.4.4.3-3: *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 | | |

| | | | |
|---|---|---|---|
| | [14] Table 7.3.1-14 with condition FR1 | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n16 | | |
| } | | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | Config 1, 2 |
| | kHz 30 | | Config 3 |
| } | | | |

**Table 6.3.4.4.4.3-4: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.4.4.5 Test requirement

Table 6.3.4.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.4.4.5-1: Cell specific test parameters for NR FR1-FR1 Intra-frequency cell switch**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1~T5 | T1~T5 |
| NR RF Channel Number | | | 1 | 1 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |

| | | | | |
|---|---|---|---|---|
| | Config 3 | | CR2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH configuration | | | PRACH.6 FR1 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | -0.64 | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.7 | -58.7 |
| | Config 3 | dBm/ 38.16MHz | -52.6 | -52.6 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit PUSCH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T5.
The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms, as specified in TS 38.133 [6] clause 6.3.1.2. $T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ is defined in TS 38.133 [6] clause 6.3.1.3.

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$=0 for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$=22ms for Test 2A and 2B.
- $T_{LTM\text{-}IU}$ is the uncertainty in transmitting the first uplink transmission on Cell 2.

- $T_{LTM\text{-}RRC\text{-}processing}$ = 10 ms if the UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

## 6.3.5 LTM PSCell Switch

### 6.3.5.0 Minimum conformance requirements

#### 6.3.5.0.1 Minimum conformance requirements for LTM PCell Switch

LTM cell switch delay $D_{LTM}$ is the delay from the end of the last TTI containing the MAC-CE command for cell switch until the time the UE transmits the first UL message on the target cell.

The requirements in this section apply when

- the target cell is known, and
- the target joint UL/DL TCI state or separate UL and DL TCI states in the MAC-CE LTM cell switch command are known, or
- the target cell is an FR1 cell, and the UE has reported L3-RSRP measurement result with SSB index associated to the target TCI state within 5 seconds before receiving the LTM TCI state activation command, and SNR of the SSB associated to the target TCI state ≥ -3dB.

LTM cell switch delay is defined as:

$$D_{LTM} = T_{cmd} + T_{LTM\text{-}RRC\text{-}processing} + T_{LTM\text{-}processing} + T_{first\text{-}RS} + T_{RS\text{-}proc} + T_{LTM\text{-}IU} \text{ ms}$$

Where:

$T_{cmd}$, $T_{LTM\text{-}RRC\text{-}processing}$, $T_{LTM\text{-}processing}$, $T_{first\text{-}RS}$, $T_{RS\text{-}proc}$ and $T_{LTM\text{-}IU}$ are as stated in TS 38.133 [6] section 6.3.1.2.

The definition of known LTM target cell and the definition of known target joint DL/UL TCI state or separate DL and UL TCI states are as stated in TS 38.133 [6] in section 6.3.1.2.

### 6.3.5.1 NR SA FR1 RACH-based intra-frequency LTM PSCell switch

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability is missing
- Message contents are TBD
- Test procedure is missing

#### 6.3.5.1.1 Test purpose

To verify the UE's ability to perform NR FR1 RACH-based intra-frequency PSCell switch specified in 38.133 [6] clause 8.20 for both with and without early TCI state activation.

#### 6.3.5.1.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for SCG with RACH from Release 18 onwards.

#### 6.3.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.5.0.

The normative reference for this requirement is TS 38.133 [6] clauses 8.20 and A.6.3.5.1.

### 6.3.5.1.4 Test description

#### 6.3.5.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.5.1.4.1-1.

**Table 6.3.5.1.4.1-1: Intra-frequency cell switch from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 6.3.5.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.3.5.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.3.5.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.3.5.1.4.1-2.

**Table 6.3.5.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.5.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.3.5.1.4.1-3.
2. Message contents are defined in clause 6.3.5.1.4.3.
3. Three cells are deployed in the test, which are FR1 PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings are according to Table 6.3.5.1.4.1-3 and Table 6.3.5.1.5-1.

**Table 6.3.5.1.4.1-3: General test parameters for Intra-frequency PSCell cell switch from FR1 to FR1**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cells | | Cell 1 (PCell), Cell 2 (PSCell) | | | | |
| | Neighbouring cell | | Cell 3 | | | | Cell 3 is the candidate cell |
| Final condition | Active cells | | Cell 1 (PCell), Cell 3 (PSCell) | | | | |
| A3-Offset | | dB | -6 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Time offset between Cell 2 and Cell 3 | | | 2 µs | | | | RTD between Cell 2 and Cell 3 is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 3) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in TS.38.133 [6] clause A.3.16B. In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.<br><br>CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | CandidateTCI-State#2 | | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.1 | | | | |

6.3.5.1.4.2 Test procedure

TBD

6.3.5.1.4.3 Message contents

TBD

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.3.5.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

6.3.5.1.5 Test requirements

Table 6.3.5.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.3.5.1.5-1: Cell specific test parameters for NR FR1 Intra-frequency PSCell switch test case**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|

| | | | T1 ~ T4 | T1 ~ T4 | T1 ~ T4 |
|---|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 2 | 2 |
| Duplex mode | Config 1, 1A | | FDD | | |
| | Config 2, 3, 2A, 3A | | TDD | | |
| TDD configuration | Config 1, 1A | | Not Applicable | | |
| | Config 2, 2A | | TDDConf.1.1 | | |
| | Config 3, 3A | | TDDConf.2.1 | | |
| $BW_{channel}$ | Config 1, 1A | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 2, 2A | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 3, 3A | MHz | 40: $N_{RB,c}$ = 106 | | |
| BWP BW | Config 1, 1A | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 2, 2A | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 3, 3A | MHz | 40: $N_{RB,c}$ = 106 | | |
| PDSCH Reference | Config 1, 1A | | SR.1.1 FDD | | |
| | Config 2, 2A | | SR.1.1 TDD | | |
| | Config 3, 3A | | SR.2.1 TDD | | |
| CORESET Reference Channel | Config 1, 1A | | CR.1.1 FDD | | |
| | Config 2, 2A | | CR.1.1 TDD | | |
| | Config 3, 3A | | CR.2.1 TDD | | |
| CP length | Config 1, 2, 3, 1A, 2A, 3A | | Normal | | |
| TRS configuration | Config 1, 1A | | TRS.1.1 FDD | | |
| | Config 2, 2A | | TRS.1.1 TDD | | |
| | Config 3, 3A | | TRS.1.2 TDD | | |
| OCNG Patterns | Config 1, 2, 3, 1A, 2A, 3A | | OP.1 | | |
| SMTC Configuration | Config 1, 2, 3, 1A, 2A, 3A | | SMTC.1 | | |
| SSB Configuration | Config 1,2, 1A, 2A | | SSB.1 FR1 | | |
| | Config 3, 3A | | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2, 1A, 2A | kHz | 15 | | |
| | Config 3, 3A | kHz | 30 | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2, 1A, 2A | kHz | 15 | | |
| | Config 3, 3A | kHz | 30 | | |
| PRACH configuration | Config 1, 2, 3, 1A, 2A, 3A | | FR1 PRACH configuration 6 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | Config 1, 2, 3, 1A, 2A, 3A | | DLBWP.0.1 | | |
| | Dedicated DL BWP | Config 1, 2, 3, 1A, 2A, 3A | | DLBWP.1.1 | | |
| | Initial UL BWP | Config 1, 2, 3, 1A, 2A, 3A | | ULBWP.0.1 | | |
| | Dedicated UL BWP | Config 1, 2, 3, 1A, 2A, 3A | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 1A, 2A, 3A | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of PDSCH to PDSCH | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | Config 1, 2, 3, 1A, 2A, 3A | | | | |
| $N_{oc}$ Note2 | | Config 1, 2, 3, 1A, 2A, 3A | dBm/15kHz | -98+TT | | |
| $N_{oc}$ Note2 | | Config 1,2, 1A, 2A | dBm/SCS | -98+TT | | |
| | | Config 3, 3A | | -95+TT | | |
| $\hat{E}_s/I_{ot}$ | | Config 1, 2, 3, 1A, 2A, 3A | dB | 11+TT | -0.64+TT | -0.64+TT |
| $\hat{E}_s/N_{oc}$ | | Config 1, 2, 3, 1A, 2A, 3A | dB | 11+TT | 8+TT | 8+TT |
| SSB_RP | | Config 1,2, 1A, 2A | dBm/SCS | -87+TT | -90+TT | -90+TT |
| | | Config 3, 3A | dBm/SCS | -84+TT | -87+TT | -87+TT |
| Io Note3 | | Config 1,2, 1A, 2A | dBm/ 9.36MHz | -58.7+TT | -58.7+TT | -58.7+TT |
| | | Config 3, 3A | dBm/ 38.16MHz | -52.62+TT | -52.6+TT | -52.6+TT |
| Propagation condition | | Config 1, 2, 3, 1A, 2A, 3A | - | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
|---|---|

The UE shall start to transmit the PRACH to Cell 3 in no later than $D_{LTM}$ from the beginning of time period T4.

The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms and is specified in clause 6.3.1.2

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 0 ms for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 22 ms for Test 2A and 2B
- $T_{LTM\text{-}IU}$ = 20 ms
- $T_{LTM\text{-}RRC\text{-}processing}$ = 10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability
- $T_{LTM\text{-}processing}$ = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

# 6.4 Timing

## 6.4.1 UE transmit timing

### 6.4.1.0 Minimum conformance requirements

#### 6.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 6.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table 6.4.1.0.1-2.

**Table 6.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $12*64*T_c$ |
| | | 30 | $10*64*T_c$ |
| | | 60 | $10*64*T_c$ |
| | 30 | 15 | $8*64*T_c$ |
| | | 30 | $8*64*T_c$ |
| | | 60 | $7*64*T_c$ |
| 2 | 120 | 60 | $3.5*64*T_c$ |
| | | 120 | $3.5*64*T_c$ |
| | 240 | 60 | $3*64*T_c$ |
| | | 120 | $3*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 6.4.1.0.1-2: The Value of $N_{\mathrm{TA\,offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\mathrm{TA\,offset}}$ (Unit: $T_C$) |
|---|---|
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| Note 1: The UE identifies $N_{\mathrm{TA\,offset}}$ based on the information n-TimingAdvanceOffset according to TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\mathrm{TA\,offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to section 4.2 in [8] and the value 39936 of $N_{\mathrm{TA\,offset}}$ can also be provided for a FDD serving cell. | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{TA} + N_{TA\ offset}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.

2) The minimum aggregate adjustment rate shall be $T_p$ per second.

3) The maximum aggregate adjustment rate shall be $T_q$ per 200 ms for SCS of UL signals smaller or equal to 120 kHz and 100 ms for SCS of uplink signals larger or equal to 480 kHz.

where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 6.4.1.0.1-3.

**Table 6.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 1 | 15 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| | 30 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| | 60 | $5.5*64*T_c$ | $5.5*64*T_c$ |
| 2 | 60 | $2.5*64*T_c$ | $2.5*64*T_c$ |
| | 120 | $2.5*64*T_c$ | $2.5*64*T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

## 6.4.1.1 NR SA FR1 UE transmit timing accuracy

### 6.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1.2.

### 6.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.6.4.1.1

### 6.4.1.1.4 Test Description

#### 6.4.1.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-1 [17].

This test can be run in one of the configurations defined in Table 6.4.1.1.4.1-1.

**Table 6.4.1.1.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 6.4.1.1-1 | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 6.4.1.1-2 | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 6.4.1.1-3 | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

| Note: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. |
|---|

Configure the test equipment and the DUT according to the parameters in Table 6.4.1.1.4.1-2

**Table 6.4.1.1.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE link | | |

1. Message contents are defined in clause 6 6.4.1.1.4.3.

2. A single NR cell is used. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1. The general test parameters are given in Table 6.4.1.1.5-1 below.

### 6.4.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell). The downlink timing of the NR Cell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case.

Following will be the test sequence for this test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up NR Cell according to parameters given in Table 6.4.1.1.4.1-1.

3. The SS shall transmit an RRCReconfiguration message configuring the UE with the message content defined in clause 6.4.1.1.4.3.

4. The UE shall transmit RRCReconfigurationComplete message.

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.

   a. The $N_{TA}$ offset value (in $T_c$ units) is 25600 for FR1

   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 6.4.1.1.5-4

6. The test system shall adjust the timing of the DL path by values given in Table 6.4.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

**Table 6.4.1.1.4.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 15 | +64*64Tc | +32*64Tc |
| 30 | +32*64Tc | +16*64Tc |

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 6.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 6.4.1.0.1 and Table 6.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 6.4.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

#### 6.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.4.1.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 6.4.1.1.4.3-1: *SRS-Config* : Additional test requirement for UE transmit timing accuracy for NR SA FR1 UE**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | SCS15 |
| | 25 | | SCS30 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |

| | | | |
|---|---|---|---|
| sl1 | 0 | | Test 1 |
| sl320 | 3 | | Test 2 and SCS15 |
| sl640 | 5 | | Test 2 and SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.4.1.1.4.3-2: *DRX-Config* : Additional test requirement for UE transmit timing accuracy Test 2 for NR SA FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-InactivityTimer | ms1 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| } | | | |

6.4.1.1.5 Test Requirements

**Table 6.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | Test2 |
|---|---|---|---|---|
| SSB ARFCN | | 1,2,3 | Freq1 | Freq1 |
| NR Channel Number | | 1,2,3 | 2 | 2 |
| TDD configuration | | 1 | Not Applicable | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1 | 10: $N_{RB,c}$ = 52 | |
| | | 2 | 10: $N_{RB,c}$ = 52 | |
| | | 3 | 40: $N_{RB,c}$ = 106 | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1 ULBWP.1.1 | |
| DRx Cycle | ms | 1,2,3 | N/A | DRX.8[Note5] |
| PDSCH Reference measurement channel | | 1 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| OCNG Patterns | | 1,2,3 | OP.1 | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC | | 1 | SMTC.1 | |
| | | 3 | SMTC.2 | |
| TRS configuration | | 1 | TRS.1.1 FDD | |

| | | | | |
|---|---|---|---|---|
| | | 2 | TRS.1.1 TDD | |
| | | 3 | TRS.1.2 TDD | |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | -98 | -98 |
| | | 3 | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | | 1,2,3 | 3.3 | 3.3 |
| $\hat{E}_s/N_{oc}$ | | 1,2,3 | 3.3 | 3.3 |
| SS-RSRP Note3 | dBm/SCS | 1,2 | -95 | -95 |
| | | 3 | -92 | -92 |
| Io Note3 | dBm/9.36MHz | 1,2 | -65.08 | -65.08 |
| | dBm/38.1MHz | 3 | -61.99 | -61.99 |
| Propagation condition | | 1,2,3 | AWGN | |
| SRS Config | | 1 | SRSConf.1 Note6 | SRSConf.3 Note6 |
| | | 2,3 | SRSConf.1 Note6 | SRSConf.2 Note6 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: DRx related parameters are given in Table 6.4.1.1.5-3 or Table A.5.-1
Note 6: SRS configs are given in Table 6.4.1.1.5-2

**Table 6.4.1.1.5-2: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
|---|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | 0 | |
| | resourceType | Periodic | Periodic | Periodic | |
| | Usage | Codebook | Codebook | Codebook | |
| | SRS-ResourceSetId | 0 | 0 | 0 | |
| SRS-Resource | nrofSRS-Ports | Port1 | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | 0 | |
| | freqDomainShift | 0 | 0 | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| | freqHopping c-SRS | 14 for test configuration 1,2<br>25 for test configuration 3 | 25 | 14 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | Neither | |
| | resourceType | Periodic | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1 | sl640,5 | sl320,3 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | 0 | Any 10 bit number |

**Table 6.4.1.1.5-3: DRX-Configuration for UL Timing Tests**

| Field | Test 2 |
|---|---|
| | Value |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| longDRX-CycleStartOffset | 320 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13] | |

**Table 6.4.1.1.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $13.75*64*T_c$ |
| | | 30 | $11.75*64*T_c$ |
| | | 60 | $11.75*64*T_c$ |
| | 30 | 15 | $9.75*64*T_c$ |
| | | 30 | $9.75*64*T_c$ |
| | | 60 | $8.75*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 6.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ | Maximum Adjustement Rate |
|---|---|---|---|---|
| 1 | 15 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 30 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 60 | $6.0*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

## 6.4.2 UE timer accuracy

## 6.4.3 Timing advance

### 6.4.3.0 Minimum conformance requirement

#### 6.4.3.0.1 Minimum conformance requirement for timing advance adjustment

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 6.4.3.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 6.4.3.0.1-1: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 | 120 |
|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ |

## 6.4.3.1 NR SA FR1 timing advance adjustment accuracy

### 6.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

### 6.4.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.4.3.1.

### 6.4.3.1.4 Test description

#### 6.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.4.3.1.4.1-1.

**Table 6.4.3.1.4.1-1: NR SA FR1 timing advance adjustment accuracy supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.4.3.1.4.1-2

**Table 6.4.3.1.4.1-2: Initial conditions for NR SA FR1 timing advance adjustment accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE Link | | |

**Table 6.4.3.1.4.1-3: General test parameters for timing advance**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |

| | | | |
|---|---|---|---|
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For SCS = 15kHz : $N_{TA_new} = N_{TA_old}$ + $8192*T_c$ (based on equation in TS 38.213 [8] section 4.2)<br>For SCS = 30kHz : $N_{TA_new} = N_{TA_old}$ + $4096*T_c$ (based on equation in TS 38.213 [8] section 4.2) |
| T1 | s | 5 | |
| T2 | s | 5 | |

1. Message contents are defined in clause 6.4.3.1.4.3.

2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.4.3.1.4.1-3 above.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

#### 6.4.3.1.4.2 Test Procedure

The test consists of single cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 6.4.3.1.5-1 and table 6.4.3.1.4.1-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

1. Set the parameters according to values in Tables 6.4.3.1.4.1-3.

2. SS shall transmit an RRCReconfiguration message.

3. The UE shall transmit RRCReconfigurationComplete message.

4. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

5. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value 39 as specified in table 6.4.3.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

6. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

7. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

9. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. The SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. After the RRC connection release, the SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 or if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 6.4.3.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |

**Table 6.4.3.1.4.3-1: srs-Config setup**

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | Config 1,2 | |
| | 24 | Config 3 | |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | periodic | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 2 | Once every 5 Slots | SCS15 |
| sl5 | 4 | Once every 5 Slots | SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k* slots after the reception of the timing advance command, where:

$k$ = 5 for Config 1, 2, and 3

The Timing Advance adjustment accuracy shall be within the limits specified in Table 6.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

Table 6.4.3.1.5-1 and Table 6.4.3.1.5-2 define the primary level settings.

**Table 6.4.3.1.5-1: Cell specific test parameters for timing advance**

| Parameter | | Unit | Test1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| SMTC configuration | Config 1,2 | | SMTC.1 FR1 | |
| | Config 3 | | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | |
| | Config 3 | | 30 kHz | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 3 | |
| $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -67.57 | |
| | Config 3 | dBm/ 38.16MHz | -62.58 | |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

**Table 6.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance**

| Field | | Value | Comment |
|---|---|---|---|
| c-SRS | Config 1,2 | 12 | Frequency hopping is disabled |
| | Config 3 | 24 | |
| b-SRS | | 0 | |
| b-hop | | 0 | |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 | |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5@2 for SCS 15kHz<br>sl5@4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 | |
| repetitionFactor | | n1 | |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 | |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

**Table 6.4.3.1.5-3: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS kHz | 15 | 30 | 60 |
|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±344 $T_c$ | ±344 $T_c$ | ±216 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 6.5 Signaling characteristics

## 6.5.1 Radio link monitoring

### 6.5.1.00 General

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 6.5.1-1.

The threshold $Q_{in}$ is defined as the level at which the downlink radio link quality can be significantly more reliably received than at $Q_{out}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 6.5.1-1.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 6.5.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 6.5.1-1.

**Table 6.5.1-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out}$ | $BLER_{in}$ |
|---|---|---|
| 0 | 10% | 2% |

UE shall be able to monitor up to $X_{RLM-RS}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, where $X_{RLM-RS}$ is specified in Table 6.5.1-2, and meet the requirements as specified in this section.

**Table 6.5.1-2: Maximum number of RLM-RS resources $X_{RLM-RS}$**

| Maximum number of RLM-RS resources, $X_{RLM-RS}$ | Carrier frequency range of PCell |
|---|---|
| 2 | FR1, ≤ 3 GHz |
| 4 | FR1, > 3 GHz |
| 8 | FR2 |

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

Any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means no uplink signal.

Introduction of Requirement on Radio Link Monitoring for UE Configured with Relaxed Measurement Criteria.

For the UE supports *rlm-Relaxation-r17*and configured with explicit signalling *goodServingCellEvaluationRLM,* which is always configured to the UE when the network enables RLM relaxation for the UE as specified in TS 38.331 [13], the relaxed requirements defined in clause 6.5.1.0.4 for SSB based radio link monitoring and the relaxed requirements defined in clause 6.5.1.0.5 for CSI-RS based radio link monitoring are allowed to apply to the relaxed RLM measurements on SpCell after fulfilling the following conditions:

- for the serving cells in intra-band carrier aggregation configured with SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on SCell, when
  - the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on Scell in the intra-band carrier aggregation if the *lowMobilityEvaluationConnected* is not configured, or
  - the UE is also configured with *lowMobilityEvaluationConnected* and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of $T_{SearchDeltaP-Connected}$ and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the serving cell based on the measurements that are configured for SSB-based or CSI-RS based RLM on SpCell together with CSI-RS based BFD on Scell in the intra-band carrier aggregation.
- for other serving cells, when

- the good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell if the *lowMobilityEvaluationConnected* is not configured, or

- the UE is also configured with *lowMobilityEvaluationConnected* and both low mobility criterion defined in clause 5.7.13.1 of TS 38.331 [13] is fulfilled for a period of $T_{SearchDeltaP-Connected}$ and good serving cell quality criterion defined in clause 5.7.13.2 of TS 38.331 [13] is fulfilled for the SpCell.

otherwise, UE shall apply the requirements defined in TS 38.133 [6] clause 8.1.2.2 for SSB based radio link monitoring and the requirements defined in TS 38.133 [6] clause 8.1.3.2 for CSI-RS based radio link monitoring. Note that when multiple resources are configured on a serving cell for RLM or BFD evaluation, the good serving cell quality criterion is considered as fulfilled for the serving cell when any resource configured for the cell fulfils the good serving defined in clause 5.7.13.2 of TS 38.331 [13].

The UE is no longer allowed to relax RLM measurements and apply the relaxed radio link monitoring provided that at least one of the following conditions is met:

- The UE sends out of sync indications to the higher layers,

- The timer T310 is running.

- No DRX is used or DRX cycle is longer than 80ms

## 6.5.1.0 Minimum conformance requirements

### 6.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ [ms] evaluation period. The requirements in this section apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 6.5.1.0.1-1.

$T_{Evaluate_out_SSB}$ is defined in Table 6.5.1.0.1-1 for FR1.

**Table 6.5.1.0.1-1: Evaluation period $T_{Evaluate_out}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) |
|---|---|
| no DRX | max(200,ceil(10*P)*$T_{SSB}$) |
| DRX cycle≤320 | max(200,ceil(15*P)*max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 | ceil(10*P)*$T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of SSB configured for RLM. | |

For FR1,

- P=1/(1 – $T_{SSB}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

If DRX is used, when the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When

- the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration,

or

- the UE transitions between DRX and no DRX or DRX cycle periodicity changes,

for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in section 8.1.2 if the RLM-RS resource is SSB.

When DRX is used, TIndication_interval is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [11] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6 and 8.1.7.

#### 6.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ [ms] period becomes better than the threshold $Q_{in_SSB}$ within $T_{Evaluate_in_SSB}$ [ms] evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 6.5.1.0.2-1 for FR1.

For FR1,

- $P=1/(1 - T_{SSB}/MGRP)$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of $M_{out}$ and $M_{in}$ used in Table 6.5.1.2.3-1 are defined as:

- $M_{out}$ = 20 and $M_{in}$ = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

**Table 6.5.1.0.2-1: Evaluation period $T_{Evaluate_out}$ and $T_{Evaluate_in}$ for FR1**

| Configuration | $T_{Evaluate_out}$ (ms) | $T_{Evaluate_in}$ (ms) |
|---|---|---|
| no DRX | max(200, ceil($M_{out}$×P)×$T_{CSI-RS}$) | max(100, ceil($M_{in}$×P) × $T_{CSI-RS}$) |
| DRX ≤ 320ms | max(200, ceil(1.5×$M_{out}$×P)× max($T_{DRX}$, $T_{CSI-RS}$)) | max(100, ceil(1.5×$M_{in}$×P)× max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX > 320ms | ceil($M_{out}$×P) × $T_{DRX}$ | ceil($M_{in}$×P) × $T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of CSI-RS resource configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in}$, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in section 8.1.2 of TS 38.133 [6] if the RLM-RS resource is SSB, or $T_{CSI-RS}$ specified later in this if the RLM-RS resource is CSI-RS.

When DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [11] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6, 8.1.7 and A.7.5.1.

#### 6.5.1.0.3 Minimum conformance requirements for out-of-sync and in-sync CSI-RS based RLM

[TS 38.133 clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI\text{-}RS}$ [ms] period becomes worse than the threshold $Q_{out_CSI\text{-}RS}$ within $T_{Evaluate_out_CSI\text{-}RS}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_CSI\text{-}RS}$ within $T_{Evaluate_in_CSI\text{-}RS}$ [ms] evaluation period.

- $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ are defined in Table 8.1.3.2-1 for FR1.

For FR1,

- $P=1/(1 - T_{CSI\text{-}RS}/MGRP)$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of $M_{out}$ and $M_{in}$ used in Table 8.1.3.2-1 are defined as:

- $M_{out}$ = 20 and $M_{in}$ = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

**Table 6.5.1.0.3-1: Evaluation period $T_{Evaluate_out}$ and $T_{Evaluate_in}$ for FR1**

| Configuration | $T_{Evaluate_out}$ (ms) | $T_{Evaluate_in}$ (ms) |
|---|---|---|
| no DRX | $\max(200, \text{ceil}(M_{out}\times P)\times T_{CSI\text{-}RS})$ | $\max(100, \text{ceil}(M_{in}\times P) \times T_{CSI\text{-}RS})$ |
| DRX ≤ 320ms | $\max(200, \text{ceil}(1.5\times M_{out}\times P)\times \max(T_{DRX}, T_{CSI\text{-}RS}))$ | $\max(100, \text{ceil}(1.5\times M_{in}\times P)\times \max(T_{DRX}, T_{CSI\text{-}RS}))$ |
| DRX > 320ms | $\text{ceil}(M_{out}\times P) \times T_{DRX}$ | $\text{ceil}(M_{in}\times P) \times T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

[TS 38.133 clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in}$, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is $\max(10ms, T_{RLM\text{-}RS,M})$, where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in section 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in section 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is $\max(10ms, 1.5*DRX_cycle_length, 1.5*T_{RLM\text{-}RS,M})$ if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery

using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

[TS 38.133 clause 8.1.5]

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.2, 8.1.6 and 8.1.5.

#### 6.5.1.0.4 Minimum requirement of SSB based radio link monitoring for UE fulfilling relaxed measurement criteria

[TS 38.133 clause 8.1.2.4]

This clause contains minimum requirements for relaxed radio link monitoring based on SSB.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB_Relax}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB_Relax}$ [ms] evaluation period.

$T_{Evaluate_out_SSB_Relax}$ is defined in Table 6.5.1.0.4-1 for FR1.

$T_{Evaluate_out_SSB_Relax}$ is defined in Table 6.5.1.0.4-2 for FR2 with scaling factor N=8.

The value of P is defined in TS 38.133 [6] clause 8.1.2.2.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 6.5.1.0.4-1: Evaluation period $T_{Evaluate_out_SSB_Relax}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX},T_{SSB}) \leq 80ms$ | $Max(200\times K3^{NOTE3}, Ceil(15 \times K1^{NOTE2} \times P) \times Max(T_{DRX},T_{SSB}))$ |
| $80ms < Max(T_{DRX},T_{SSB}) \leq 160ms$ | $Ceil(15 \times P) \times Max(T_{DRX},T_{SSB})$ |
| NOTE 1: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>NOTE 2: K1 = 4 for $Max(T_{DRX},T_{SSB}) \leq 40ms$ and K1 = 2 for $40ms<Max(T_{DRX},T_{SSB}) \leq 80ms$.<br>NOTE 3: K3 = K1, if K1 ≤ 2; otherwise K3 = 1. | |

**Table 6.5.1.0.4-2: Evaluation period $T_{Evaluate_out_SSB_Relax}$ for FR2**

| Configuration | $T_{Evaluate_out_SSB_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX},T_{SSB}) \leq 80ms$ | $Max(200\times K4^{NOTE3}, Ceil(15 \times K2^{NOTE2} \times P \times N) \times Max(T_{DRX},T_{SSB}))$ |
| $80ms < Max(T_{DRX},T_{SSB}) \leq 160ms$ | $Ceil(15 \times P \times N) \times Max(T_{DRX},T_{SSB})$ |
| NOTE 1: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>NOTE 2: K2 = 2.<br>NOTE 3: K4 = K2, if K2 ≤ 2; otherwise K4 = 1. | |

#### 6.5.1.0.5 Minimum requirement of CSI-RS based radio link monitoring for UE fulfilling relaxed measurement criteria

[TS 38.133 clause 8.1.3.4]

This clause contains minimum requirements for relaxed radio link monitoring based on CSI-RS.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS_Relax}$ [ms] period becomes worse than the threshold $Q_{out_CSI-RS}$ within $T_{Evaluate_out_CSI-RS_Relax}$ [ms] evaluation period.

$T_{Evaluate_out_CSI-RS_Relax}$ is defined in Table 6.5.1.0.5-1 for FR1.

$T_{Evaluate_out_CSI-RS_Relax}$ is defined in Table 6.5.1.0.5-2 for FR2 with scaling factor N=1.

The value of P is defined in TS 38.133 [6] clause 8.1.3.2.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{out}$ used in Table 6.5.1.0.5-1 and Table 6.5.1.0.5-2 are defined as:

- $M_{out}$ = 20, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 6.5.1.0.5-1: Evaluation period $T_{Evaluate_out_CSI-RS_Relax}$ for FR1**

| Configuration | $T_{Evaluate_out_CSI-RS_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX}, T_{CSI-RS}) \leq 80$ ms | $Max(200 \times K3^{NOTE3}, Ceil(1.5 \times M_{out} \times P \times K1^{NOTE2}) \times Max(T_{DRX}, T_{CSI-RS})^{NOTE1})$ |
| NOTE1: $T_{CSI-RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>NOTE2: K1 = 2 for 40 ms < $MAX(T_{DRX}, T_{CSI-RS}) \leq 80$ ms, K1 = 4 for $MAX(T_{DRX}, T_{CSI-RS}) \leq 40$ ms<br>NOTE3: K3 = K1, if K1 ≤ 2; K3 = 1 otherwise. | |

**Table 6.5.1.0.5-2: Evaluation period $T_{Evaluate_out_CSI-RS_Relax}$ for FR2**

| Configuration | $T_{Evaluate_out_CSI-RS_Relax}$ (ms) |
|---|---|
| $Max(T_{DRX}, T_{CSI-RS}) \leq 80$ ms | $Max(200 \times K4^{NOTE3}, Ceil(1.5 \times M_{out} \times P \times N \times K2^{NOTE2}) \times Max(T_{DRX}, T_{CSI-RS})^{NOTE1})$ |
| NOTE1: $T_{CSI-RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length and no longer than 80ms.<br>NOTE2: K2 = 2.<br>NOTE3: K4 = K2, if K2 ≤ 2; K4 = 1 otherwise. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.4.

## 6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

### 6.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

### 6.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.1.

#### 6.5.1.1.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

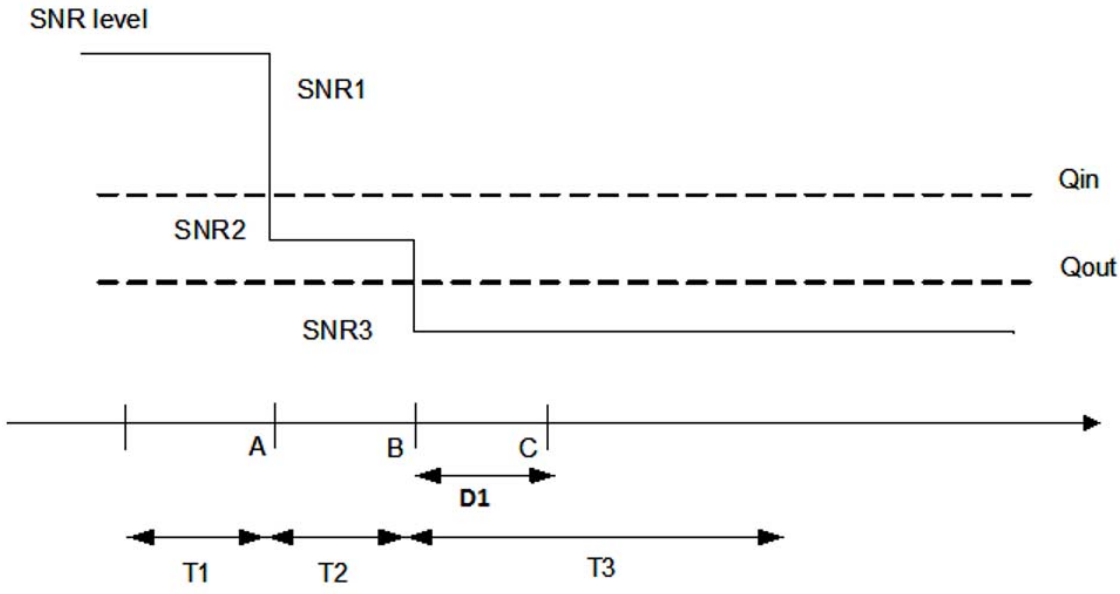



**Figure 6.5.1.1.4-1: SNR variation for out-of-sync testing**

#### 6.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.1.4.1-1.

**Table 6.5.1.1.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations**

| Configuration | Description |
|---|---|
| 6.5.1.1-1 | FDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.1-2 | TDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.1-3 | TDD, SSB SCS 30 kHz, data SCS 30kHz, BW 40MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.1.4.1-2.

**Table 6.5.1.1.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 6.5.1.1.4.1-3: Void**

1. Message contents are defined in clause 6.5.1.1.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.5.1.1.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |

| | | | |
|---|---|---|---|
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2, 5 | | CSI-RS.1.1 TDD |
| | Config 3, 6 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 6.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters according to T1 in Table 6.5.1.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.1.5-1. T3 starts.

7. If the SS:
   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,
   the number of successful tests is increased by one.

8. Otherwise the number of failed tests is increased by one.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.1.5-1.

10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short_DCI" and with the following exceptions:

**Table 6.5.1.1.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-1<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.5-4<br>Table H.3.5-9 |

**Table 6.5.1.1.4.3-1: Void**

**Table 6.5.1.1.4.3-2: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 6.5.1.1.4.3-3: Void**

**Table 6.5.1.1.4.3-4 *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -53 | -106 is actual value in dBm (-53 * 2 dBm) | dBm/15kHz |
| | -51 | -102 is actual value in dBm (-51 * 2 dBm) | dBm/30kHz |
| } | | | |
| } | | | |

#### 6.5.1.1.5 Test Requirement

Table 6.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 6.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.e | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1 | dBm/ SCS | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -95 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances).

**Table 6.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| Note Ensure that RLM RS is partially overlapped with measurement gap | |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

### 6.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PCell, when DRX is not used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

### 6.5.1.2.2 Test applicability

This test applies to all types of NR UEs supporting Release 15 and forwared

### 6.5.1.2.3 Minimum conformance requirements

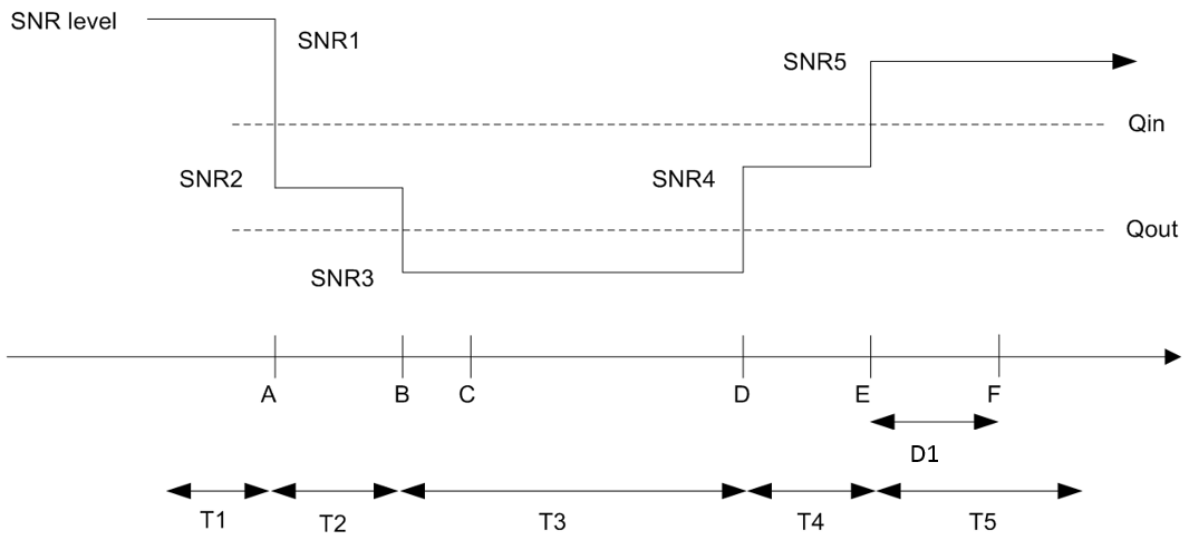
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.2.

### 6.5.1.2.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

**Figure 6.5.1.2.4-1 - SNR variation for in-sync testing**




### 6.5.1.2.4 Test Requirements

#### 6.5.1.2.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.2.4.1-1.

**Table 6.5.1.2.4.1-1: Supported test configurations for FR1 PSCell**

| Configuration | Description |
|---|---|
| 6.5.1.2-1 | FDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.2-2 | TDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.2-3 | TDD, SSB SCS 30 kHz, data SCS 30kHz, BW 40MHz |

| Note: | The UE is only required to pass in one of the supported test configurations in FR1 |
|---|---|

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.2.4.1-2.

**Table 6.5.1.2.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 6.5.1.2.4.1-3: Void**

1. Message contents are defined in clause 6.5.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The general test parameters are given in Table 6.5.1.2.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex C.1.

**Table 6.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |

| | | | |
|---|---|---|---|
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

#### 6.5.1.2.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.2.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 6.5.1.2.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-4<br>Table H.3.5-9 |

**Table 6.5.1.2.4.3-1: Void**

**Table 6.5.1.2.4.3-2: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 6.5.1.2.4.3-3: Void**

6.5.1.2.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.2.3.

Table 6.5.1.2.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

**Table 6.5.1.2.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -95 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE wiht 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances)

## 6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

### 6.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

### 6.5.1.3.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.3.

### 6.5.1.3.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

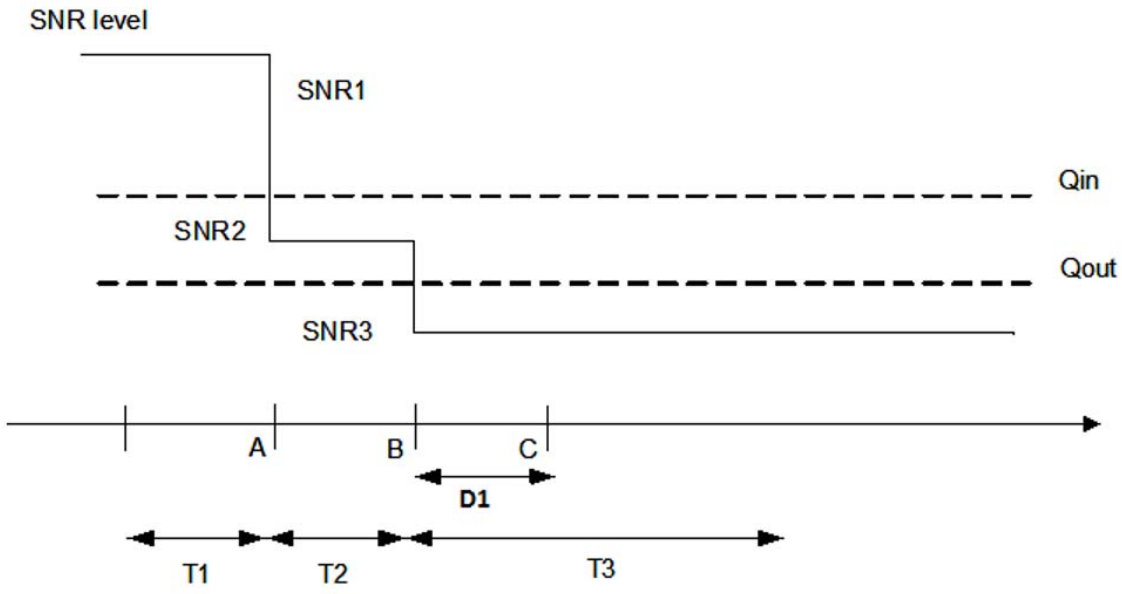



**Figure 6.5.1.3.4-1: SNR variation for out-of-sync testing**

#### 6.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.3.4.1-1.

**Table 6.5.1.3.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode supported test configurations**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 6.5.1.3-1 | FDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.3-2 | TDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.3-3 | TDD, SSB SCS 30 kHz, data SCS 30kHz, BW 40MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.3.4.1-2.

**Table 6.5.1.3.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 6.5.1.3.4.1-3: Void**

1. Message contents are defined in clause 6.5.1.3.4.3.

2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.5.1.3.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| | Config 1 | | CCR.1.3 FDD |

| | | | |
|---|---|---|---|
| Dedicated CORESET Reference Channel | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2 | | Table A.7.1-1, PRACH.1 FR1 |
| | Config 3 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.68 |
| T3 | | s | 0.68 |
| D1 | | s | 0.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 6.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.3.5-1. T3 starts.

5. If the SS:
   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,
   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.3.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 6.5.1.3.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.5.1.3.4.3-1: Void**

**Table 6.5.1.3.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311 | ms1000 | | |
| } | | | |

**Table 6.5.1.3.4.3-3: Void**

**Table 6.5.1.3.4.3-4 *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfoSEQUENCE { | | | |
| q-RxLevMin | -53 | -106 is actual value in dBm (-53 * 2 dBm) | dBm/15kHz |
| | -51 | -102 is actual value in dBm (-51 * 2 dBm) | dBm/30kHz |
| } | | | |
| } | | | |

6.5.1.3.5 Test Requirement

Table 6.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 6.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -95 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.3.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode

### 6.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the Pcell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

### 6.5.1.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.5.1.4.3 Minimum conformance requirements

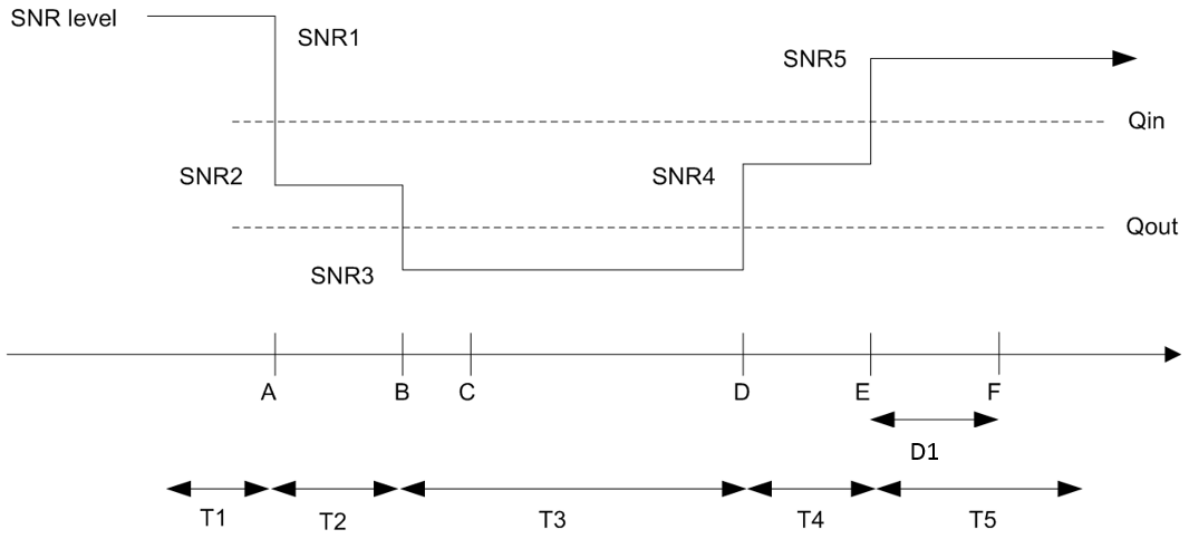
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.4.

### 6.5.1.4.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.Editor note: whether to revise power level to be gradually changed

**Figure 6.5.1.4.4-1 - SNR variation for in-sync testing**




#### 6.5.1.4.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.4.4.1-1.

**Table 6.5.1.4.4.1-1: Supported test configurations for NR FR1 PCell**

| Configuration | Description |
|---|---|
| 6.5.1.4-1 | FDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |
| 6.5.1.4-2 | TDD, SSB SCS 15 kHz, data SCS 15kHz, BW 10MHz |

| | |
|---|---|
| 6.5.1.4-3 | TDD, SSB SCS 30 kHz, data SCS 30kHz, BW 40MHz |
| Note: | The UE is only required to pass in one of the supported test configurations in FR1. |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.4.4.1-2.

**Table 6.5.1.4.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for NR PCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

**Table 6.5.1.4.4.1-3: Void**

1. Message contents are defined in clause 6.5.1.4.4.3.

2. There is one cell (Cell 1), which is the active NR cell, in the test. The power levels and settings are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2.

3. The general test parameters are given in Table 6.5.1.4.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.

**Table 6.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |

| | | | | |
|---|---|---|---|---|
| | | Config 2 | | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| | | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 15 kHz |
| | | Config 3 | | 30 kHz |
| PRACH Configuration | | Config 1, 2 | | Table A.7.1-1, PRACH.1 FR1 |
| | | Config 3 | | Table A.7.1-1, PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 2000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | | CSI-RS.1.1 FDD |
| | Config 2 | | | CSI-RS.1.1 TDD |
| | Config 3 | | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1 | | | TRS.1.1 FDD |
| | Config 2 | | | TRS.1.1 TDD |
| | Config 3 | | | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.64 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| D1 | | | s | 0.84 |

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

#### 6.5.1.4.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.4.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1 second after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 6.5.1.4.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.5.1.4.4.3-1: Void**

**Table 6.5.1.4.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 6.5.1.4.4.3-3: Void**

### 6.5.1.4.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.4.3.

Table 6.5.1.4.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

**Table 6.5.1.4.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -95 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).

## 6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

### 6.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

#### 6.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.5.

#### 6.5.1.5.4 Test description

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

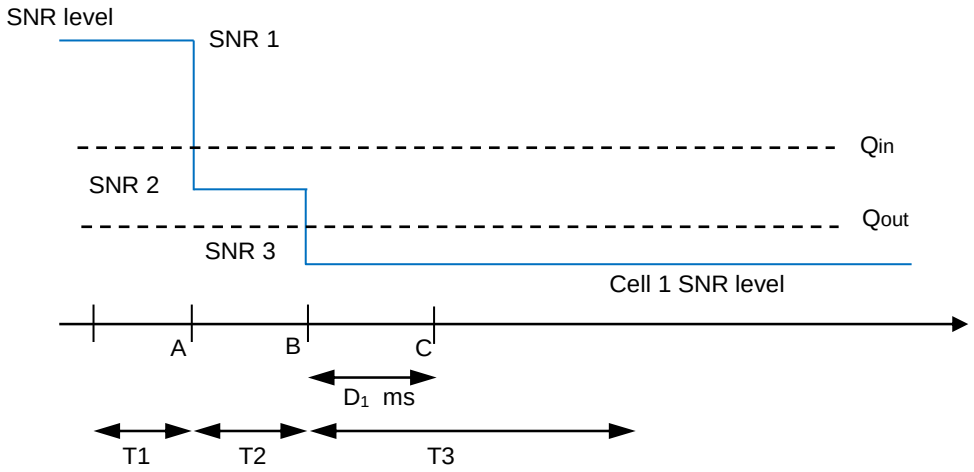



**Figure 6.5.1.5.4-1: SNR variation for out-of-sync testing**

#### 6.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.5.4.1-1.

**Table 6.5.1.5.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX**

| Configuration | Description |
|---|---|
| 6.5.1.5-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.5-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.5-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.5.4.1-2.

**Table 6.5.1.5.4.1-2: Initial conditions for NR SA radio link monitoring NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |

1. The general test parameter settings are set up according to Table 6.5.1.5.4.1-3. The measurement gap configuration is according to Table 6.5.1.5.4.1-4.

2. Message contents are defined in clause 6.5.1.5.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.5.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.1.5.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |

| | | | |
|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table 6.5.1.5.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |

### 6.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.
3. The UE shall transmit RRCReconfigurationComplete message.
4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.5.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.5.5-1. T3 starts.
7. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.5.5-1.

9. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 4-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

**Table 6.5.1.5.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM |

**Table 6.5.1.5.4.3-2 *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfoSEQUENCE { | | | |
| q-RxLevMin | -46 | -92 is actual value in dBm (-46 * 2 dBm) | dBm/15kHz or dBm/30kHz |
| } | | | |
| } | | | |

**Table 6.5.1.5.4.3-2: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 6.5.1.5.5 Test requirement

Tables 6.5.1.5.4.1-3 and 6.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 6.5.1.5.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

The UE behaviour during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ($D_1$ ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

### 6.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.6.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

#### 6.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.6.

#### 6.5.1.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the Pcell to emulate out-of-sync and in-sync states.

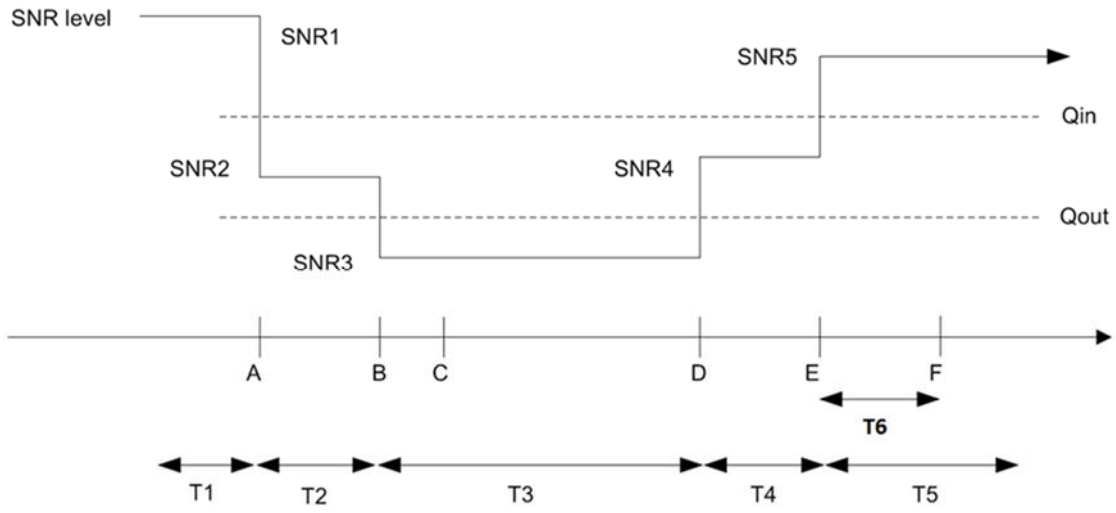



**Figure 6.5.1.6.4-1: SNR variation for In-sync testing**

#### 6.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.6.4.1-1.

**Table 6.5.1.6.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Configuration | Description |
|---|---|
| 6.5.1.6-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.6-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.6-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.6.4.1-2.

**Table 6.5.1.6.4.1-2: Initial conditions for for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | |

1. The general test parameter settings are set up according to Table 6.5.1.6.4.1-3.

2. Message contents are defined in clause 6.5.1.6.4.3.

3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.6.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.1.6.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |

| | | | |
|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 6.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 6.5.1.6.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM |

### 6.5.1.6.5 Test requirement

Tables 6.5.1.6.4.1-3 and 6.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 6.5.1.6.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

### 6.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.7.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

### 6.5.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.7.

### 6.5.1.7.4 Test description

The test consists three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

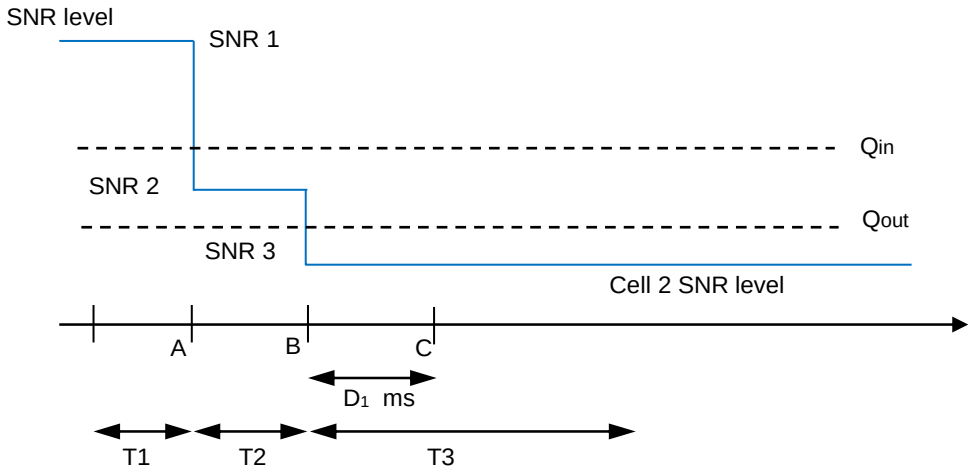



**Figure 6.5.1.7.4-1: SNR variation for out-of-sync testing**

#### 6.5.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.7.4.1-1.

**Table 6.5.1.7.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Configuration | Description |
|---|---|
| 6.5.1.7-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |

| | |
|---|---|
| 6.5.1.7-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.7-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.7.4.1-2.

**Table 6.5.1.7.4.1-2: Initial conditions for NR SA radio link monitoring for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.1.7.4.1-3.
2. Message contents are defined in clause 6.5.1.7.4.3.
3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.7.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.1.7.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| | Config 1, 2 | | 15 kHz |

| | | | |
|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 6.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 6.5.1.7.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-9<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.5.1.7.4.3-2 *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfoSEQUENCE { | | | |
| q-RxLevMin | -46 | -92 is actual value in dBm (-46 * 2 dBm) | dBm/15kHz or dBm/30kHz |
| } | | | |
| } | | | |

**Table 6.5.1.7.4.3-3: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| } | | | |

#### 6.5.1.7.5 Test requirement

Tables 6.5.1.7.4.1-3 and 6.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

**Table 6.5.1.7.5-1: Cell specific test parameters for FR1 for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ($D_1$ ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

### 6.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 6.5.1.8.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

#### 6.5.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.8.

#### 6.5.1.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

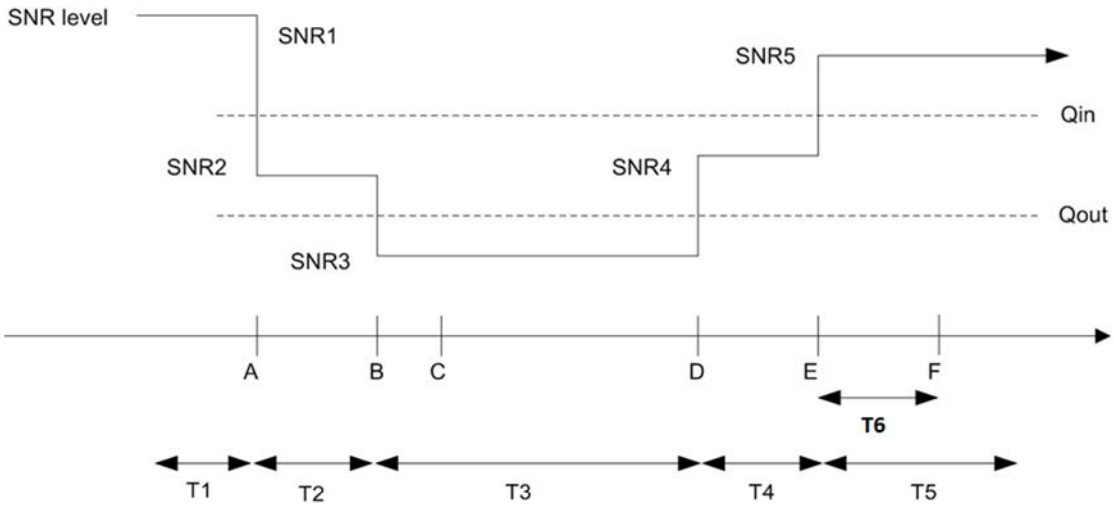



**Figure 6.5.1.8.4-1: SNR variation for In-sync testing**

##### 6.5.1.8.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.8.4.1-1.

**Table 6.5.1.8.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Configuration | Description |
|---|---|
| 6.5.1.8-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.8-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.8-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.8.4.1-2.

**Table 6.5.1.8.4.1-2: Initial conditions for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.1.8.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.8.4.1-4.

2. Message contents are defined in clause 6.5.1.8.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.1.8.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |

| | | | |
|---|---|---|---|
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | | 0.2 |
| T5 | | | 1.88 |
| T6 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table 6.5.1.8.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| Note 1: Void | |

### 6.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.8.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.8.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.8.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.8.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 4-10 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 6.5.1.8.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3 and Gap |

**Table 6.5.1.8.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| } | | | |

### 6.5.1.8.5 Test requirement

Tables 6.5.1.8.4.1-3 and 6.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

**Table 6.5.1.8.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances)

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.1.9 SA FR1 radio link monitoring out-of-sync Test for PCell configured with CSI-RS-based RLM for UE fulfilling relaxed measurement criterion

### 6.5.1.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.3.4 for UE fulfilling good serving cell quality criterion.

### 6.5.1.9.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle and supporting RLM relaxation criteria *rlm-Relaxation-r17*.

#### 6.5.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.9.

#### 6.5.1.9.4 Test description

There is one cell, Cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.9.4-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.s.

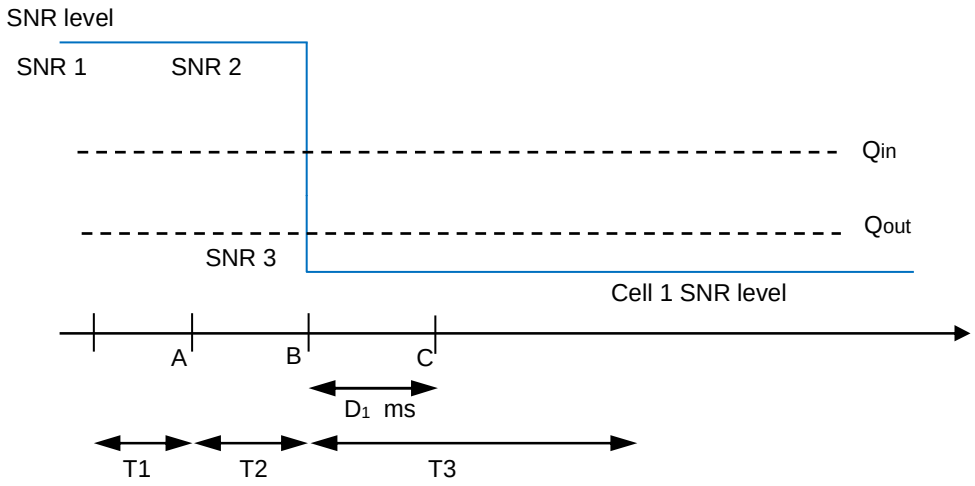



**Figure 6.5.1.9.4-1: SNR variation for CSI-RS out-of-sync testing**

#### 6.5.1.9.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.9.4.1-1.

**Table 6.5.1.9.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Configuration | Description |
|---|---|
| 6.5.1.9-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.9-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.1.9-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.9.4.1-2.

**Table 6.5.1.9.4.1-2: Initial conditions for NR SA radio link monitoring for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.9.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.1.9.4.1-3.

2. Message contents are defined in clause 6.5.1.9.4.3.

3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.9.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.1.9.4.1-3: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |

| | | | |
|---|---|---|---|
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.X1 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 2.48 |
| T3 | | s | 4.88 |
| D1 | | s | 4.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 6.5.1.9.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.s.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.9.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.9.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.9.5-1. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.9.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

**Table 6.5.1.9.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-9<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.X |

**Table 6.5.1.9.4.3-2 *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfoSEQUENCE { | | | |
| q-RxLevMin | -46 | -92 is actual value in dBm (-46 * 2 dBm) | dBm/15kHz or dBm/30kHz |
| } | | | |
| } | | | |

**Table 6.5.1.9.4.3-3: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| } | | | |

**Table 6.5.1.9.4.3-4: CellGroupConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| goodServingCellEvaluationRLM-r17 SEQUENCE { | | | |
| offset-r17 | Not present | If this field is absent, the UE applies the (default) value of 0 dB | |
| } | | | |
| } | | | |
| } | | | |

#### 6.5.1.9.5 Test requirement

Tables 6.5.1.9.4.1-3 and 6.5.1.9.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

**Table 6.5.1.9.5-1: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode**

| Parameter | Unit | Test 1 |
|---|---|---|

| | | | T1 | T2 | T3 |
|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | 1.8 | -15.8 |
| | Config 2 | | 1.8 | 1.8 | -15.8 |
| | Config 3 | | 1.8 | 1.8 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| goodServingCellEvaluationRLM | | | configured | | |
| offset in goodServingCellEvaluationRLM | | dB | Not configured | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.9.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -0.8dB, which is -18.8 dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ($D_1$ ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.1.10 to 6.5.1.12

## 6.5.1.13 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode for UE operating on a cell with less than 5MHz BW

### 6.5.1.13.1 Test purpose

The purpose of this test is to verify that the UE supporting less than 5 MHz bandwidth and a long DRX cycle properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the NR cell radio link monitoring requirements as specified in clause 8.1 of TS 38.133 [6].

### 6.5.1.13.2 Test applicability

This test applies to all types of NR UE Release 18 supporting less than 5 MHz bandwidth and a long DRX cycle.

### 6.5.1.13.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.13.

### 6.5.1.13.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.13.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

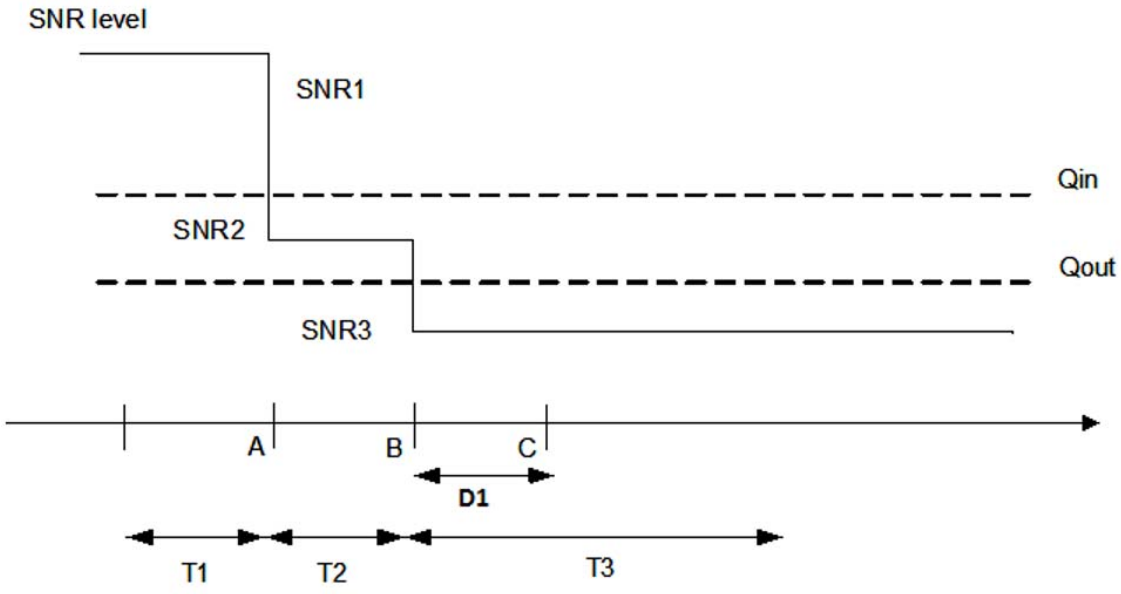



**Figure 6.5.1.13.4-1: SNR variation for out-of-sync testing**

### 6.5.1.13.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.13.4.1-1.

**Table 6.5.1.13.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 6.5.1.13-1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.13.4.1-2.

**Table 6.5.1.13.4.1-2: Initial conditions for radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode for UE operating on a cell with less than 5MHz mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.13.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

General test parameters as specified in Table 6.5.1.3.4.1-4 with config 1 apply except those specified in Table 6.5.1.13.4.1-3.

1. Message contents are defined in clause 6.5.1.13.4.3.
2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
3. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.13.4.1-3: General test parameters for FR1 OOS 12 PRB in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| $BW_{channel}$ | Config 1 | MHz | 3: $N_{RB,c}$ = 12 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.2 FDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.6 FDD |
| SSB Configuration | Config 1 | | SSB.13 FR1 |
| | DCI format | | 1-0 |
| In sync transmission parameters | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 2 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| Out of sync transmission parameters | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | REG bundle size | | 6 |
| | CP length | | Normal |

| | | | |
|---|---|---|---|
| | Mapping from REG to CCE | | Distributed |

6.5.1.13.4.2 Test Procedure

Same as 6.5.1.3.4.2

6.5.1.13.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with the condition "Short_DCI" and with the following exceptions:

**Table 6.5.1.13.4.3-1: Common Exception messages for radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement for a UE operating on a cell with less than 5MHz mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-4 with condition SCS15kHz_FDD<br>Table H.3.5-9<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.5.1.13.4.3-2: RLF-TimersAndConstant**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311 | ms1000 | | |
| } | | | |

**Table 6.5.1.13.4.3-3: SIB1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfoSEQUENCE { | | | |
| q-RxLevMin | -53 | -106 is actual value in dBm (-53 * 2 dBm) | dBm/15kHz |
| } | | | |
| } | | | |

6.5.1.13.5 Test Requirement

Cell-specific test parameters as specified in Table 6.5.1.3.5-1 apply for this test except those specified in Table 6.5.1.13.5-1. Test requirements specified in 6.5.1.3.5 apply to this test.

**Table 6.5.1.13.5-1: Cell specific test parameters for FR1 OOS 12 PRB in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| SNR on RLM-RS | Config 1 | dB | 4.8 | -3.2 | -12.8 |

## 6.5.1.14 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE operating on a cell with less than 5MHz BW

### 6.5.1.14.1 Test purpose

The purpose of this test is to verify that the UE supporting less than 5 MHz properly detects the out-of-sync and in sync for monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

### 6.5.1.14.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards for a UE operating on a cell with less than 5 MHz bandwidth.

### 6.5.1.14.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.14 and 8.1.2.

### 6.5.1.14.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.14.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

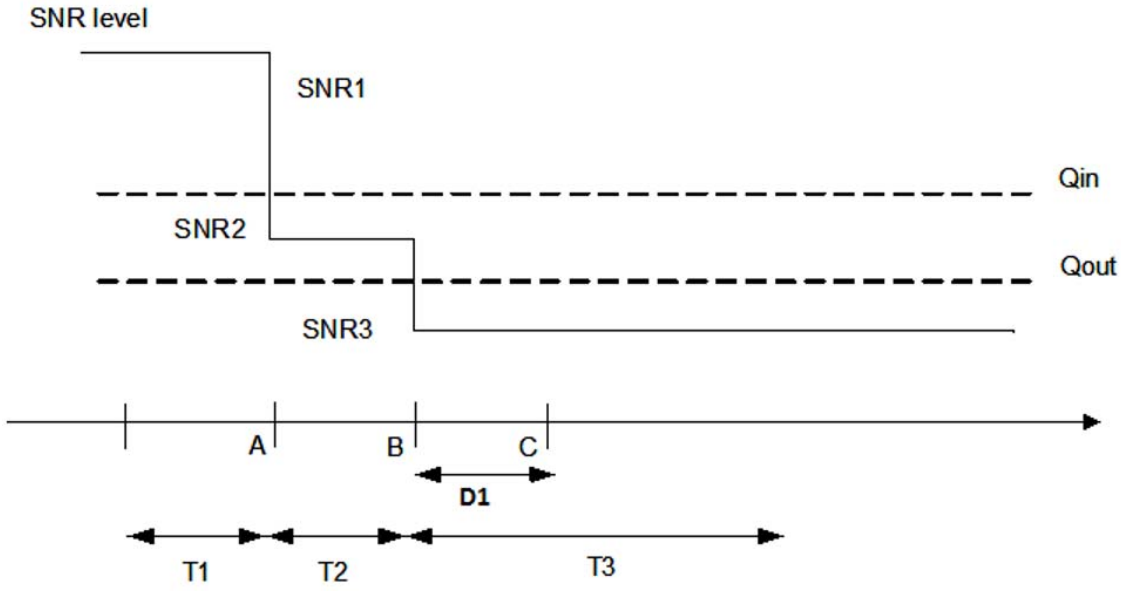



**Figure 6.5.1.14.4-1: SNR variation for out-of-sync testing**

#### 6.5.1.14.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.14.4.1-1.

**Table 6.5.1.14.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 6.5.1.14-1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.14.4.1-2.

**Table 6.5.1.14.4.1-2: Initial conditions for radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for a UE operating on a BW less than 5 MHz BW**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.14.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.5.1.14.4.3.
2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
3. General test parameters as specified in Table 6.5.1.14.4.1-3 with config 1 apply except those specified in Table 6.5.1.14.4.1-3.
4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.14.4.1-3: General test parameters for FR1 OOS 15 PRB in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| $BW_{channel}$ | Config 1 | MHz | 3: $N_{RB,c}$ = 15 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.3 FDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.7 FDD |
| SSB Configuration | Config 1 | | SSB.13 FR1 |
| | DCI format | | 1-0 |
| In sync transmission parameters | Number of Control OFDM symbols | | 3 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| Out of sync transmission parameters | Number of Control OFDM symbols | | 3 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | REG bundle size | | 6 |
| | CP length | | Normal |
| | Mapping from REG to CCE | | Non-Distributed |

6.5.1.14.4.2 Test Procedure

Same as 6.5.1.1.4.2.

6.5.1.14.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short_DCI" and with the following exceptions:

**Table 6.5.1.14.4.3-1: Common Exception messages for radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement for a UE operating on less than 5 MHz BW**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-1<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.5-4 with condition SCS15kHz_FDD<br>Table H.3.5-9 |

**Table 6.5.1.14.4.3-2: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 6.5.1.14.4.3-3: *SIB1***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -53 | -106 is actual value in dBm (-53 * 2 dBm) | dBm/15kHz |
| } | | | |
| } | | | |

6.5.1.14.5 Test Requirement

Cell specific test parameters as specified in Table 6.5.1.14.5-1 apply except those specified in Table 6.5.1.14.5-1. Test requirements specified in clause 6.5.1.1.5 apply to this test.

**Table 6.5.1.14.5-1: Cell specific test parameters for FR1 PCell**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| SNR_SSB of set $q_0$ | Config 1 | dB | 2.8 | -5.2 | -14.8 |

## 6.5.1.15 NR SA FR1 Radio Link Monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspect is either missing or TBD:

- Test tolerance analysis and measurement uncertainty are missing

### 6.5.1.15.1 Test purpose

The purpose of this test is to verify that the UE supporting *support-3MHz-ChannelBW-r18* properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.15.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards for a UE operating on a cell with 3 MHz channel bandwidth.

### 6.5.1.15.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.15 and 8.1.

### 6.5.1.15.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.15.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

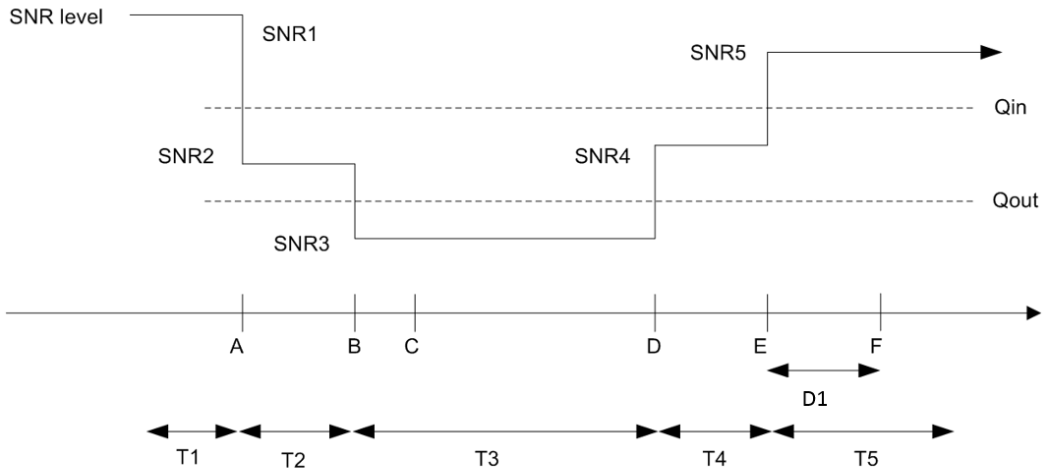



**Figure 6.5.1.15.4-1 - SNR variation for in-sync testing**

#### 6.5.1.15.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.15.4.1-1.

**Table 6.5.1.15.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 6.5.1.15-1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 3 MHz (15 PRB) |
| Note: The UE is required to pass the test with configuration 1 for every supported 3MHz band in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.15.4.1-2.

**Table 6.5.1.15.4.1-2: Initial conditions for radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for a UE operating with 3 MHz channel BW**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1 |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.15.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.5.1.15.4.3.

2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. General test parameters as specified in Table 6.5.1.2.4.1-3 with config 1 apply except those specified in Table 6.5.1.15.4.1-3.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.15.4.1-3: General test parameters for FR1 in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| $BW_{channel}$ | Config 1 | MHz | 3: $N_{RB,c}$ = 15 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.3 FDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.7 FDD |
| SSB Configuration | Config 1 | | SSB.13 FR1 |
| In sync transmission parameters | Number of Control OFDM symbols, Config 1 | | 3 |
| | Number of Control OFDM symbols, Config 1 | | 2 |
| | Aggregation level, Config 1 | CCE | 4 |
| | Mapping from REG to CCE, Config 1 | Config 1 | Non-Distributed |
| Out of sync transmission parameters | Number of Control OFDM symbols, Config 1 | | 3 |
| | Aggregation level, Config 1 | CCE | 8 |
| | Mapping from REG to CCE, Config 1 | Config 1 | Non -Distributed |

### 6.5.1.15.4.2 Test Procedure

Same as 6.5.1.2.4.2.

#### 6.5.1.15.4.3 Message Contents

Same as 6.5.1.2.4.3.

### 6.5.1.15.5 Test Requirement

Cell specific test parameters as specified in Table 6.5.1.15.5-1 apply except those specified in Table 6.5.1.2.5-1. Test requirements specified in clause 6.5.1.2.5 apply to this test.

**Table 6.5.1.15.5-1: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| SNR on RLM-RS | Config 1 | dB | 2.8 | -5.2 | -14.8 | -3.3 | 3.8 |

## 6.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in DRX mode

### 6.5.1.16.1 Test purpose

The purpose of this test is to verify that the UE supporting less than 5 MHz BW properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.16.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards for a UE operating on a cell with 3 MHz channel bandwidth.

### 6.5.1.16.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.16 and 8.1.

### 6.5.1.16.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.16.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

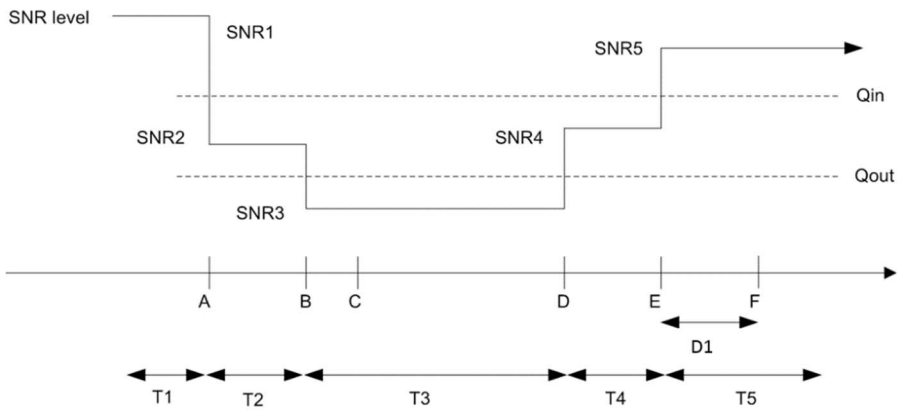



**Figure 6.5.1.16.4-1 - SNR variation for in-sync testing**

#### 6.5.1.16.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.16.4.1-1.

**Table 6.5.1.16.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 6.5.1.16-1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 3 MHz (12 PRB) |
| Note: The If the UE indicates the support for band n100, the UE is required to pass the test with 12 PRB configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.16.4.1-2.

**Table 6.5.1.16.4.1-2: Initial conditions for radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode for a UE operating with 3 MHz channel BW**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.1.16.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part | | |

1. Message contents are defined in clause 6.5.1.16.4.3.
2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
3. General test parameters as specified in Table 6.5.1.4.4.1-3 with config 1 apply except those specified in Table 6.5.1.16.4.1-3.
4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

**Table 6.5.1.16.4.1-3: General test parameters for FR1 in-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| $BW_{channel}$ | Config 1 | MHz | 3: $N_{RB,c}$ = 12 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.2 FDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.6 FDD |
| SSB Configuration | Config 1 | | SSB.13.FR1 |
| In sync transmission parameters | Number of Control OFDM symbols, Config 1 | | 2 |
| | Aggregation level, Config 1 | | 2 |
| | Mapping from REG to CCE, Config 1 | | Distributed |
| Out of sync transmission parameters | Number of Control OFDM symbols, Config 1 | | 2 |
| | Aggregation level, Config 1 | | 4 |

| | | | |
|---|---|---|---|
| | Mapping from REG to CCE, Config 1 | | Distributed |

6.5.1.16.4.2 Test Procedure

Same as 6.5.1.4.4.2.

6.5.1.16.4.3 Message Contents

Same as 6.5.1.4.4.3.

6.5.1.16.5 Test Requirement

Cell specific test parameters as specified in Table 6.5.1.16.5-1 apply except those specified in Table 6.5.1.4.5-1. Test requirements specified in clause 6.5.1.4.5 apply to this test.

**Table 6.5.1.16.5-1: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| SNR on RLM-RS | Config 1 | dB | 4.8 | -3.2 | -12.8 | -0.8 | 6.3 |

## 6.5.2 Interruption

### 6.5.2.0 Minimum conformance requirements

#### 6.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

If the PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on PCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1

If the PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than X slots before $T_{SMTC_duration}$ and no later than X slots after $T_{SMTC_duration}$, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and $T_{SMTC_duration}$ are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

Interruptions on active SCells due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

If the activated SCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on an activated SCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1

If the activated SCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on the activated SCell no earlier than X slots before $T_{SMTC_duration}$ and no later than X slots after $T_{SMTC_duration}$, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and $T_{SMTC_duration}$ are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

**Table 6.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length (slot) | |
|---|---|---|---|
| 0 | 1 | | 1 |
| 1 | 0.5 | | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 |

| | | | |
|---|---|---|---|
| | | Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 |
| | | Aggressor cell is on FR1 | 5 |

**Table 6.5.2.0.1-2: Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 1 | 0.5 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 2 | 0.25 | 2 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 3 | 0.125 | 4 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| NOTE 1: $T_{SMTC_duration}$ measured in subframes is<br>- the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and $T_{SMTC\ duration}$ for the SCell being activated is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, $T_{SMTC\ duration}$ for the SCell being activated is 0ms;<br>- the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.<br>NOTE 2: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.

### 6.5.2.0.2 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by *srs-SwitchFromServCellIndex* and *srs-SwitchFromCarrier* in TS38.331 [13];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [9].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD.
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [13], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101-1 [2], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 6.5.2.0.1-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 6.5.2.0.1-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 6.5.2.0.1-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 6.5.2.0.1-2.

**Table 6.5.2.0.1-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
| | | 300, 500 | 5 | 4 |
| | | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
| | | 300, 500 | 9 | 7 |
| | | 900 | 12 | 10 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

**Table 6.5.2.0.1-2: Interruption length X2 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us) [Note 1] | Interruption length X2 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 60 | 120 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 2 | 2 |
| 2 | 0.25 | ≤ 200 | 3 | 3 |
| 3 | 0.125 | ≤ 200 | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 6.5.2.0.1-1 and in Table 6.5.2.0.1-2 based on SRS carrier switching time ≤ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 6.5.2.0.1-1 and in Table 6.5.2.0.1-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.9.

## 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC

### 6.5.2.1.1 Test purpose

To verify UE's ability to complete NR PCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate in standalone NR requirements.

### 6.5.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 2DL CA.

### 6.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.2.1.

### 6.5.2.1.4 Test description

#### 6.5.2.1.4.1 Initial conditions

Test 6.5.2.1 can be run in one of the configurations defined in this clause. Supported test configurations for NR PCell are shown in Table 6.5.2.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.2.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.2.1.4.1-1: Supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 6.5.2.1-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 6.5.2.1-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6.5.2.1-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.5.2.1.4.1-1A: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 6.5.2.1-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 6.5.2.1-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6.5.2.1-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.2.1.4.1-2.

**Table 6.5.2.1.4.1-2: Initial conditions for NR SA FR1 interruptions during measurements on deactivated NR SCC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.5.2.1.4.1-3

2. Message contents are defined in clause 6.5.2.1.4.3.

3. There are two NR carriers and two cells specified in the test. Cell 1 is the PCell on one NR carrier, Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be configured according to Annex C.1.1 and C.1.2.

**Table 6.5.2.1.4.1-3: General test parameters for NR SA FR1 interruptions during measurements on deactivated NR SCC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two NR RF channels |
| Active PCell | | Cell 1 | PCell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Deactivated SCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to Cell 1 and Cell 2 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 6.5.2.1.4.2 Test procedure

The test consists of two cells: Cell 1 and Cell 2. Cell 1 is PCell and Cell 2 is deactivated SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1 and Cell 2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell 1 shall be configured as PCell and Cell 2 shall be configured as SCell. During T1, PCell is continuously scheduled in DL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters according to Table 6.5.2.1.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

5. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

7. If no longer than X consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”. Where

   - For PCell test configuration 6.5.2.1-1,

     - X = interruption length+$k_1$ if $k_1 \leq$ interruption length

     - X = interruption length if $k_1$ > interruption length

     Note: UE expects that the SS won't use $k_1 = 3$ for PCell test configuration 4.5.2.3-1 and 4.5.2.3-4.

   - For PCell test configuration 6.5.2.1-2 and 6.5.2.1-3,

     - X = interruption length.

   - interruption length is given in table 6.5.2.1.5-2 for inter-band case and in 6.5.2.1.5-3 for intra-band case.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 6.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with Condition Deactivated SCell;<br>Table H.3.1-4 with A3-offset = 15 |
| Specific message contents exceptions for SCell Test Configuration 6.5.2.1-1, 6.5.2.1-2 | Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for SCell Test Configuration 6.5.2.1-3 | Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.2.1.4.3-2: ServingCellConfig (Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 | |
| } | | | |

#### 6.5.2.1.5 Test requirement

Table 6.5.2.1.5-1 and Table 6.5.2.1.5-1A defines the primary level settings including test tolerances for NR SA FR1 interruptions during measurements on deactivated NR SCC.

**Table 6.5.2.1.5-1: NR cell specific test parameters for NR PCell for NR SA FR1 interruptions during measurements on deactivated NR SCC**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 9 |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 7 |
| | Config 3 | | 106 Note 8 |

| | | | |
|---|---|---|---|
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Dedicated UL BWP Configuration | | | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.2 TDD |
| | Config 3 | | SR.2.1 TDD |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | Config 1,2 | | OP.1 Note 7 |
| | Config 3 | | OP.1 Note 8 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| Io Note3 | Config 1,2 | dBm/9.36MHz | -58.96 |
| | Config 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell 1 Note 5 | | µs | - |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [8].
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 9: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

**Table 6.5.2.1.5-1A: NR cell specific test parameters for NR SCell for NR SA FR1 interruptions during measurements on deactivated NR SCC**

| Parameter | Unit | Cell 2 |
|---|---|---|

| | | | |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | | Note 9 |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 7 |
| | $Config_{SCell}$ 3 | | 106 Note 8 |
| Initial DL BWP Configuration | | | DLBWP.0.1 |
| Dedicated DL BWP Configuration | | | DLBWP.1.1 |
| Initial UL BWP Configuration | | | N/A |
| Dedicated UL BWP Configuration | | | N/A |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | SR.1.2 TDD |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| CSI-RS for tracking | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 7 |
| | $Config_{SCell}$ 3 | | OP.1 Note 8 |
| SMTC Configuration | | | SMTC.4 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.5 FR1 |
| | $Config_{SCell}$ 3 | | SSB.6 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $N_{oc}$ Note 2 | $Config_{SCell}$ 1,2 | dBm/SCS | -104 |
| | $Config_{SCell}$ 3 | | -101 |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell 1 Note 5 | | µs | 3 |
| Propagation Condition | | | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess. |
| Note 4: | Void |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. |
| Note 6: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [8]. |
| Note 7: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 8: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 9: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-2.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-3.

**Table 6.5.2.1.5-2: Interruption duration if the PCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

**Table 6.5.2.1.5-3: Interruption duration if the PCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length |
|---|---|---|
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.2.2 SA interruptions at NR SRS carrier based switching

### 6.5.2.2.1 Test purpose

The purpose of this test is to verify PCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

### 6.5.2.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 2 DL CA.

### 6.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.2.2.

6.5.2.2.4 Test description

6.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.2.2.4.1-1.

**Table 6.5.2.2.4.1-1: Supported test configurations for SA interruptions at NR SRS carrier based switching**

| Configuration | Description |
|---|---|
| 6.5.2.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 6.5.2.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 6.5.2.2-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.2.2.4.1-2.

**Table 6.5.2.2.4.1-2: Initial conditions for SA interruptions at NR SRS carrier based switching**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.5.2.2.4.1-3.
2. Message contents are defined in clause 6.5.2.2.4.3.
3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell 1 Is E-UTRAN PCell, Cell 2 is NR FR1 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 6.5.2.2.4.1-3: General test parameters for SA interruptions at NR SRS carrier based switching**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1 |
| Configured SCell | | Cell 2 | Activated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell 2 timing offset to Cell 1 | μs | 0 | |
| Time alignment error between Cell 2 and Cell 1 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 5 | |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

6.5.2.2.4.2 Test procedure

The test consists of two cells: Cell 1 and Cell 2. Cell 1 is the PCell and Cell 2 is activated SCell without PUCCH/PUSCH transmission. The test consists of two time periods, with duration of T1 and T2. Prior to the start of

the test, the UE is configured with the SRS carrier based switching between PCell and SCell. UE shall also indicate SRS-SwitchingTimeNR in the capabilities.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2 with the message exceptions as in 6.5.2.2.4.3.

3. Set the parameters according to T1 in Table 6.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

4. The SS activates Scell (Cell 2) and starts to schedule DL transmission continuously on both PCell and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK on PCell.

5. Set the parameters according to T2 in Tables 6.5.2.2.5-1. T2 starts.

6. Immediately at the beginning of T2, SRS is requested via DCI format 2_3 and the UE shall initiate NR SRS switching.

7. If the interruption in the received ACK/NACK on PCell during the switching from NR PCell to NR SCell exceeds the value as defined in Table 6.5.2.2.5-2, increase the number of failed iterations by one, otherwise increase the number of passed iterations by one.

8. the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

9. After the RRC connection release, the SS:
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
or
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

#### 6.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

**Table 6.5.2.2.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| carrierSwitching | *SRS-CarrierSwitching* | | |
| } | | | |
| } | | | |

**Table 6.5.2.2.4.3-2: *SRS-CarrierSwitching***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-181 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-CarrierSwitching ::= SEQUENCE { | | | |
| srs-SwitchFromServCellIndex | 1 | | |
| srs-SwitchFromCarrier | nUL | | |
| } | | | |

**Table 6.5.2.2.4.3-3: SRS-Config**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| srs-ResourceSetId | 0 | | |
| srs-ResourceIdList SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-ResourceId { | 1 entry | | |
| SRS-ResourceId[1] | 0 | entry 1 | |
| } | | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| usage | antennaSwitching | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-Resource { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| resourceMapping SEQUENCE { | | | |
| startPosition | 1 | | |
| nrofSymbols | n1 | | |
| repetitionFactor | n1 | | |
| } | | | |
| freqDomainPosition | 0 | | |
| freqDomainShift | 0 | | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.5.2.2.5 Test requirement

Table 6.5.2.2.5-1 defines the primary level settings including test tolerances for SA FR1 interruptions at NR SRS carrier based switching.

**Table 6.5.2.2.5-1: Cell specific test parameters for SA interruptions at NR SRS carrier based switching**

| **Parameter** | | **Unit** | **T1** | | **T2** | |
|---|---|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Duplex mode | Config 1 | | FDD | TDD | FDD | TDD |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | N/A | TDDConf.1.1 | N/A | TDDConf.1.1 |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Downlink initial BWP Configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP Configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| TCI state | | | TCI.State.0 | | | |
| TRS Configuration | | | TRS.1.1 TDD | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.1.1 TDD | SR.1.1 FDD | SR.1.1 TDD |
| | Config 2 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3 | | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.1.1 TDD | CCR.1.1 FDD | CCR.1.1 TDD |
| | Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.1.1 TDD | CR.1.1 FDD | CR.1.1 TDD |
| | Config 2 | | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3 | | CR2.1 TDD | CR2.1 TDD | CR2.1 TDD | CR2.1 TDD |
| OCNG Patterns | | | OP.1 | | | |
| SRS Configuration | Config 1,2 | | SRS.4 TDD | | | |
| | Config 3 | | SRS.5 TDD | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| SMTC configuration | | | SMTC.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/15kHz | -104 | | | |
| | Config 3,6 | | -101 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | | | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | | | |
| | Config 3,6 | | -84 | | | |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | | | |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |

The UE shall be scheduled on PCell continuously throughout the test. During the time duration T2, the interruption on PCell shall not be more than the values specified in Table 6.5.2.2.5-2 depending on the reported *SRS-SwitchingTimeNR* capability.

**Table 6.5.2.2.5-2: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
| | | 300, 500 | 5 | 4 |
| | | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
| | | 300, 500 | 9 | 7 |
| | | 900 | 12 | 10 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 6.5.3 SCell activation and deactivation delay

### 6.5.3.0 Minimum conformance requirements

#### 6.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

Same as in clause 4.5.3.0.1.

#### 6.5.3.0.2 Minimum conformance requirements for TRS based SCell activation

For a UE supporting *scellWithoutSSB-InterBandCA-r18* if the SCell being activated belongs to FR1 and if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) in the target SCell (FrequencyInfoDL) nor SMTC configuration for the target SCell, and if there is one collocated active reference serving cell on different FR1 band, when the following conditions are fulfilled,

- The RTD between the target SCell and the collocated reference serving cell is within CP where CP is corresponding to the SCS of SSB-less SCell, and
- The EPRE difference at the UE is smaller than or equal to [30] dB, where EPRE difference is the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell normalized by SCSs of SSB of reference cell and A-TRS/P-TRS of SSB-less SCell, and
- The RS(s) of the SSB-less SCell being activated is (are) QCL-TypeA with TRS(s) of the SSB-less SCell being activated, and the TRS(s) of the SSB-less SCell being activated is (are) further QCL-TypeC with SSB(s) of an inter-band active serving cell, and the inter-band active serving cell shall be same as the reference serving cell.

where the reference serving cell can be indicated by higher layer parameter *referenceCell-r18*. If UE is not indicated with *referenceCell-r18*, the reference serving cell is assumed to be the QCL-typeC source cell if there is only one active QCL-typeC source cell configured.

Where $T_{activation_time}$ is

- $T_{first_TRS} + T_{TRS}$ +5 ms, if aperiodic CSI-RS resources are not configured for SCell activation or UE do not support *aperiodicCSI-RS-FastScellActivation-r17*

- $T_{first_ATRS} + T_{gap} + T_{ATRS}$ + 5 ms if aperiodic CSI-RS resources are configured for Scell activation for UE supporting *aperiodicCSI-RS-FastScellActivation-r17*

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n (where n mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The interruption length X2 on any activated serving cell are according to Table 6.5.3.0.2-1 and 6.5.3.0.2-2.

**Table 6.5.3.0.2-1: Interruption length X2 for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | |
|---|---|---|---|
| 0 | 1 | | 1 |
| 1 | 0.5 | | 1 |

**Table 6.5.3.0.2-2 Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 1 | 0.5 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| NOTE 1: $T_{SMTC_duration}$ measured in subframes is<br>- the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and $T_{SMTC\ duration}$ for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, $T_{SMTC\ duration}$ for the SCell being activated is 0ms;<br>- the longest SMTC duration among all active serving | | |
| NOTE 2: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

## 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

### 6.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

### 6.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

### 6.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.1.

### 6.5.3.1.4 Test description

#### 6.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.3.1.4.1-1: supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 6.5.3.1-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 6.5.3.1-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6.5.3.1-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 6.5.3.1.4.1-1A: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 6.5.3.1-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 6.5.3.1-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6.5.3.1-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.1.4.1-2 and Table 6.5.3.1.4.1-3.

**Table 6.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.3.1.5-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

**Table 6.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell 2 timing offset to Cell 1 | µs | 0 | |
| Time alignment error between Cell 2 and Cell 1 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | PCell Config 1: 2<br>PCell Config 2: 3<br>PCell Config 3: 2.5 | $k_1$×NR slot length<br><br>$k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case. |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |

1. Message contents are defined in clause 6.5.3.1.4.3.
2. There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the deactivated SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

### 6.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}+T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}} + N_{\mathrm{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\mathrm{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot m + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot m + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to m + 1 + $\frac{\mathrm{T_{HARQ}+3ms}}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.1.4.1-3 and 6.5.3.1.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message. If the TE doesn't receive the *MeasurementReport* during T1, go to step 9.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = n + 1 + $\frac{\mathrm{T_{HARQ}}+3\mathrm{ms}+T_{\mathrm{CSI_Reporting}}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if slot $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T3 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot m + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

- and DTX is not observed by the SS outside the slot m + 1 + $\frac{\text{THARQ}}{NR\ slot\ length}$ to $m + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

- Then the number of successes for the event “Deactivation” is increased by one. Otherwise, count a fail for the event “Deactivation”.

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

10. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
or
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events “Activation” and “Deactivation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

#### 6.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 6.5.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell; |

**Table 6.5.3.1.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.5.3.1.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 6.5.3.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.1.4.3-2A: MeasConfig (Table 6.5.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 6.5.3.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.5.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.1.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 6.5.3.1.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r16 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.1.4.3-5: CellGroupConfig-SCell (Table 6.5.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 6.5.3.1.4.3-7: ServingCellConfig-SCell (Table 6.5.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 6.5.3.1.5 Test requirement

Table 6.5.3.1.5-1 and Table 6.5.3.1.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.5.3.1.5-1: Cell specific test parameters for NR PCell for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Duplex mode | Config 1 | | FDD | | |
| | Config 2,3 | | TDD | | |
| TDD configuration | Config 1 | | Not applicable | | |
| | Config 2 | | TDDConf.1.1 | | |
| | Config 3 | | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | Note 7 | | |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 5 | | |
| | Config 3 | | 106 Note 6 | | |
| Initial BWP configuration | | | DLBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | | |

| | | | |
|---|---|---|---|
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 |
| | Config 3, | | OP.1 Note 6 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| CSI-RS configuration for CSI reporting Note 8 | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| SMTC configuration | | | SMTC.1 |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2 | slot | 5 |
| | Config 3 | | 10 |
| CSI reporting offset | Config 1,2 | slot | 3 |
| | Config 3 | | 5 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.87 |
| Correlation Matrix and Antenna configuration | | | 2x2 Low |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5.

**Table 6.5.3.1.5-2: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | | |
| | $Config_{SCell}$ 2,3 | | TDD | | |
| TDD configuration | $Config_{SCell}$ 1 | | Not applicable | | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | Note 7 | | |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 5 | | |
| | $Config_{SCell}$ 3 | | 106 Note 6 | | |
| Initial BWP configuration | | | DLBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | N/A | | |
| | $Config_{SCell}$ 2 | | N/A | | |
| | $Config_{SCell}$ 3 | | N/A | | |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | N/A | | |
| | $Config_{SCell}$ 2 | | N/A | | |
| | $Config_{SCell}$ 3 | | N/A | | |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | N/A | | |
| | $Config_{SCell}$ 2 | | N/A | | |
| | $Config_{SCell}$ 3 | | N/A | | |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 | | |
| | $Config_{SCell}$ 3, | | OP.1 Note 6 | | |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 | | |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting Note 8 | $Config_{SCell}$ 1 | | CSI-RS.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | CSI-RS.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | CSI-RS.2.1 TDD | | |
| SMTC configuration | | | SMTC.1 | | |
| reportConfigType | | | N/A | | |
| reportQuantity | | | N/A | | |
| CSI reporting periodicity | $Config_{SCell}$ 1,2 | slot | N/A | | |
| | $Config_{SCell}$ 3 | | N/A | | |
| CSI reporting offset | $Config_{SCell}$ 1,2 | slot | N/A | | |
| | $Config_{SCell}$ 3 | | N/A | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | $Config_{SCell}$ 1,2 | dBm/SCS | -104 | | |
| | $Config_{SCell}$ 3 | | -101 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | | |
| SS-RSRP Note3 | $Config_{SCell}$ 1,2 | dBm/SCS | -87 | | |
| | $Config_{SCell}$ 3 | | -84 | | |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | | |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | -58.96 | | |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | -52.87 | | |
| Correlation Matrix and Antenna configuration | | 2x2 Low | | | |

| Propagation condition | - | AWGN |
|---|---|---|
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. | | |
| Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | |
| Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | |
| Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. | | |
| Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. | | |
| Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5. | | |

During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot $n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}}{NR\ slot\ length}$ was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot $n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}}{NR\ slot\ length}$.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstSSB} + 5ms$, as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell/PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-1 shows the derivation of the Test procedure requirement for DTX during T2, based on the core requirements for interruption.

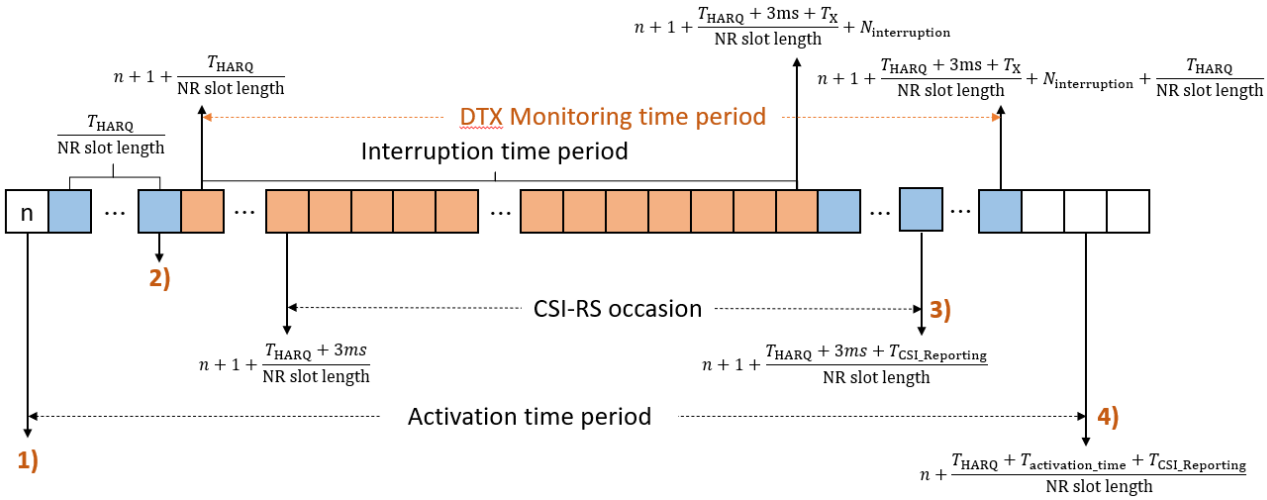



Figure 6.5.3.1.5-1: Procedure derivation for Activation

1) Activation command for SCell
2) ACK for MAC-CE for SCell activation
3) First CSI report timing (could be invalid CQI)

4) First non-zero CSI report transmission

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot m + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell during SCell deactivation shall not happen outside the slot m + 1 + $\frac{T_{HARQ}}{NR\ slot\ length}$ to m + 1 + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-2 shows the derivation of the Test procedure requirement for NR PSCell DTX during T3, based on the core requirements for interruption.

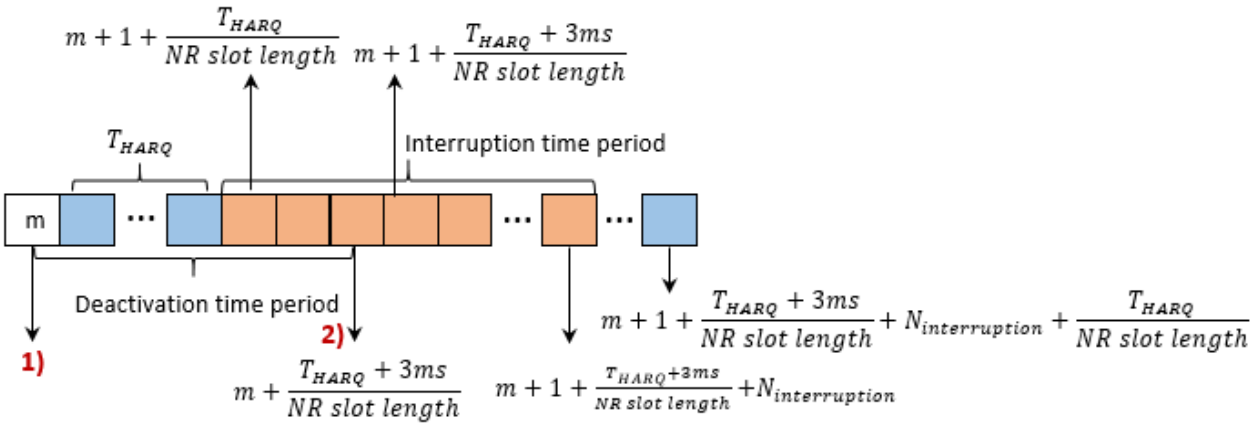



**Figure 6.5.3.1.5-2: Procedure derivation for Deactivation**

1) Deactivation command for SCell

2) Latest slot stop sending CSI reports for SCell

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot n + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

### 6.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

### 6.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

### 6.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.2.

#### 6.5.3.2.4 Test description

##### 6.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

**Table 6.5.3.2.4.1-1: Void**

**Table 6.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |

##### 6.5.3.2.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2.

##### 6.5.3.2.4.3 Message contents

Same message contents as described in section 6.5.3.1.4.3 with following exception:

- Table 6.5.3.1.4.3-3 is replaced by Table 6.5.3.2.4.3-1.

**Table 6.5.3.2.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| | | | |

#### 6.5.3.2.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX} + T_{rs} + 5ms$.

### 6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX

#### 6.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements stated in TS 38.133 [6] clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

#### 6.5.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

#### 6.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.3.

#### 6.5.3.3.4 Test description

##### 6.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

**Table 6.5.3.3.4.1-1: Void**

**Table 6.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell configured, but not detected. |

##### 6.5.3.3.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2, except step3 and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. The SCell (Cell 2) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n, power ON the SCell (Cell 2), T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and,

- step 3a is removed.

##### 6.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 6.5.3.3.4.3-1: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.3.3.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.3.4.3-2: CellGroupConfig (Table 6.5.3.3.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.3.4.3-3 | |
| } | | | |

| | | | |
|---|---|---|---|
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.3.4.3-4 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 6.5.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 6.5.3.3.4.3-4: ServingCellConfig-SCell (Table 6.5.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

#### 6.5.3.3.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX} + T_{SMTC_MAX} + 2*T_{rs} + 5ms$

### 6.5.3.4 NR SA FR1 direct SCell activation at SCell addition of known SCell

#### 6.5.3.4.1 Test purpose

The purpose of this test is to verify that the direct SCell activation delay and interruption is within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

#### 6.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

#### 6.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.4.

#### 6.5.3.4.4 Test description

##### 6.5.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.4.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.4.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.3.4.4.1-1: supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 6.5.3.4.4.1-1A: Supported test configurations for NR PSCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.4.4.1-2 and Table 6.5.3.4.4.1-3.

**Table 6.5.3.4.4.1-2: Initial conditions for known FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.3.4.5-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

**Table 6.5.3.4.4.1-3: General test parameters for known FR1 SCell activation case**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two NR radio channels are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Inter-frequency neighbour cell (SCell to-be) | | Cell 2 | Inter-frequency neighbour cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern | | gp0 | Measurement gap is used during parts of time period T1 for detection of Cell 2. |
| CSI reporting periodicity | ms | 2 | CSI reporting periodicity for periodic reporting of CQI for PCell and, when added, SCell. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | Measurement cycle for SCell does not come into effect in direct activation at SCell addition. |
| Timing offset between Cell 1 and Cell 2 | μs | ≤ MRTD | The value of maximum timing offset depends upon the carrier aggregation scenario. |

| | | | |
|---|---|---|---|
| T1 | s | 7 | During this time period the PCell shall be known and Cell 2 shall be detected as an inter-frequency neighbour cell. |
| T2 | s | 1 | During this time period Cell 2 shall be configured and directly activated as SCell. |
| A3-offset | dB | -15 | |
| THARQ | ms | k1×NR slot length | k1 is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by dl-DataToUL-ACK if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [8] |
| TCSI_Reporting | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | ms | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\,\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 6.5.3.4.4.3.

2.There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

#### 6.5.3.4.4.2 Test procedure

The test consists of two successive time periods with duration T1 and T2, respectively. There are two carriers, each with one cell. Cell 1 (PCell) is on RF channel 1 (PCC), and Cell 2 (SCell) is on RF channel 2 (SCC). Cell 1 and Cell 2 both operate according to one of the configurations in Table 6.5.3.4.4.1-1. Before the test starts the UE is connected to Cell 1 on RF channel 1. The UE is only monitoring RF channel 1 and is not aware of Cell 2 on RF channel 2. The UE is continuously scheduled in PCell throughout the test.

At the beginning of T1 the UE is configured to measure RF channel 2 in measurement gaps. During T1, the UE detects and measures Cell 2 on RF channel 2 and sends a measurement report containing Cell 2 to the test equipment. After having received a measurement report containing Cell 2, the test equipment deconfigures the measurement gaps and thereafter sends a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state (*sCellState* is set to *activated*). The time between reception of the last measurement report carrying SCell and transmission of the RRCReconfiguration message directly activating SCell is kept short enough to allow the SCell to remain known to the UE.

Time period T2 starts when the UE receives the RRC connection reconfiguration message at the UE antenna connector. The corresponding slot at which the message is received at the UE antenna connector is denoted *m.* The UE shall complete activation of the SCell no later than in slot $m + \frac{\mathrm{N_{direct}}}{\text{NR slot length}}$, where $\mathrm{N_{direct}}$ is defined as the time taken for direct SCell activation as specified in clause 8.3.4, TS 38.133 [6]. From slot $m + \frac{\mathrm{N_{direct}}}{\text{NR slot length}}$ and onwards the UE shall report valid CSI both for PCell and SCell. The test equipment verifies the activation time by counting the slots between the RRC connection reconfiguration message is sent and until CSI report with non-zero CQI for both PCell and SCell is received. The test equipment verifies that interruptions on other serving cells are within the requirements by counting ACK/NACKs transmitted in PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.4.4.1-3 and 6.5.3.4.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 2, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state as defined in message contents table 6.5.3.4.4.3-5.

6. The UE shall start reporting CSI in PSCell in slot (m+k+$T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.4. UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot m + 1 + $\frac{T_{HARQ}+T_1+\text{TRRC_process}+T_(CSI_Reporting)}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_(CSI_Reporting)+T_1+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{T_{HARQ}+T_1+\text{TRRC_process}+T_(CSI_Reporting)}{NR\ slot\ length}$ was subject to interruption,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_1+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 6.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL , with the following exceptions:

**Table 6.5.3.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell; |

**Table 6.5.3.4.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.5.3.4.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 6.5.3.4.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.4.4.3-2A: MeasConfig (Table 6.5.3.4.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 6.5.3.4.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.5.3.4.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.4.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 6.5.3.4.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.4.4.3-5: CellGroupConfig-SCell (Table 6.5.3.4.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.4.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.4.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| sCellState-r16 | activated | | |
| … | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.4.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.4.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 6.5.3.4.4.3-7: ServingCellConfig-SCell (Table 6.5.3.4.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 6.5.3.4.5 Test requirement

Tables 6.5.3.4.5-1 and 6.5.3.4.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.5.3.4.5-1: NR Cell specific test parameters for NR PCell**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL | | DLBWP.0.1 | |
| | Initial UL | | ULBWP.0.1 | |
| | Dedicated DL | | DLBWP.1.1 | |
| | Dedicated UL | | ULBWP.1.1 | |
| TCI state | | | TCI.State.0 | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| OCNG Pattern | | | OP.1 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| SMTC configuration | | | SMTC.1 | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | |
| | Config 3 | | 10 | |
| CSI reporting offset | Config 1,2 | slot | 3 | |
| | Config 3 | | 5 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104+~~TT~~ | |
| | Config 3 | | -101+~~TT~~ | |

| | | | |
|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 17+~~TT~~ |
| $\hat{E}_s/N_{oc}$ | | dB | 17+~~TT~~ |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87+~~TT~~ |
| | Config 3 | | -84+~~TT~~ |
| Io Note3 | Config 1,2 | dBm/9.36 MHz | -59.0+~~TT~~ |
| | Config 3 | dBm/38.16 MHz | -52.9+~~TT~~ |
| Propagation condition | | | AWGN |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP, and Io levels have been derived from other parameters for information purpose. They are not settable parameters themselves.

**Table 6.5.3.4.5-2: NR Cell specific test parameters for NR SCell**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | |
| | $Config_{SCell}$ 2,3 | | TDD | |
| TDD configuration | $Config_{SCell}$ 2 | | TDDConf.1.1 | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | $Config_{SCell}$ 1,2 | MHz | 10: $N_{RB,c}$ = 52 | |
| | $Config_{SCell}$ 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL | | N/A | DLBWP.0.1 |
| | Initial UL | | | N/A |
| | Dedicated DL | | | DLBWP.1.1 |
| | Dedicated UL | | | N/A |
| TCI state | | | N/A | TCI.State.0 |
| CSI-RS configuration for CSI reporting | $Config_{SCell}$ 1 | | N/A | CSI-RS.1.1 FDD |
| | $Config_{SCell}$ 2 | | | CSI-RS.1.1 TDD |
| | $Config_{SCell}$ 3 | | | CSI-RS.2.1 TDD |
| TRS Configuration | $Config_{SCell}$ 1 | | N/A | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | | TRS.1.2 TDD |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | N/A | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | | SR.1.1 TDD |
| | $Config_{SCell}$ 3 | | | SR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | N/A | CCR.1.1 FDD |
| | $Config_{SCell}$ 2 | | | CCR.1.1 TDD |
| | $Config_{SCell}$ 3 | | | CCR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | N/A | |
| | $Config_{SCell}$ 2 | | | |
| | $Config_{SCell}$ 3 | | | |
| OCNG Pattern | | | OP.1 | |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 | |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 | |
| SMTC configuration | | | SMTC.1 | |
| reportConfigType | | | N/A | |
| reportQuantity | | | N/A | |
| CSI reporting periodicity | $Config_{SCell}$ 1,2 | slot | N/A | |
| | $Config_{SCell}$ 3 | | N/A | |
| CSI reporting offset | $Config_{SCell}$ 1,2 | slot | N/A | |
| | $Config_{SCell}$ 3 | | N/A | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | |
| $N_{oc}$ Note2 | $Config_{SCell}$ 1,2 | dBm/SCS | -104+~~TT~~ |
| | $Config_{SCell}$ 3 | | -101+~~TT~~ |
| $\hat{E}_s/I_{ot}$ | | dB | 17+~~TT~~ |
| $\hat{E}_s/N_{oc}$ | | dB | 17+~~TT~~ |
| SS-RSRP Note3 | $Config_{SCell}$ 1,2 | dBm/SCS | -87+~~TT~~ |
| | $Config_{SCell}$ 3 | | -84+~~TT~~ |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/9.36 MHz | -59.0+~~TT~~ |
| | $Config_{SCell}$ 3 | dBm/38.16 MHz | -52.9+~~TT~~ |
| Propagation condition | | | AWGN |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP, and Io levels have been derived from other parameters for information purpose. They are not settable parameters themselves.

The UE shall complete the direct activation of the SCell no later than at slot $n + \frac{N_{direct}}{\text{NR slot length}}$.

The UE shall report non-zero CQI for SCell from slot $n + \frac{N_{direct}}{\text{NR slot length}}$ and onwards throughout time period T2.

The interruption on PCell during direct activation of the SCell shall occur within the interruption window specified in TS 38.133 [6] clause 8.3.4 and shall not exceed the length specified in TS 38.133 [6] clause 8.2.2.2.11.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.3.5 NR SA FR1 direct SCell activation at handover with known SCell

### 6.5.3.5.1 Test purpose

The purpose of this test is to verify the requirement for the FDD-FDD and TDD-TDD intra-frequency handover with direct SCell activation requirements specified in is TS 38.133 [6] subclause 8.3.5.

### 6.5.3.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

### 6.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.5.

### 6.5.3.5.4 Test description

#### 6.5.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.5.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.3.5.4.1-1: Intra-frequency handover with direct SCell activation from FR1-to-FR1 test configurations for NR PCell**

| Config | Description |
|---|---|

| | |
|---|---|
| 1 | Source PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode<br>Target PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | Source PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode<br>Target PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | Source PCell: NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode<br>Target PCell: NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.5.3.5.4.1-1A: Intra-frequency handover with direct SCell activation from FR1-to-FR1 test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.5.4.1-2 and Table 6.5.3.5.4.1-3.

**Table 6.5.3.5.4.1-2: Initial conditions for known FR1 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.3.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

**Table 6.5.3.5.4.1-3: General test parameters Intra-frequency handover with direct SCell activation from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | PCell | | Cell 1 | |
| | SCell | | Cell 2 | |
| | Target cell | | Cell 3 | |
| Final condition | PCell | | Cell 3 | |
| | SCell | | Cell 2 | |
| | neighbour cell | | Cell 1 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| PRACH configuration index | | | FR1 PRACH configuration 1 | As specified in Table 6.3.3.2-3 in TS 38.211 [7] |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | UE is in connected mode with PCell and SCell (Cell 2) is in activated state. UE receives a handover command |
| T2 | | s | $N_{direct}$ | UE shall accomplish the activation of the SCell |
| T3 | | s | 1 | |
| A3-offset | | dB | -15 | |

| | | | |
|---|---|---|---|
| $T_{HARQ}$ | slot | k | k is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [8] |
| $T_{CSI_Reporting}$ | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |
| k | ms | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\,\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1. Message contents are defined in clause 6.5.3.5.4.3.

2. There are three NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3. Cell 3 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

### 6.5.3.5.4.2 Test Procedure

This test is to verify the requirement for the FDD-FDD and TDD-TDD intra-frequency handover with direct SCell activation requirements specified in TS 38.133 [6] subclause 8.3.5.

Supported test configurations for NR PCell are shown in table 6.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in table 6.5.3.5.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently. Both handover with direct SCell activation requirements are tested by using the parameters in table 6.5.3.5.4.1-3, 6.5.3.5.5-1 and 6.5.3.5.5-2.

The test scenario comprises of two FR1 carriers and the 3 cells as given in tables 6.5.3.5.4.1-1 and 6.5.3.5.4.1-3. The test consists of three successive time periods, with time durations of T1, T2, and T3 respectively.

At the start of time duration T1, the UE is in connected mode with PCell and SCell (Cell 2) is in activated state and UE is reporting CQI for both PCell and SCell.

Time period T2 starts when UE receives a handover command to Cell 3 that also activates SCell (Cell 2). This is done using an *RRCReconfiguration* message with parameter *sCellState* set to *activated* for the SCell (Cell 2). The message is sent from the test equipment to the UE and is received in a subframe # denoted m at the UE antenna connector. The UE shall accomplish the activation of the SCell no later than subframe ($m + N_{direct}$), where $N_{direct}$ is the time for direct SCell activation at handover as defined in TS 38.133 [6] clause 8.3.5.

Time period T3 starts at ($m + N_{direct}$), at which point UE shall be reporting a valid CQI for both PCell and SCell. The test equipment verifies the activation time by counting the slots between the RRC connection reconfiguration message is sent and until CSI report with non-zero CQI for both PCell and SCell is received. The test equipment verifies that interruptions on other serving cells are within the requirements by counting ACK/NACKs transmitted in PCell.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message

7. Set the parameters according to T1 in Tables 6.5.3.5.4.1-3, 6.5.3.5.5-1, and 6.5.3.5.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

8. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

9. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

10. After having received a measurement report containing Cell 2, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state as defined in message contents table 6.5.3.5.4.3-5, and also implying handover to Cell 3.

6. The UE shall transmit the uplink PRACH channel to Cell 3 less than 62 ms from the beginning of time period T2. The UE shall start reporting CSI in PSCell in slot (m+k+ 1+$T_{interrupt}$ +$T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.5. $T_{interrupt}$ is the interruption time during handover as specified in TS 38.133 [6] clause 6.1.1, $T_2$ is the delay from slot $n + \frac{T_{RRC_Process}+T_{interrupt}}{NR\ slot\ length}$ until UE has obtained a valid TA command for the target PCell and $T_3$ is the delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213[8], UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot m + 1 + $\frac{T_{HARQ}+T_{interrupt}+T_2+T_3+TRRC_process+T_(CSI_Reporting)}{NR\ slot\ length}$,
  - or slot $m + 1 + \frac{T_{HARQ}+T_{interrupt}+T_2+T_3+T_(CSI_Reporting)\ +TRRC_process+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{T_{HARQ}+T_{interrupt}+T_2+T_3+TRRC_process+T_(CSI_Reporting)}{NR\ slot\ length}$ was subject to interruption, where $N_{interruption}$ is the interruption length given in TS 38.133 [6] clause 8.2.
- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{N_{direct}}{NR\ slot\ length}$,
  - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{direct}}{NR\ slot\ length}$.
- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to $m + 1 + \frac{TRRC_process+T_2+T_3+T_{interrrupt}+T_{HARQ}+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2
- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008), and Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 6.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL , with the following exceptions:

**Table 6.5.3.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell;<br>Table H.3.2-2 with Condition RBConfig_KeyChange |

**Table 6.5.3.5.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.5.3.5.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 6.5.3.5.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.5.4.3-2A: MeasConfig (Table 6.5.3.5.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 6.5.3.5.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.5.3.5.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.5.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.5.3.5.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.5.4.3-5: CellGroupConfig-SCell (Table 6.5.3.5.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.5.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.5.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| sCellState-r16 | activated | | |
| … | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.5.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 6.5.3.5.4.3-7: ServingCellConfig-SCell (Table 6.5.3.5.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

6.5.3.5.5 Test requirements

Table 6.5.3.5.5-1 and 6.5.3.5.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.5.3.5.5-1: Cell specific test parameters for NR PCell for NR FR1-FR1 Intra-frequency handover with direct SCell activation test case**

| Parameter | | Unit | Cell 1 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| | Config 1 | | CSI-RS.1.1 FDD | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CSI-RS configuration for CSI reporting | Config 2 | | CSI-RS.1.1 TDD | | | | | |
| | Config 3 | | CSI-RS.2.1 TDD | | | | | |
| reportConfigType | | | periodic | | | | | |
| reportQuantity | | | cri-RI-PMI-CQI | | | | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | | | | |
| | Config 3 | | 10 | | | | | |
| CSI reporting offset | Config 1,2 | slot | 3 | | | | | |
| | Config 3 | | 5 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 8 | 8 | 8 | 8 | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | 8 | 8 | 8 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -90 | -90 | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -87 | -87 | -87 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.71 | -58.71 | -58.71 | -58.71 | -58.71 | --58.71 |
| | Config 3 | dBm/ 38.16MHz | -52.60 | -50.96 | -50.96 | -50.96 | -50.96 | -50.96 |
| Propagation condition | | - | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.5.3.5.5-2: Cell specific test parameters for NR SCell for NR FR1-FR1 Intra-frequency handover with direct SCell activation test case**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| NR RF Channel Number | | | 2 | | |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | | |
| | $Config_{SCell}$ 2,3 | | TDD | | |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable | | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | | |
| $BW_{channel}$ | $Config_{SCell}$ 1 | MHz | 10: $N_{RB,c}$ = 52 | | |
| | $Config_{SCell}$ 2 | | 10: $N_{RB,c}$ = 52 | | |
| | $Config_{SCell}$ 3 | | 40: $N_{RB,c}$ = 106 | | |
| BWP BW | $Config_{SCell}$ 1 | MHz | 10: $N_{RB,c}$ = 52 | | |
| | $Config_{SCell}$ 2 | | 10: $N_{RB,c}$ = 52 | | |
| | $Config_{SCell}$ 3 | | 40: $N_{RB,c}$ = 106 | | |
| DRx Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD | | |

| | | | | | |
|---|---|---|---|---|---|
| CORESET Reference Channel | $Config_{SCell}$ 1 | | CR.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD | | |
| TRS configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD | | |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD | | |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD | | |
| OCNG Patterns | | | OCNG pattern 1 | | |
| SMTC Configuration | | | SMTC pattern 1 | | |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 | | |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | $Config_{SCell}$ 1,2 | kHz | 15 kHz | | |
| | $Config_{SCell}$ 3 | | 30 kHz | | |
| PUCCH/PUSCH subcarrier spacing | $Config_{SCell}$ 1,2 | kHz | 15 kHz | | |
| | $Config_{SCell}$ 3 | | 30 kHz | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | |
| | Initial UL BWP | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | |
| $N_{oc}$ Note2 | $Config_{SCell}$ 1,2 | dBm/SCS | -98 | | |
| | $Config_{SCell}$ 3 | | -95 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | 8 | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 |
| SSB_RP | $Config_{SCell}$ 1,2 | dBm/SCS | -90 | -90 | -90 |
| | $Config_{SCell}$ 3 | dBm/SCS | -87 | -87 | -87 |
| Io Note3 | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | -61.41 | -61.41 | -61.41 |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | -55.31 | -55.31 | -55.31 |
| Propagation condition | | - | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall be capable to transmit valid CSI report for the directly activated SCell no later than in subframe $m+N_{direct}$. The rate of correct observed SCell direct activation delay during repeated tests shall be at least 90%.

NOTE: The SCell activation delay, $N_{direct}$, can be expressed as: $N_{direct} = T_{RRC_process} + T_{interrupt} + T_2 + T_3 + T_{activation_time} + T_{CSI_Reporting}$ - 3ms, where:

$T_{RRC_Process}$: RRC procedure delay defined in clause 12 of TS 38.331 [13],

$T_{interrupt}$: Interruption time during handover as specified in TS 38.133 [6] clause 6.1.1,

$T_2$: Delay from slot $m + \frac{T_{RRC_Process} + T_{interrupt}}{\text{NR slot length}}$ until UE has obtained a valid TA command for the target PCell,

$T_3$: Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213 [8],

$T_{activation_time}$ and $T_{CSI_Reporting}$ are specified in TS 38.133 [6] clause 8.3.2, where the following definitions of $T_{FirstSSB}$ and $T_{FirstSSB_MAX}$ as defined in TS 38.133 [6] section 8.3.5 shall apply:

- $T_{FirstSSB}$: the time to the end of the first complete SSB burst indicated by the SMTC after slot m + $(T_{RRC_Process}+T_{interrupt}+T2+T3)/(NR\ slot\ length)$

- $T_{FirstSSB_MAX}$: the time to the end of the first complete SSB burst indicated by the SMTC after slot m + $(T_{RRCProcess}+T_{interrupt}+T2+T3)/(NR\ slot\ length)$

This gives a total of $N_{direct}$ = 10 + 52 + $T_{IU}$ + $T_2$ + $T_3$ + $T_{activation_time}$ + $T_{CSI_Reporting}$ - 3 ms = 62 + 10 + 13 + 6 + 20 + 2 - 3 = 94 ms for test configurations 1 and 2.

This gives a total of $N_{direct}$ = 10 + 52 + $T_{IU}$ + $T_2$ + $T_3$ + $T_{activation_time}$ + $T_{CSI_Reporting}$ - 3 ms = 62 + 10 + 13 + 6 + 20 + 2 - 3 = 94 ms for test configuration 3.

During T3 the UE shall send valid CSI reports for PCell and SCell with non-zero CQI index and continue to send CSI reports for PCell and SCell (Cell 2) with non-zero CQI index until the end of T3.

All the above test requirements shall be fulfilled for the observed SCell direct activation delay to be counted as correct.

## 6.5.3.6 to 6.5.3.9

## 6.5.3.10 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle

### 6.5.3.10.1 Test purpose

The purpose of this test is to verify that the fast SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the SCell in FR1 is known by the UE at the time of activation.

### 6.5.3.10.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards and supporting 2DL CA in NR and fast SCell activation.

### 6.5.3.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

### 6.5.3.10.4 Test description

#### 6.5.3.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell and NR SCell are shown in Table 6.5.3.10.4.1-1.

**Table 6.5.3.10.4.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.10.4.1-2 and Table 6.5.3.10.4.1-3.

**Table 6.5.3.10.4.1-2: Initial conditions for fast known FR1 SCell activation case**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.3.10.5-1 | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | Connection Diagram |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

**Table 6.5.3.10.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell 2 timing offset to Cell 1 | μs | 0 | |
| Time alignment error between Cell 2 and Cell 1 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 | |
| $T_{HARQ}$ | ms | Config 1: 2<br>Config 2: 3<br>Config 3: 2.5 | $k_1$×NR slot length<br><br>$k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case. |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |

1.Message contents are defined in clause 6.5.3.10.4.3.

2.There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

### 6.5.3.10.4.2 Test procedure

The test consists of two successive time periods, with duration of T1and T2, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n (where n mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation of SCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.10.4.1-3 and 6.5.3.10.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = n + 1 + $\frac{\text{T}_{\text{HARQ}}+3\text{ms}+T_{\text{CSI_Reporting}}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where $\text{T}_{\text{activation_time}} = \text{T}_{\text{FirstATRS}}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.16,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if slot $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event “Activation” is increased by one. Otherwise, count a fail for the event “Activation” and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 6.5.3.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 6.5.3.10.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 6.5.3.10.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 6.5.3.10.4.3-5 | |
| measConfig | MeasConfig | Table 6.5.3.10.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.10.4.3-2A: MeasConfig (Table 6.5.3.10.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2 Table 6.5.3.10.4.3-3 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 6.5.3.10.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.10.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 6.5.3.10.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.10.4.3-5: CellGroupConfig-SCell (Table 6.5.3.10.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.10.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |

| | | | |
|---|---|---|---|
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.10.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| … | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.10.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.10.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 6.5.3.10.4.3-7: ServingCellConfig-SCell (Table 6.5.3.10.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |
| } | | | |

### 6.5.3.10.5 Test requirement

Table 6.5.3.10.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.5.3.10.5-1: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,2 | MHz | Note 7 | | | |
| | Config 3 | | Note 7 | | | |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 5 | | | |
| | Config 3 | | 106 Note 6 | | | |
| Initial BWP configuration | | | DLBWP.0.2 | | | |
| TCI state | | | TCI.State.0 | | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | - | |
| | Config 2 | | SR.1.1 TDD | | - | |
| | Config 3 | | SR.2.1 TDD | | - | |
| | Config 1 | | CCR.1.1 FDD | | - | |

| | | | | |
|---|---|---|---|---|
| Dedicated CORESET parameters | Config 2 | | CCR.1.1 TDD | - |
| | Config 3 | | CCR.2.1 TDD | - |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | - |
| | Config 3 | | CR.2.1 TDD | - |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 | |
| | Config 3, | | OP.1 Note 6 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| Aperiodic CSI-RS for Scell activation | Config 1 | | N/A | TRS.1.3 FDD |
| | Config 2 | | N/A | TRS.1.3 TDD |
| | Config 3 | | N/A | TRS.1.4 TDD |
| gapBetweenBursts | | slots | N/A | |
| CSI-RS configuration for CSI reporting (Note 8) | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| SMTC configuration | | | SMTC.1 | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity for PCell | Config 1,2 | slot | 5 | - |
| | Config 3 | | 10 | - |
| CSI reporting offset for PCell | Config 1,2 | slot | 3 | - |
| | Config 3 | | 5 | - |
| CSI reporting periodicity for SCell | Config 1,2 | slot | 5 | N/A |
| | Config 3 | | 10 | N/A |
| CSI reporting offset for SCell | Config 1,2 | slot | 2 | N/A |
| | Config 3 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | |
| | Config 3 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 | NA |
| | Config 3 | | -84 | NA |
| CSI-RSRP Note3 | Config 1,2 | dBm/SCS | NA | -87 |
| | Config 3 | | NA | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 | |
| | Config 3 | dBm/ 38.16MHz | -52.87 | |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP, CSI-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

| | |
|---|---|
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |
| Note 8: | On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5. |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot ($n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + 5ms$, as defined in TS 38.133 [6] clause 8.3.16.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + 5ms$, as defined in TS 38.133 [6] clause 8.3.16.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, as defined in TS 38.133 [6] clause 8.3.16.

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 6.5.3.11 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 640ms SCell measurement cycle

### 6.5.3.11.1 Test purpose

The purpose of this test is to verify that the fast SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the SCell in FR1 is known by the UE at the time of activation.

### 6.5.3.11.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards and supporting 2DL CA in NR and fast SCell activation.

### 6.5.3.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

### 6.5.3.11.4 Test description

#### 6.5.3.11.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.10.4.1 with following exception:

The listed parameter values in Tables 6.5.3.11.4.1-1 will replace the values of corresponding parameters in Tables 6.5.3.10.4.1-3. The listed parameter values in Tables 6.5.3.11.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.10.5-1.

**Table 6.5.3.11.4.1-1: General test parameters for known FR1 SCell activation case, 640 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |

**Table 6.5.3.11.4.1-2: Cell specific test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| gapBetweenBursts | | slots | 2 | | | |

### 6.5.3.11.4.2 Test procedure

Same test procedure as described in section 6.5.3.10.4.2:

### 6.5.3.11.4.3 Message contents

Same message contents as described in section 6.5.3.10.4.3 with following exception:

- Table 6.5.3.10.4.3-3 is replaced by Table 6.5.3.11.4.3-1.

**Table 6.5.3.11.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

**Table 6.5.3.11.4.3-2: SCellActivationRS-Config**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCellActivationRS-Config-r17 ::= SEQUENCE { | | | |
| gapBetweenBursts-r17 | 2 | | |
| } | | | |

### 6.5.3.11.5 Test requirement

Table 6.5.3.10.5-1 defines the primary level settings including test tolerances for all tests except the listed parameter values in Tables 6.5.3.11.5-1 will replace the values of corresponding parameters in Table 6.5.3.10.5-1.

**Table 6.5.3.11.5-1: Cell specific test parameters for known FR1 Scell activation case, 640ms Scell measurement cycle**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1,2 | MHz | Note 7 | | | |
| | Config 3 | | Note 7 | | | |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 5 | | | |
| | Config 3 | | 106 Note 6 | | | |
| Initial BWP configuration | | | DLBWP.0.2 | | | |
| TCI state | | | TCI.State.0 | | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | | | |

| | | | | |
|---|---|---|---|---|
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | - |
| | Config 3 | | SR.2.1 TDD | - |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | - |
| | Config 3 | | CCR.2.1 TDD | - |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | - |
| | Config 3 | | CR.2.1 TDD | - |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 | |
| | Config 3, | | OP.1 Note 6 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| Aperiodic CSI-RS for Scell activation | Config 1 | | N/A | TRS.1.3 FDD |
| | Config 2 | | N/A | TRS.1.3 TDD |
| | Config 3 | | N/A | TRS.1.4 TDD |
| gapBetweenBursts | | slots | 2 | |
| CSI-RS configuration for CSI reporting (Note 8) | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| SMTC configuration | | | SMTC.1 | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity for PCell | Config 1,2 | slot | 5 | - |
| | Config 3 | | 10 | - |
| CSI reporting offset for PCell | Config 1,2 | slot | 3 | - |
| | Config 3 | | 5 | - |
| CSI reporting periodicity for SCell | Config 1,2 | slot | 5 | N/A |
| | Config 3 | | 10 | N/A |
| CSI reporting offset for SCell | Config 1,2 | slot | 2 | N/A |
| | Config 3 | | 4 | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | |
| | Config 3 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 | |
| | Config 3 | | -84 | |
| CSI-RSRP Note3 | Config 1,2 | dBm/SCS | | -87 |
| | Config 3 | | | -84 |
| SCH_RP Note 3 | | dBm/15 kHz | -87 | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 | |
| | Config 3 | dBm/ 38.16MHz | -52.87 | |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

| | |
|---|---|
| Note 3: | SS-RSRP, CSI-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |
| Note 8: | On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5. |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $(n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length})$. UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption.During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS} + T_{gap} + T_{ATRS}$+ 5ms, as defined in clause 8.3.16.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS}$ + 5ms, as defined in clause 8.3.16.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, as defined in clause 8.3.16.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 6.5.3.12 to 6.5.3.14

## 6.5.3.15 NR SA FR1 TRS based SCell Activation of SSB-less SCell in inter-band CA in non-DRX

Editor's note: This test case is incomplete. The following aspect is either missing or TBD:

- Some parameters are defined in brackets
- Test tolerance analysis and measurement uncertainty are missing

### 6.5.3.15.1 Test purpose

The purpose of this test is to verify that the SSB-less SCell activation delay is within the requirements stated in TS 38.133 [6] clause 8.3.2, when the to be activated SCell in FR1 is provided with periodic CSI-RS for tracking instead of SSB. SCell does not provide neither SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration.

### 6.5.3.15.2 Test applicability

This test applies to all types of NR UE release 18 onwards that support *scellWithoutSSB-InterBandCA-r18*.

### 6.5.3.15.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses 8.3.2 and 8.2.2.2.

6.5.3.15.4 Test description

6.5.3.15.4.1 Initial conditions

The supported test configurations are shown in Table 6.5.3.15.4.1-1 and 6.5.3.15.4.1-2 below.

**Table 6.5.3.15.4.1-1: FR1 inter-band SSB-less SCell activation based on TRS for NR PCell in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.5.3.15.4.1-2: FR1 inter-band SSB-less SCell activation based on TRS for NR SCell in non-DRX for 160ms SCell measurement cycle supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.15.4.1-3.

**Table 6.5.3.15.4.1-3: Initial conditions for TRS based SCell Activation of SSB-less SCell in FR1 inter-band CA in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7A.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.3.15.4.1-4.

2. Message contents are defined in clause 6.5.3.15.4.3.

3. The test scenario comprises of two NR carriers, each with one cell. Both cells have constant signal levels throughout the test and are configured according to Annex E.4.

**Table 6.5.3.15.4.1-4: General test parameters for TRS based SCell activation of SSB-less SCell in FR1 inter-band CA in non-DRX for 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test, where NR radio channels 1 and 2 are in different NR bands. |

| | | | |
|---|---|---|---|
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| | | | |
| Cell 2 timing offset to Cell 1 | µs | Length of CP of Cell 2 | |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | Config 1: 2<br>Config 2: 3<br>Config 3: 2.5 | $k_1$×NR slot length<br><br>$k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case. |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |

### 6.5.3.15.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) but is not aware of Cell 2 (SCell). Cell 1 and Cell 2 are in different bands. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. At the same time, UE also receives the indication of reference serving cell in the same RRC message. The Cell 1 is indicated as the reference cell of Cell 2. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n (where n mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation of SCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2,. Set the parameters according to T1 in Tables 6.5.3.15.4.1-1 and 6.5.3.15.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3,. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1, with the message content exceptions defined in clause 6.5.3.15.4.3. NR RRCReconfiguration message is

contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n (where n mode 20=1) and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = n + 1 + $\frac{\mathrm{T_{HARQ}+3ms+}T_{CSI_Reporting}}{NR\ slot\ length}$

  - or slot $s_{first_CSI}^{int} = n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

  - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s_{first_CSI}^{int}$,

- - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, where $\mathrm{T_{activation_time}} = \mathrm{T_{First_TRS}} + \mathrm{T_{TRS}}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.2,

  - or slot $s_{nonzero_CQI}^{int} = max\left(s_{first_CSI}^{int}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

  - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s_{nonzero_CQI}^{int}$ if $s_{nonzero_CQI}$ was subject to interruption,

- and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 3-9 until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

6.5.3.15.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 6.5.3.15.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 6.5.3.15.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 6.5.3.15.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.15.4.3-5: CellGroupConfig-SCell (Table 6.5.3.15.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.15.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.15.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.15.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.15.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

6.5.3.15.5 Test requirement

Table 6.5.3.15.5-1 and Table 6.5.3.15.5-2 define the primary level settings including test tolerances for TRS based SCell Activation of SSB-less SCell in FR1 inter-band CA in non-DRX.

**Table 6.5.3.15.5-1: PCell test configuration parameters for TRS based SCell activation of SSB-less SCell in FR1 inter-band CA in non-DRX for 160 ms measurement cycle**

| Parameter | Unit | Cell 1 | |
|---|---|---|---|
| | | T1 | T2 |

| | | | |
|---|---|---|---|
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,2 | MHz | Note 7 |
| | Config 3 | | Note 7 |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 5 |
| | Config 3 | | 106 Note 6 |
| Initial BWP configuration | | | DLBWP.0.1 |
| TCI state | | | TCI.State.0 |
| TRS Configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 |
| | Config 3, | | OP.1 Note 6 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| Periodic CSI-RS configuration for CSI reporting (Note 8) | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| SMTC configuration | | | SMTC.1 |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2 | slot | 5 |
| | Config 3 | | 10 |
| CSI reporting offset | Config 1,2 | slot | 3 |
| | Config 3 | | 5 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 10+TT |
| $\hat{E}_s/N_{oc}$ | | dB | 10+TT |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -94+TT |
| | Config 3 | | -91+TT |
| SCH_RP Note 3 | | dBm/15 kHz | -91+TT |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -65.63+TT |
| | Config 3 | dBm/ 38.16MHz | -59.54+TT |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.

Note 3: Io, SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.
Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5.

**Table 6.5.3.15.5-2: SCell test configuration parameters for TRS based SCell activation of SSB-less SCell in FR1 inter-band CA in non-DRX for 160 ms measurement cycle**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | |
| | $Config_{SCell}$ 2,3 | | TDD | |
| TDD configuration | $Config_{SCell}$ 1 | | Not applicable | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | |
| referenceCell | $Config_{SCell}$ 1,2,3 | | Cell 1 | |
| $BW_{channel}$ | $Config_{SCell}$ 1,2 | MHz | Note 7 | |
| | $Config_{SCell}$ 3 | | Note 7 | |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 5 | |
| | $Config_{SCell}$ 3 | | 106 Note 6 | |
| Initial BWP configuration | | | DLBWP.0.1 | |
| TCI state | | | TCI.State.0 Note 9 | |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD | |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD | |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 | |
| | $Config_{SCell}$ 3 | | OP.1 Note 6 | |
| SSB Configuration | $Config_{SCell}$ 1,2,3 | | Not provided | |
| Periodic CSI-RS configuration for CSI reporting (Note 8) | $Config_{SCell}$ 1 | | CSI-RS.1.1 FDD | |
| | $Config_{SCell}$ 2 | | CSI-RS.1.1 TDD | |
| | $Config_{SCell}$ 3 | | CSI-RS.2.1 TDD | |
| SMTC configuration | | | Not provided | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | $Config_{SCell}$ 1,2 | slot | - | |
| | $Config_{SCell}$ 3 | | - | |
| CSI reporting offset | $Config_{SCell}$ 1,2 | slot | - | |
| | $Config_{SCell}$ 3 | | - | |
| EPRE ratio of PSS to SSS | | dB | N/A | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| | Config 1,2 | dBm/SCS | -104 | |

| | | | |
|---|---|---|---|
| $N_{oc}$ Note2 | Config 3 | | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 19 + [$\Delta_{EPRE}$ Note 10] |
| $\hat{E}_s/N_{oc}$ | | dB | 19 + [$\Delta_{EPRE}$ Note 10] |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | - |
| | Config 3 | | - |
| SCH_RP Note 3 | | dBm/15 kHz | N/A |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | Note 3 |
| | Config 3 | dBm/ 38.16MHz | Note 3 |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: Io, SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.
Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5.
Note 9: The SSB in referenceSignal in the TCI state is configured as the SSB in Cell 1.

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (n + 1 + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot n + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{first_TRS} + T_{TRS} + 5$ ms, as defined in 6.5.3.0.2.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, as defined in TS 38.133 [6] clause 8.3.2.

The interruption on any activated serving cell shall not be more than the values specified as defined in Table 6.5.3.0.2-1 and Table 6.5.3.0.2-2.

All the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 6.5.3.16 NR SA FR1 Inter-band SSB-less SCell Activation based on A-TRS in non-DRX

### 6.5.3.16.1 Test purpose

The purpose of this test is to verify that the inter-band SSB-less SCell activation times are within the requirements stated in TS 38.133 [6] clause 8.3.2.

#### 6.5.3.16.2 Test applicability

This test applies to all types of NR UE release 17 onwards and supports *scellWithoutSSB-InterBandCA-r18 and aperiodicCSI-RS-FastScellActivation-r17.*

#### 6.5.3.16.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses 8.3.2 and 8.2.2.2.

#### 6.5.3.16.4 Test description

##### 6.5.3.16.4.1 Initial conditions

The supported test configuration is listed in Table 6.5.3.16.4-1 and 6.5.3.16.4-.

**Table 6.5.3.16.4.1-1: Inter-band SSB-less SCell Activation based on A-TRS for NR PCell**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.5.3.16.4.1-2: Inter-band SSB-less SCell Activation based on A-TRS for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.16.4.1-3.

**Table 6.5.3.16.4.1-3: Initial conditions for Inter-band SSB-less SCell Activation based on A-TRS**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7A.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | NA | | |

1. The general test parameter settings are set up according to Table 6.5.3.16.4.1-4.

2. Message contents are defined in clause 6.5.3.16.4.3.

3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 and Cell 2 are configured according to Annex E.4.

**Table 6.5.3.16.4.1-4: General test parameters for Inter-band SSB-less SCell Activation based on A-TRS**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test, where NR radio channel 1 and 2 are in different NR bands. |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell 2 timing offset to Cell 1 | μs | Length of CP of Cell 2 | |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | Config 1: 2<br>Config 2: 3<br>Config 3: 2.5 | $k_1$×NR slot length<br><br>$k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case. |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |

### 6.5.3.16.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to PCell Cell 1, but is not aware of Cell 2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. At the same time, UE also receives the indication of reference serving cell in the same RRC message. The Cell 1 is indicated as the reference cell of Cell 2. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n (where n mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, as defined in clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}+T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}} + N_{\mathrm{interruption}}$, as defined in clause 8.3, where $N_{\mathrm{interruption}}$ is the interruption length given in clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation of SCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.15.4.1-1 and 6.5.3.15.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1, with the message content exceptions defined in clause 6.5.3.15.4.3. NR *RRCReconfiguration* message is contained in *RRCConnectionReconfiguration* and NR *RRCReconfigurationComplete* message is contained in *RRCConnectionReconfigurationComplete*.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n (where n mode 20=1) and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

- If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI} = \text{n} + 1 + \frac{\text{T}_{\text{HARQ}}+3\text{ms}+T_{CSI_Reporting}}{NR\ slot\ length}$
  - or slot $s_{first_CSI}^{int} = n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,
  - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s_{first_CSI}^{int}$,
- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI} = \text{n} + \frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where $\text{T}_{\text{activation_time}} = \text{T}_{\text{First_ATRS}} + \text{T}_{\text{gap}} + \text{T}_{\text{ATRS}} + 5\text{ms}$, as defined in TS 38.133 [6] clause 8.3.16,
  - or slot $s_{nonzero_CQI}^{int} = max\left(s_{first_CSI}^{int}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,
  - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s_{nonzero_CQI}^{int}$ if $s_{nonzero_CQI}$ was subject to interruption,
- and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2
- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, the SS shall transmit an RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Switch off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 3-9 until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

### 6.5.3.16.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 6.5.3.16.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell |

**Table 6.5.3.16.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 6.5.3.16.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.16.4.3-5: CellGroupConfig-SCell (Table 6.5.3.16.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 6.5.3.16.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 6.5.3.16.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.3.16.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.16.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 6.5.3.16.4.3-7: ServingCellConfig-SCell (Table 6.5.3.16.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |

6.5.3.16.5 Test requirement

Table 6.5.3.16.5-1 and 6.5.3.16.5-2 define the primary level settings including test tolerances for the test.

**Table 6.5.3.16.5-1: PCell test parameters for Inter-band SSB-less SCell Activation based on A-TRS**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2 | MHz | Note 7 | |
| | Config 3 | | Note 7 | |
| $BW_{occupied}$ | Config 1,2 | RB | 52 Note 5 | |
| | Config 3 | | 106 Note 6 | |
| Initial BWP configuration | | | DLBWP.0.1 | |
| TCI state | | | TCI.State.0 | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 | |
| | Config 3, | | OP.1 Note 6 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| CSI-RS configuration for CSI reporting (Note 8) | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| SMTC configuration | | | SMTC.1 | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | |
| | Config 3 | | 10 | |
| CSI reporting offset | Config 1,2 | slot | 3 | |
| | Config 3 | | 5 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | |
| | Config 3 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 10 | |
| $\hat{E}_s/N_{oc}$ | | dB | 10 | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -94 | |
| | Config 3 | | -91 | |
| SCH_RP Note 3 | | dBm/15 kHz | -91 | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -65.63 | |
| | Config 3 | dBm/ | -59.54 | |

| | | | |
|---|---|---|---|
| | | 38.16MHz | |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: Io, SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.
Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5.

**Table 6.5.3.16.5-2: SCell parameters for Inter-band SSB-less SCell Activation based on A-TRS**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD | |
| | $Config_{SCell}$ 2,3 | | TDD | |
| TDD configuration | $Config_{SCell}$ 1 | | Not applicable | |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 | |
| | $Config_{SCell}$ 3 | | TDDConf.2.1 | |
| referenceCell | $Config_{SCell}$ 1,2,3 | | Cell 1 | |
| $BW_{channel}$ | $Config_{SCell}$ 1,2 | MHz | Note 7 | |
| | $Config_{SCell}$ 3 | | Note 7 | |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | RB | 52 Note 5 | |
| | $Config_{SCell}$ 3 | | 106 Note 6 | |
| Initial BWP configuration | | | DLBWP.0.1 | |
| TCI state | | | TCI.State.0 Note 9 | |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD | |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD | |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | - | |
| | $Config_{SCell}$ 2 | | - | |
| | $Config_{SCell}$ 3 | | - | |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 | |
| | $Config_{SCell}$ 3 | | OP.1 Note 6 | |
| SSB Configuration | $Config_{SCell}$ 1,2,3 | | Not provided | |
| Aperiodic CSI-RS for Scell activation | $Config_{SCell}$ 1 | | TRS.1.3 FDD | |
| | $Config_{SCell}$ 2 | | TRS.1.3 TDD | |
| | $Config_{SCell}$ 3 | | TRS.1.4 TDD | |
| gapBetweenBursts | $Config_{SCell}$ 1,2 | slot | 2 | |
| | $Config_{SCell}$ 3 | slot | 3 | |
| CSI-RS configuration for CSI reporting (Note 8) | $Config_{SCell}$ 1 | | CSI-RS.1.1 FDD | |
| | $Config_{SCell}$ 2 | | CSI-RS.1.1 TDD | |
| | $Config_{SCell}$ 3 | | CSI-RS.2.1 TDD | |
| SMTC configuration | | | Not provided | |
| reportConfigType | | | periodic | |
| reportQuantity | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | $Config_{SCell}$ 1,2 | slot | - | |
| | $Config_{SCell}$ 3 | | - | |
| CSI reporting offset | $Config_{SCell}$ 1,2 | slot | - | |

| | | | |
|---|---|---|---|
| | Config$_{SCell}$ 3 | | - |
| EPRE ratio of PSS to SSS | | dB | N/A |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 18 |
| $\hat{E}_s/N_{oc}$ | | dB | 18 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | - |
| | Config 3 | | - |
| SCH_RP Note 3 | | dBm/15 kHz | N/A |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | N/A |
| | Config 3 | dBm/ 38.16MHz | N/A |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: Io, SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.
Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 [9] cl. 5.2.2.5.
Note 9: The SSB in referenceSignal in the TCI state is configured as the SSB in Cell 1.

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $(n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length})$. UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{first_ATRS} + T_{gap} + T_{ATRS} + 5$ ms, as defined in clause 6.5.3.0.2.

During T2 interruption of PCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.2.

The interruption on any activated serving cell shall not be more than the values specified for SA in Table 6.5.3.0.2-1 and Table 6.5.3.0.2-2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

The rate of successful tests during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.4 UE UL carrier RRC reconfiguration delay

### 6.5.4.0 Minimum conformance requirements

#### 6.5.4.0.1 Minimum conformance requirements for UL carrier RRC reconfiguration delay

[TS 38.133, clause 8.4.2]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of the last slot containing the RRC command.

$T_{UL_carrier_config}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [13] plus the interruption time specified in TS 38.133 [6] section 8.2.1.2.6.

[TS 38.133, clause 8.4.3]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_deconfig}$ from the end of the last slot containing the RRC command.

$T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.4.

### 6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay

#### 6.5.4.1.1 Test purpose

To verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] section 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

#### 6.5.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SUL.

#### 6.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.4.1.

#### 6.5.4.1.4 Test description

##### 6.5.4.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.5.4.1.4.1-1.

**Table 6.5.4.1.4.1-1: Supported test configurations**

| Configuration | PSCell (Cell 1) | SCell (Cell 2) |
|---|---|---|
| 6.5.4.1-1 | 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-2 | 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-3 | 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode |
| 6.5.4.1-4 | 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; |

| | | |
|---|---|---|
| | | SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-5 | 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-6 | 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode |
| 6.5.4.1-7 | 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode;<br>SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-8 | 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode;<br>SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode |
| 6.5.4.1-9 | 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode;<br>SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | | |

Configure the test requirement and the DUT according to the parameters in Table 6.5.4.1.4.1-2.

**Table 6.5.4.1.4.1-2: Initial conditions for NR SA FR1 UE UL carrier RRC reconfiguration delay**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.5.4.1.4.1-3.
2. Message contents are defined in clause 6.5.4.1.4.3.
3. There are two NR FR1 carriers and two cells in the test. Cell 1 is PCell on the primary component carrier, Cell 2 is SCell on the secondary component carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.5.4.1.5-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

**Table 6.5.4.1.4.1-3: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 1, 2 | Two radio channels are used for this test. |
| Active cell | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Normal | |
| DRX | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF | |

| | | | | |
|---|---|---|---|---|
| Measurement gap pattern Id | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF | |
| Filter coefficient | | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 0 | L3 filtering is not used |
| T1 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 | |
| T2 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 | |
| T3 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 | |

#### 6.5.4.1.4.2 Test procedure

There are two cells: FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.*

The test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 1 is configured to UE. At the start of T2, a supplementary uplink cell (Cell 2) is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

At the start of the test the UE is in RRC_CONNECTED state with Cell 1 (NR uplink cell). The SS shall provide continuous UL grants to the UE, so it can transmit in the corresponding uplink carrier as soon as it is ready for transmission.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Setup PCell (Cell 1) according to parameters given in Table 6.5.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.
3. Both Cell 1 NR uplink and SUL Cell 2 supplementary uplink are broadcast by *ServingCellConfigCommonSIB* of Cell 1.
4. During time duration T1, NR uplink (Cell 1) is configured on the UE. Setup Cell 1 according to parameters given in Table 6.5.4.1.5-1.
5. At the start of T2, the supplementary uplink Cell (Cell 2) is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the supplementary uplink Cell (Cell 2) within 20ms. If UE transmits data on the supplementary uplink Cell (Cell 2) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration" and proceed with step 7.
6. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*, then UE shall transmit data only on the NR uplink carrier of SCell within 20ms. If UE stops transmitting data on supplementary uplink carrier on SCell (Cell 2) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".
7. Repeat steps 1-6 until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 6.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.5.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.8-1<br>Table H.3.8-2<br>Table 4.6.3-128 in 38.508-1 [14] with condition SUL<br>Table 4.6.3-167 in 38.508-1 [14] with condition PUSCH_PUCCH_ON_SUL<br>Table 4.6.3-169 in 38.508-1 [14] with condition SUL<br>Table 4.6.3-202 in 38.508-1 [14] with condition SUL_SUL |

6.5.4.1.5 Test requirement

Table 6.5.4.1.5.1-1 and 6.5.4.1.5-2 define the primary level settings including test tolerances for UE UL carrier RRC reconfiguration delay test.

**Table 6.5.4.1.5-1: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)**

| Parameter | Unit | Test Configuration | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| Channel number | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 | | |
| TDD configuration | | Conf 1, 2, 3 | N/A | | |
| | | Conf 4, 5, 6 | TDD Conf.1.1 | | |
| | | Conf 7, 8, 9 | TDD Conf.2.1 | | |
| $BW_{channel}$ | MHz | Conf 1, 2, 3 | Note 6 | | |
| | | Conf 4, 5, 6 | Note 6 | | |
| | | Conf 7, 8, 9 | Note 6 | | |
| $BW_{occupied}$ | RB | Conf 1, 2, 3 | 52 Note 4 | | |
| | | Conf 4, 5, 6 | 52 Note 4 | | |
| | | Conf 7, 8, 9 | 106 Note 5 | | |
| PDSCH reference measurement channel as defined in A.1.1 | | Conf 1, 2, 3 | SR.1.1 FDD | | |
| | | Conf 4, 5, 6 | SR.1.1 TDD | | |
| | | Conf 7, 8, 9 | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.1.2 | | Conf 1, 2, 3 | CR.1.1 FDD | | |
| | | Conf 4, 5, 6 | CR.1.1 TDD | | |
| | | Conf 7, 8, 9 | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.1.3 | | Conf 1, 2, 3 | CCR.1.1 FDD | | |
| | | Conf 4, 5, 6 | CCR.1.1 TDD | | |
| | | Conf 7, 8, 9 | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 | | Conf 1, 2, 3, 4, 5, 6 | OP.1 Note 4 | | |
| | | Config 7, 8, 9 | OP.1 Note 5 | | |
| SSB configuration | | Conf 1, 2, 3, 4, 5, 6 | SSB.1 FR1 | | |
| | | Conf 7, 8, 9 | SSB.2 FR1 | | |
| SMTC configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | |
| CSI-RS for tracking | | Conf 1 | TRS.1.1 FDD | | |
| | | Conf 2 | TRS.1.1 FDD | | |
| | | Conf 3 | TRS.1.1 FDD | | |
| | | Conf 4 | TRS.1.1 TDD | | |
| | | Conf 5 | TRS.1.1 TDD | | |
| | | Conf 6 | TRS.1.1 TDD | | |
| | | Conf 7 | TRS.1.2 TDD | | |
| | | Conf 8 | TRS.1.2 TDD | | |
| | | Conf 9 | TRS.1.2 TDD | | |
| DL initial BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | |
| DL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | |

| | | | | | |
|---|---|---|---|---|---|
| UL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | |
| | dBm/ SCS | Conf 1,2,3,4,5,6 | -102 | | |
| | | Conf 7,8,9 | -99 | | |
| $\hat{E}_s / N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| $\hat{E}_s / I_{ot}$ Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1,2,3,4,5,6 | -86 | -86 | -86 |
| | | Conf 7,8,9 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1,2,3,4,5,6 | -57.9 | -57.9 | -57.9 |
| | dBm/ 38.16 MHz | Conf 7,8,9 | -51.8 | -51.8 | -51.8 |
| Propagation Condition | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | |
| Antenna configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: $\hat{E}_s / I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

**Table 6.5.4.1.5-2: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SUL Cell (Cell 2)**

| Parameter | Unit | | Test 1 |
|---|---|---|---|

| | | Test Configuration | T1 | T2 | T3 |
|---|---|---|---|---|---|
| Channel number | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2 | | |
| TDD configuration | | Conf 1, 4, 7 | N/A | | |
| | | Conf 2, 5, 8 | TDDConf.1.1 | | |
| | | Conf 3, 6, 9 | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | Conf 1, 4, 7 | Note 6 | | |
| | | Conf 2, 5, 8 | Note 6 | | |
| | | Conf 3, 6, 9 | Note 6 | | |
| $BW_{occupied}$ | RB | Conf 1, 4, 7 | 52 Note 4 | | |
| | | Conf 2, 5, 8 | 52 Note 4 | | |
| | | Conf 3, 6, 9 | 106 Note 5 | | |
| PUSCH parameters for NR UL carrier | | Conf 1, 4, 7 | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] |
| | | Conf 2, 5, 8 | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] | G-FR1-A3-10 in [28] |
| | | Conf 3, 6, 9 | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] | G-FR1-A3-14 in [28] |
| PUCCH parameters For NR UL carrier | | Conf 1, 4, 7 | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] |
| | | Conf 2, 5, 8 | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] | Table 8.3.3.1.2-1 in [28] |
| | | Conf 3, 6, 9 | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] | Table 8.3.3.1.2-2 in [28] |
| PUSCH parameters for supplementary UL | | Conf 1, 4, 7 | N/A | G-FR1-A3-10 in [28] | N/A |
| | | Conf 2, 5, 8 | N/A | G-FR1-A3-10 in [28] | N/A |
| | | Conf 3, 6, 9 | N/A | G-FR1-A3-14 in [28] | N/A |
| PUCCH parameters for supplementary UL | | Conf 1, 4, 7 | N/A | N/A | N/A |
| | | Conf 2, 5, 8 | N/A | N/A | N/A |
| | | Conf 3, 6, 9 | N/A | N/A | N/A |
| PDSCH reference measurement channel as defined in A.1.1 | | Conf 1, 4, 7 | SR.1.1 FDD | | |
| | | Conf 2, 5, 8 | SR.1.1 TDD | | |
| | | Conf 3, 6, 9 | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.1.2 | | Conf 1, 4, 7 | CR.1.1 FDD | | |
| | | Conf 2, 5, 8 | CR.1.1 TDD | | |
| | | Conf 3, 6, 9 | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.1.3 | | Conf 1, 4, 7 | CCR.1.1 FDD | | |
| | | Conf 2, 5, 8 | CCR.1.1 TDD | | |
| | | Conf 3, 6, 9 | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 | | Conf 1, 2, 4, 5, 7, 8 | OP.1 Note 4 | | |
| | | Conf 3, 6, 9 | OP.1 Note 5 | | |
| SSB configuration | | Conf 1, 2, 4, 5, 7,8 | SSB.1 FR1 | | |
| | | Conf 3, 6, 9 | SSB.2 FR1 | | |
| SMTC configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | |
| CSI-RS for tracking | | Conf 1 | TRS.1.1 FDD | | |
| | | Conf 2 | TRS.1.1 TDD | | |
| | | Conf 3 | TRS.1.2 TDD | | |
| | | Conf 4 | TRS.1.1 FDD | | |
| | | Conf 5 | TRS.1.1 TDD | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Conf 6 | TRS.1.2 TDD | | |
| | | Conf 7 | TRS.1.1 FDD | | |
| | | Conf 8 | TRS.1.1 TDD | | |
| | | Conf 9 | TRS.1.2 TDD | | |
| DL initial BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | |
| DL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | |
| UL dedicated BWP configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | |
| | dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -102 | | |
| | | Conf 3, 6, 9 | -99 | | |
| $\hat{E}_s / N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| $\hat{E}_s / I_{ot}$ Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -86 | -86 | -86 |
| | | Conf 3, 6, 9 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1, 2, 4, 5, 7,8 | -57.9 | -57.9 | -57.9 |
| | dBm/ 38.16 MHz | Conf 3, 6, 9 | -51.8 | -51.8 | -51.8 |
| Propagation Condition | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | |
| Antenna configuration | | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | |
| SUL RSRP threshold (*rsrp-ThresholdSSB-SUL*) | dBm | Conf 1,2,3,4,5,6 | -75 | | |
| | | Conf 7,8,9 | -72 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: $\hat{E}_s / I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

The UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T2.

The UE shall stop the transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

## 6.5.5 Link recovery procedures

### 6.5.5.0 Minimum conformance requirements

#### 6.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 4.5.5.0.1.

#### 6.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ [ms] period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ [ms] period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 8.5.3.2-1 for FR1.

For FR1,

- $P=1/(1 - T_{CSI-RS}/MGRP)$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of $M_{BFD}$ used in Table 6.5.5.0.2-1 is defined as

- $M_{BFD}$ = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

**Table 6.5.5.0.2-1: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR1**

| Configuration | $T_{Evaluate_BFD_CSI-RS}$ (ms) |
|---|---|
| no DRX | $\max(50, M_{BFD} * P * T_{CSI-RS})$ |
| DRX cycle ≤ 320ms | $\max(50, 1.5 \times M_{BFD} * P * \max(T_{DRX}, T_{CSI-RS}))$ |
| DRX cycle > 320ms | $M_{BFD} * P * T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

When the radio link quality on all the configured RS resources in set $\bar{q}_0$ is worse than $Q_{out_LR}$, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\bar{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{BFD\text{-}RS,M}$), where $T_{BFD\text{-}RS,M}$ is the shortest periodicity of all configured RS resources in set $\bar{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\bar{q}_0$ or CSI-RS resource in the set $\bar{q}_0$.

When DRX is used, $T_{Indication_interval_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD\text{-}RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_LR}$ within $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period provided CSI-RS Ês/Iot is according to Annex Table B.2.4.2 for a corresponding band.

The value of $T_{Evaluate_CBD_CSI\text{-}RS}$ is defined in Table 6.5.5.0.2-2 for FR1.

For FR1,

- P=1/(1 – $T_{CSI\text{-}RS}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

In both FR1 and FR2, if different SCS is used for SSB and CSI-RS, and the UE does not support *simultaneousRxDataSSB-DiffNumerology*, it is assumed that the CSI-RS configured for candidate beam detection and each SSB shall be TDMed transmitted.

The values of $M_{CBD}$ used in Table 6.5.5.0.2-2 is defined as

- $M_{CBD}$ = 3, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3.

**Table 6.5.5.0.2-2: Evaluation period $T_{Evaluate_CBD_CSI\text{-}RS}$ for FR1**

| Configuration | $T_{Evaluate_CBD_CSI\text{-}RS}$ (ms) |
|---|---|
| non-DRX | max(25, ceil($M_{CBD}$ *P) * $T_{CSI\text{-}RS}$) |
| DRX cycle ≤ 320ms | ceil($M_{CBD}$ *P*N) * max($T_{DRX}$, $T_{CSI\text{-}RS}$) |
| DRX cycle > 320ms | ceil($M_{CBD}$ *P) *$T_{DRX}$ |
| Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5.3.2, 8.5.4 and 8.5.6.2.

### 6.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 4.5.5.0.3.

### 6.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 4.5.5.0.4.

### 6.5.5.0.5 TRP specific Minimum conformance requirements

[TS 38.133, clause 8.18.3]

#### 6.5.5.0.5.1 Requirements for CSI-RS based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ estimated over the last $T_{Evaluate_BFD_CSI\text{-}RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI\text{-}RS}$ within $T_{Evaluate_BFD_CSI\text{-}RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI\text{-}RS}$ is defined in Table 6.5.5.0.5.1-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{BFD}$ used in Table 6.5.5.0.5.1-1 is defined as

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 6.5.5.0.5.1-1 is defined as

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{BFD}$ = 1.

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for PSCell in NR-DC

$P_{BFD}$ = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ configured for a SCell

- $P_{BFD}$ = Z in EN-DC or NE-DC or SA.
- $P_{BFD}$ = 2* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell.

**Table 6.5.5.0.5.1-1: Evaluation period $T_{Evaluate_BFD_CSI\text{-}RS}$ for FR1**

| Configuration | $T_{Evaluate_BFD_CSI\text{-}RS}$ (ms) |
|---|---|
| no DRX | $Max(50, Ceil(M_{BFD} \times P \times P_{BFD}) \times T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $Max(50, Ceil(1.5 \times M_{BFD} \times P \times P_{BFD}) \times Max(T_{DRX}, T_{CSI\text{-}RS}))$ |
| RX cycle > 320ms | $Ceil(M_{BFD} \times P \times P_{BFD}) \times T_{DRX}$ |
| Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$. $T_{DRX}$ is the DRX cycle length. | |

#### 6.5.5.0.5.2 Requirements for CSI-RS based candidate beam detection

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_LR}$ within $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period provided CSI-RS Ês/Iot is according to Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 6.5.5.0.5.2-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI-RS}$ is defined in Table 6.5.5.0.5.2-1 for FR1.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.18.6.3 of TS 38.133.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{CBD}$ used in Table 6.5.5.0.5.2-1 is defined as

- $M_{CBD}$ = 3, if the CSI-RS resource configured in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{CBD}$ used in Table 6.5.5.0.5.2-1 is defined as

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD}$ = 1.

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PSCell in NR-DC

- $P_{CBD}$ = 2 if UE configured for candidate beam detection on SCell, 1 otherwise.

For each CSI-RS resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for a SCell

- $P_{CBD}$ = Z in EN-DC or NE-DC or SA.
- $P_{CBD}$ = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell
- $P_{CBD}$ is the number of band(s) on which UE is performing candidate beam detection only for SCell.

**Table 6.5.5.0.5.2-1: Evaluation period $T_{Evaluate_CBD_CSI-RS}$ for FR1**

| Configuration | $T_{EvaluateC_CBD_CSI-RS}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | Max(25, Ceil($M_{CBD} \times P \times P_{CBD}$) × $T_{CSI-RS}$) |
| DRX cycle > 320ms | Ceil($M_{CBD} \times P \times P_{CBD}$) × $T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$. $T_{DRX}$ is the DRX cycle length. | |

### 6.5.5.0.5.3 Requirements for TRP specific Beam Failure Recovery

Same as in the clause 4.5.5.0.5.3.

### 6.5.5.0.5.4 Scheduling availability of UE during TRP specific beam failure detection

Same as in the clause 4.5.5.0.5.4.

### 6.5.5.0.5.5 Scheduling availability of FR1 UE during TRP specific candidate beam detection

Same as in the clause 4.5.5.0.5.5

## 6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX

### 6.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and link recovery.

### 6.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.1.

### 6.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery

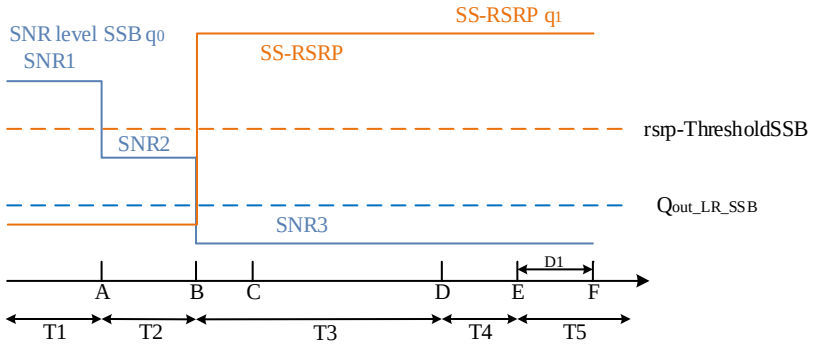



**Figure 6.5.5.1.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

#### 6.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.1.4.1-1.

**Table 6.5.5.1.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Configuration | Description |
|---|---|
| 6.5.5.1-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.1-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.1-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.1.4.1-2.

**Table 6.5.5.1.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.1.4.1-3.

2. Message contents are defined in clause 6.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.1.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | |
| | Config 2 | | 10: NRB,c = 52 | |
| | Config 3 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1. FDD | |
| | Config 2 | | CCR.1.1. TDD | |
| | Config 3 | | CCR.2.1. TDD | |
| SSB Configuration | Config 1 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |
| | Config 3 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | Config 1, 2 | | PRACH.2 FR1 | |
| | Config 3 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |

| | | | | |
|---|---|---|---|---|
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| gapOffset | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/ SCS kHz | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12 ] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12 ] |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM RS | | | 0, 1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.24 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |

| | | | |
|---|---|---|---|
| D1 | s | 0.14 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 6.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short_DCI” with the following exceptions:

**Table 6.5.5.1.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-6 with Condition BFD<br>Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0<br><br>Table H.3.1-8 with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.1.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.1.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.1.4.3-4: Void**

**Table 6.5.5.1.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |

| | | | |
|---|---|---|---|
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.1.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 6.5.5.1.4.3-7: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

6.5.5.1.5 Test requirement

Tables 6.5.5.1.4.1-3 and 6.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

**Table 6.5.5.1.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set q1 | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 2 | | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3 | | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

**Table 6.5.5.1.5-2: Void**

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 140 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX

### 6.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, link recovery and long DRX cycle.

### 6.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.2.

### 6.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

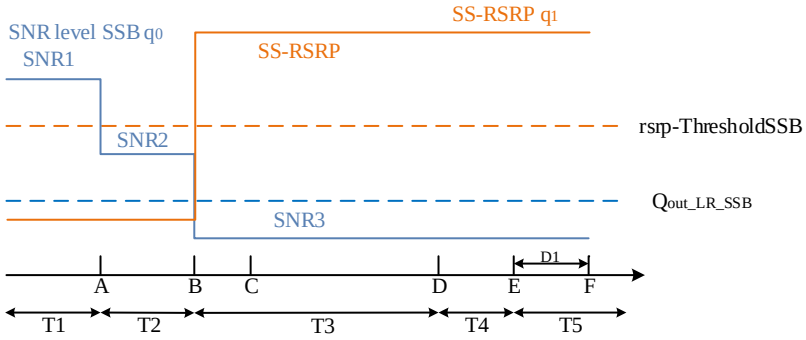



**Figure 6.5.5.2.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

#### 6.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.2.4.1-1.

**Table 6.5.5.2.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 6.5.5.2-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.2-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.2-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.2.4.1-2.

**Table 6.5.5.2.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.2.4.1-3.

2. Message contents are defined in clause 6.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.2.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | |
| | Config 2 | | 10: NRB,c = 52 | |
| | Config 3 | | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1. FDD | |
| | Config 2 | | CCR.1.1. TDD | |
| | Config 3 | | CCR.2.1. TDD | |
| SSB Configuration | Config 1 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |
| | Config 3 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | Config 1, 2 | | PRACH.2 FR1 | |
| | Config 3 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to | dB | 0 | |

| | | | | |
|---|---|---|---|---|
| | average CSI-RS RE energy | | | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | see clause A.3.3.7 of TS 38.133 [6] |
| Gap pattern ID | | | N.A. | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/ SCS kHz | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM RS | | | 0, 1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 5.17 | |
| T3 | | s | 3.24 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 6.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition “Short_DCI” with the following exceptions:

**Table 6.5.5.2.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.2.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |

| | | | |
|---|---|---|---|
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.2.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.2.4.3-4: Void**

**Table 6.5.5.2.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.2.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |

| | | | |
|---|---|---|---|
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 6.5.5.2.4.3-7: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

6.5.5.2.5 Test requirement

Tables 6.5.5.2.4.1-3 and 6.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

**Table 6.5.5.2.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set q1 | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.2.4-1. |
| Note 9: | The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1940 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

### 6.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and link recovery.

### 6.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.3.

### 6.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure and the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

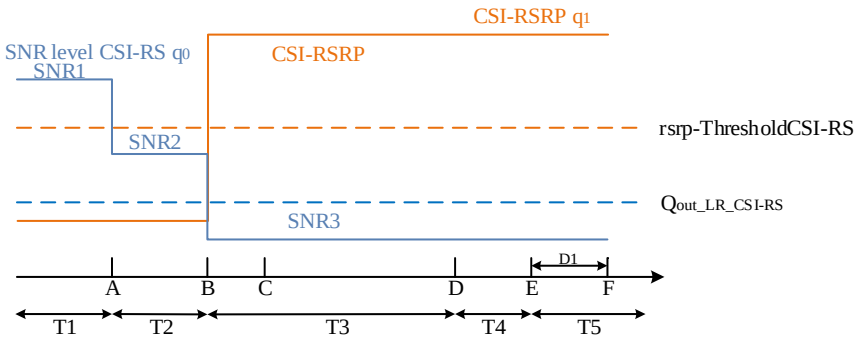



**Figure 6.5.5.3.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

### 6.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.3.4.1-1.

**Table 6.5.5.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 6.5.5.3-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.3-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.3-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.3.4.1-2.

**Table 6.5.5.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.3.4.1-3.
2. Message contents are defined in clause 6.5.5.3.4.3.
3. There is one NR carrier and one NR cell specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.3.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |

| | | | | |
|---|---|---|---|---|
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1. FDD | |
| | Config 2 | | CCR.1.1. TDD | |
| | Config 3 | | CCR.2.1. TDD | |
| SSB Configuration | Config 1 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |
| | Config 3 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | Config 1, 2 | | PRACH.4 FR1 | |
| | Config 3 | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | N |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/SCS kHz | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], section 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |

| | | | | |
|---|---|---|---|---|
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.14 | |
| T4 | | s | 0 | |
| T5 | | s | 0.08 | |
| D1 | | s | 0.05 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 6.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.5.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.3.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.3.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.3.4.3-4: Void**

**Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 6.5.5.3.4.3-6: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.3.4.3-7: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

6.5.5.3.5 Test requirement

Tables 6.5.5.3.4.1-3 and 6.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table 6.5.5.3.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set q1 | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Config 2 | dBm/SCS kHz | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 50 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

### 6.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, link recovery and long DRX cycle.

### 6.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.4.

### 6.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active

cell to emulate CSI-RS based beam failure. Figure 6.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

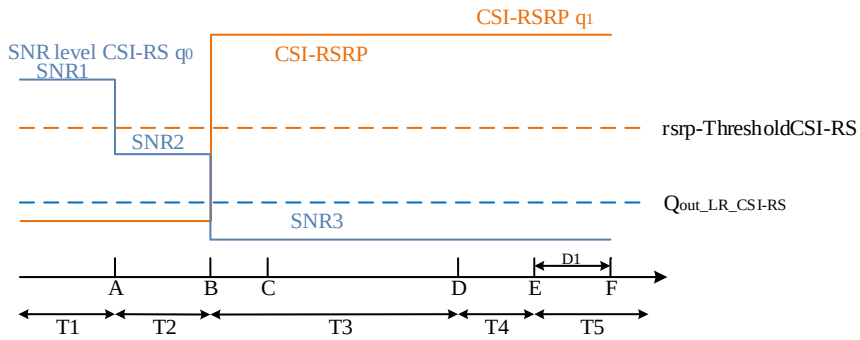



**Figure 6.5.5.4.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

### 6.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.4.4.1-1.

**Table 6.5.5.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 6.5.5.4-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.4-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.4-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.4.4.1-2.

**Table 6.5.5.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.4.4.1-3.
2. Message contents are defined in clause 6.5.5.4.4.3.
3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.4.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1. FDD | |
| | Config 2 | | CCR.1.1. TDD | |
| | Config 3 | | CCR.2.1. TDD | |
| SSB Configuration | Config 1 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |
| | Config 3 | | SSB.4 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | Config 1, 2 | | PRACH.4 FR1 | |
| | Config 3 | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/SCS kHz | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |

| | | | | |
|---|---|---|---|---|
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], section 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 8.37 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 6.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.5.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.4.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.4.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.4.4.3-4: Void**

**Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 6.5.5.4.4.3-6: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.4.4.3-7: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

6.5.5.4.5 Test requirement

Tables 6.5.5.4.4.1-3 and 6.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 6.5.5.4.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set q1 | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1940 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.5 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

### 6.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.5.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

#### 6.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.5.

#### 6.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.5.4-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure 6.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

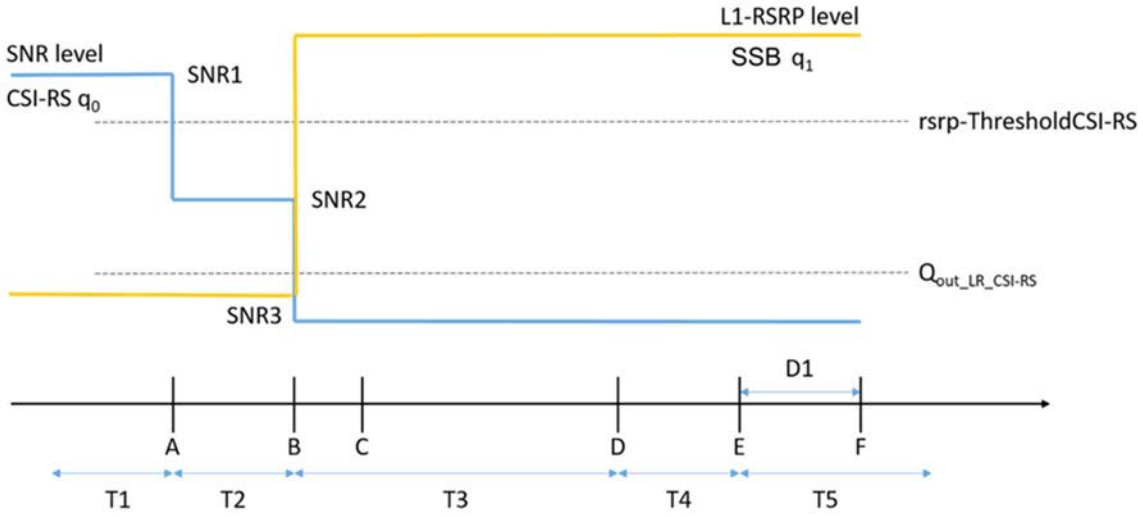



**Figure 6.5.5.5.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX**

#### 6.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.5.4.1-1.

**Table 6.5.5.5.4.1-1: Supported test configurations for FR1 PCell and SCell**

| Configuration | Description |
|---|---|
| 6.5.5.5-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.5-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.5-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.5.4.1-2.

**Table 6.5.5.5.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |

1. The general test parameter settings are set up according to Table 6.5.5.5.4.1-3.

2. Message contents are defined in clause 6.5.5.5.4.3.

3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.5.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number for PCell | | | 1 | |
| Active SCell | | | Cell 2 | |
| RF Channel Number for SCEll | | | 2 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| BW channel | Config 1 | MHz | 10: NRB,c = 52 | |
| | Config 2 | | 10: NRB,c = 52 | |
| | Config 3 | | 40: NRB,c = 106 | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | A.1.2 |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| SSB Configuration | Config 1 | | SSB.1 FR1 | A.3 |
| | Config 2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | A.4 |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH Configuration | Config 1, 2 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 3 | | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS | dB | 0 | |

| | | | | |
|---|---|---|---|---|
| | energy to average CSI-RS RE energy | | | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdBFR | Config 1, 2 | dBm/SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for $q_0$ in activated SCell | Config 1 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM RS in PCell | Config 1 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.14 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.13 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 6.5.5.5.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameter *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

#### 6.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.5.5.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.5.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |

| | | | |
|---|---|---|---|
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.5.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.5.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.5.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

### 6.5.5.5.5 Test requirement

Tables 6.5.5.5.4.1-3 and 6.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX.

**Table 6.5.5.5.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX**

| Parameter | Unit | Cell 1 | Test 1 Cell 2 | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1 | dB | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/ SCS kHz | -108 | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2 | | -108 | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -105 | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -98 | -98 | | | | |
| | Config 2 | | -98 | -98 | | | | |
| | Config 3 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.5.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.6 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

### 6.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

### 6.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

### 6.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.6.

### 6.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.6.4-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure 6.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

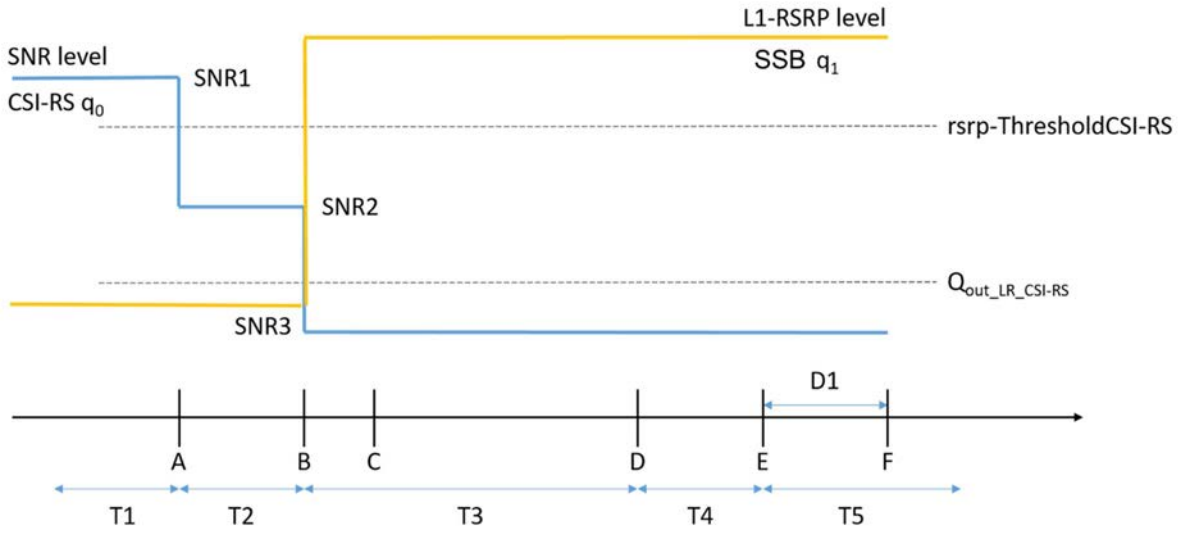



**Figure 6.5.5.6.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX**

#### 6.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.6.4.1-1.

**Table 6.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell**

| Configuration | Description |
|---|---|
| 6.5.5.6-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.6-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.5.6-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.6.4.1-2.

**Table 6.5.5.6.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.6.4.1-3.

2. Message contents are defined in clause 6.5.5.6.4.3.

3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.6.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number for PCell | | | 1 | |
| Active SCell | | | Cell 2 | |
| RF Channel Number for SCell | | | 2 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | |
| | Config 2 | | 10: NRB,c = 52 | |
| | Config 3 | | 40: NRB,c = 106 | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | A.1.2 |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| SSB Configuration | Config 1 | | SSB.1 FR1 | A.3 |
| | Config 2 | | SSB.1 FR1 | |
| | Config 3 | | SSB.2 FR1 | |

| | | | | |
|---|---|---|---|---|
| SMTC Configuration | Config 1, 2 | | SMTC.1 | A.4 |
| | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH Configuration | Config 1, 2 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 3 | | PRACH.2 FR1 | Table A.7.1-1 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | A.5 |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdBFR | Config 1, 2 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for $q_0$ in activated SCell | Config 1 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |

| | | | | |
|---|---|---|---|---|
| CSI-RS-Index assigned as RLM RS in PCell | Config 1 | | CSI-RS.1.2 FDD | A.1.4 |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 8.37 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.93 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 6.5.5.6.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and step 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

#### 6.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.5.6.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table H.3.7-1 with Condition 'DRX.7'<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.5.5.6.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.6.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.6.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.6.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

6.5.5.6.5 Test requirement

Tables 6.5.5.6.4.1-3 and 6.5.5.6.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX.

**Table 6.5.5.6.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1 to T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | dB | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | dB | 5 | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1 | dB | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | dB | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | dB | -10 | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/ SCS kHz | -110 | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2 | | -110 | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -107 | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | -98 | | | | |
| | Config 2 | | -98 | -98 | | | | |
| | Config 3 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.6.4-1. |
| Note 9: | The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances). |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.7 NR SA FR1 PCell TRP Specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX

Editor's Note: This test case is incomplete in following aspects:

- TS 38.522 applicability spec update is pending

### 6.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure in the sets $q_{0,0}$ and $q_{0,1}$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_{1,0}$ and $q_{1,1}$. The purpose is to test the downlink monitoring for beam failure detection on TRP1 within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based TRP specific beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.18 with *schedulingRequestID-BFR-r17* configured.

### 6.5.5.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, TRP Specific CSI-RS-based link recovery and PCell beam failure recovery.

### 6.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.7.

### 6.5.5.7.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.7.1-1 shows the variation of the downlink SNR of the CSI-RS in set $q_{0,0}$ and $q_{0,1}$ for TRP1 and TRP2 respectively to emulate CSI-RS based beam failure on TRP1. Figure A.6.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_{1,0}$ and $q_{1,1}$ of the candidate beam used for link recovery.

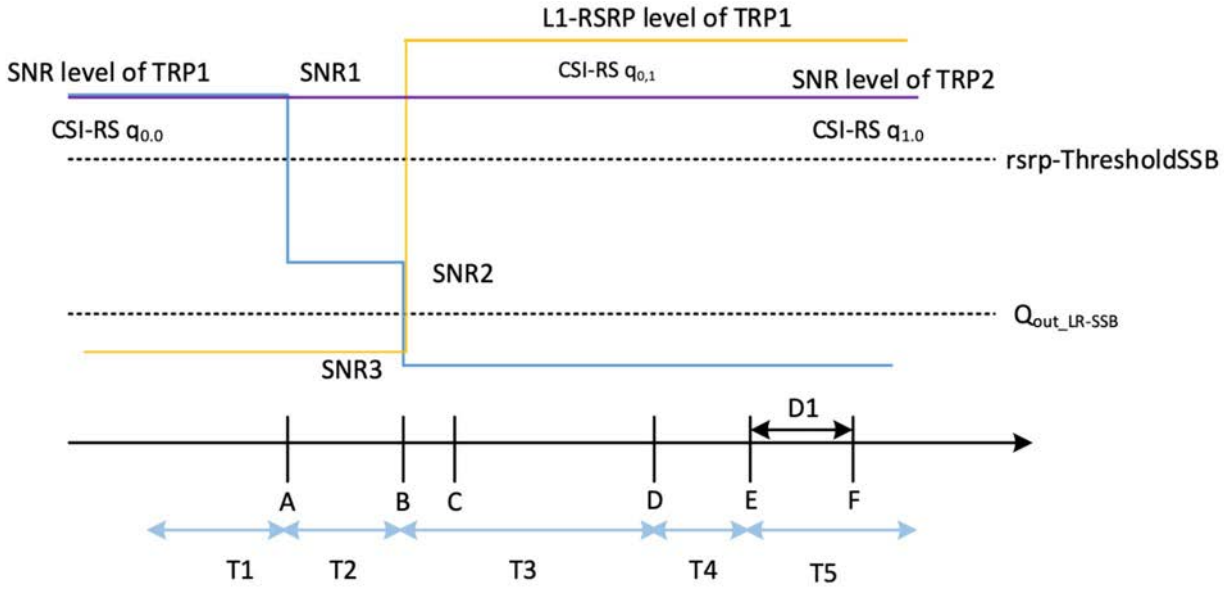



**Figure 6.5.5.7.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

#### 6.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.7.4.1-1.

**Table 6.5.5.7.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.7.4.1-2.

**Table 6.5.5.7.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.5.5.7.4.1-3.

2. Message contents are defined in clause 6.5.5.7.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.5.7.4.1-3: General test parameters for FR1 PCell for CSI-RS-based TRP specific beam failure detection and link recovery testing in DRX mode**

| Parameter | | | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | Test1 | |
| Active PCell | | | | Cell 1 | |
| RF Channel Number | | | | 1 | |
| Duplex mode | | Config 1 | | FDD | |
| | | Config 2, 3 | | TDD | |
| TDD Configuration | | Config 1 | | Not Applicable | |
| | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | |
| SSB Configuration | | Config 1 | | SSB.3 FR1 | |
| | | Config 2 | | SSB.3 FR1 | |
| | | Config 3 | | SSB.4 FR1 | |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 | |
| | | Config 3 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 15 kHz | |
| | | Config 3 | | 30 kHz | |
| PRACH Configuration | | Config 1, 2,3 | | FR1 PRACH configuration 4 | |
| OCNG parameters | | | | OP.1 | |
| CP length | | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | | 1-0 | |
| | Number of Control OFDM symbols | | | 2 | |
| | Aggregation level | | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 | |
| | DMRS precoder granularity | | | REG bundle size | |
| | REG bundle size | | | 6 | |
| DRX | | | | DRX.7 | |
| Gap pattern ID | | | | N.A. | |
| schedulingRequestID-BFR- r17 | | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on PCell | | Config 1 | slot | 5 | 5ms |
| | | Config 2, 3 | | 10 | |
| rlmInSyncOutOfSyncThreshold | | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | | Config 1, 2 | | -98 | |

| | | | | |
|---|---|---|---|---|
| | Config 3 | dBm/SCS kHz | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for TRP0 | Config 1 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for TRP1 | Config 1 | | CSI-RS.1.7 FDD | |
| | Config 2 | | CSI-RS.1.6 TDD | |
| | Config 3 | | CSI-RS.2.7 TDD | |
| CSI-RS Index assigned as BFD RS (q0,0) | | | 0 | |
| CSI-RS Index assigned as CBD RS (q1,0) | | | 1 | |
| CSI-RS Index assigned as BFD RS (q0,1) | | | 2 | |
| CSI-RS Index assigned as CBD RS (q1,1) | | | 3 | |
| CSI-RS index assigned as RLM RS | | | 0,1,2,3 | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 8.37 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.93 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 6.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 6.5.5.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 6.5.5.7.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 6.5.5.7.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 6.5.5.7.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_{10}$ and $q_{11}$ before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_{10}$ and $q_{11}$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If iteration or the random access procedure for BFD fails, switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.5.7.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.1-11 with Condition CSI-RS<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1, |

**Table 6.5.5.4.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.5.4.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 6.5.5.4.4.3-4: Void**

**Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 6.5.5.4.4.3-6: *PDCCH-Config***

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 6.5.5.4.4.3-7: ControlResourceSet for BFR**

| Derivation Path: TS 38.508-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 6.5.5.4.4.3-8:*MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

6.5.5.7.5 Test requirement

Tables 6.5.5.7.4.1-3 and 6.5.5.7.5-1 define the primary level settings including test tolerances for NR SA FR1 TRP specific CSI-RS-based beam failure detection and link recovery in DRX.

**Table 6.5.5.7.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_{0,0}$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_{0,1}$ | Config 1 | dB | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 2 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| | Config 3 | | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| SNR_CSI-RS of set $q_{1,0}$ | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_{1,0}$ | Config 1 | dB/SCS kHz | -110.2 | -110.2 | -87.8 | -87.8 | -87.8 |
| | Config 2 | | -110.2 | -110.2 | -87.8 | -87.8 | -87.8 |
| | Config 3 | | -107.2 | -107.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| | Config 3 | | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause TS 38.133 [6] A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$.

No later than time point F occurring no later than D1 = 1920+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.6 Active BWP switch delay

### 6.5.6.1 DCI-based and time-based active BWP switch

#### 6.5.6.1.0 Minimum conformance requirements

##### 6.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 6.5.6.1.0.1-1.

**Table 6.5.6.1.0.1-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within

- $T_{BWPswitchDelay}$, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or

- $T_{BWPswitchDelay}$ + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

**Table 6.5.6.1.0.1-2: Interruption length X**

| $\mu$ | NR Slot length (ms) | interruption length X (slots) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| Note1: | void | |

**Table 6.5.6.1.0.1-3: Parameters which cause interruption other than SCS**

| Parameters | Comment |
|---|---|
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* | |
| *maxMIMO-Layers-r16* | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2 and 8.2.1.2.7

### 6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

#### 6.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement on other active serving cell defined in TS 38.133 [6] clause 8.2.2.2.5.

#### 6.5.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

#### 6.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.1.

#### 6.5.6.1.1.4 Test description

##### 6.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for PCell are shown in Table 6.5.6.1.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.6.1.1.4.1-1A below. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.6.1.1.4.1-1: Supported test configurations for NR PCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX**

| Config | Description |
|---|---|
| 6.5.6.1.1-1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 6.5.6.1.1-2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6.5.6.1.1-3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.5.6.1.1.4.1-1A: Supported test configurations for NR SCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.1.4.1-2.

**Table 6.5.6.1.1.4.1-2: Initial conditions for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.5.6.1.1.4.1-3.

2. Message contents are defined in clause 6.5.6.1.1.4.3.

3. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

   - UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in SCell.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in PCell.

   - UE is configured with a bwp-InactivityTimer timer value for SCell.

**Table 6.5.6.1.1.4.1-3: General test parameters for DL BWP switch in SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active SCell | | Cell 2 | SCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and SCell |
| *bwp-InactivityTimer* | ms | 200 | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | For both PCell and SCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on SCC. |
| Cell 2 timing offset to Cell 1 | µs | 3 | Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 6.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 2. This message also configures 2 different UE-specific bandwidth parts for Cell 2, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for SCell.

4. The SS shall send a DCI format 1_1 command for SCell DL BWP switch.

5. The UE shall receive the DCI format 1_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}+k_1$)

   and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}$+ Interruption length + $k_1$)

   and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

6. If the UE sends valid ACK/NACK for the SCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.

7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1:

   a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}+k_1$)

   and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}$+ Interruption length + $k_1$)

   and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.2.2.5-1-1.

If all subtests pass, the test passes. If one subtest fails, the test fails.

6.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.6.1.1.4.3-1: Common Exception messages for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 6.5.6.1.1.4.3-1A: *RRCReconfiguration* (Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.6.1.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.1.4.3-1B: *CellGroupConfig* (Table 6.5.6.1.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig | Table 6.5.6.1.1.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.1.4.3-2: *ServingCellConfig* (Table 6.5.6.1.1.4.3-1B)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 6.5.6.1.1.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 6.5.6.1.1.4.3-3 | |

| | | | |
|---|---|---|---|
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |

**Table 6.5.6.1.1.4.3-3: *BWP-Downlink* (Table 6.5.6.1.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 6.5.6.1.1.4.3-9 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.1.4.3-4: *Void***

**Table 6.5.6.1.1.4.3-5: *Void***

**Table 6.5.6.1.1.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 6.5.6.1.1.4.3-9)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 6.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |

| | | | |
|---|---|---|---|
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 6.5.6.1.1.4.3-7: Void**

**Table 6.5.6.1.1.4.3-8: *Void***

**Table 6.5.6.1.1.4.3-9: *PDSCH-ConfigCommon* (Table 6.5.6.1.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 6.5.6.1.1.4.3-6 | |
| } | | | |

6.5.6.1.1.5 Test requirements

Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1 and 6.5.6.1.1.5-2 define the primary level settings including test tolerances.

**Table 6.5.6.1.1.5-1: NR Cell specific test parameters for NR PCell for DL BWP switch in SA**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.1.2 |
| $BW_{channel}$ | | RB | Note 7 |
| $BW_{occupied}$ | Config 1,2 | | 52 Note 5 |
| | Config 3 | | 106 Note 6 |
| Active BWP ID | | | 0 |
| Initial DL BWP Configuration | | | DLBWP.0.2Note4 |
| Initial UL BWP Configuration | | | ULBWP.0.2Note4 |
| Active DL BWP-0 Configuration | | | DLBWP.0.2Note4 |
| Active DL BWP-1 Configuration | | | N.A. |
| Active DL BWP-2 Configuration | | | N.A. |
| Active UL BWP-0 Configuration | | | ULBWP.0.2Note4 |
| Active UL BWP-1 Configuration | | | N.A. |
| Active UL BWP-2 Configuration | | | N.A. |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET | Config 1 | | CCR.1.2 FDD |

| | | | |
|---|---|---|---|
| parameters | Config 2 | | CCR.1.2 TDD |
| | Config 3 | | CCR.2.4 TDD |
| TRS Configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2 | | OP.1 Note 5 |
| | Config 3 | | OP.1 Note 6 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$.

**Table 6.5.6.1.1.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in SA**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell}$ 1 | | FDD |
| | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell}$ 1 | | Not Applicable |
| | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell}$ 3 | | TDDConf.1.2 |

| | | | |
|---|---|---|---|
| $BW_{channel}$ | | RB | Note 7 |
| $BW_{occupied}$ | $Config_{SCell}$ 1,2 | | 52 Note 5 |
| | $Config_{SCell}$ 3 | | 106 Note 6 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | | | DLBWP.0.2Note4 |
| Initial UL BWP Configuration | | | N.A. |
| Active DL BWP-0 Configuration | | | N.A. |
| Active DL BWP-1 Configuration | | | DLBWP.1.1Note4 |
| Active DL BWP-2 Configuration | | | DLBWP.1.3Note4 |
| Active UL BWP-0 Configuration | | | N.A. |
| Active UL BWP-1 Configuration | | | N.A. |
| Active UL BWP-2 Configuration | | | N.A. |
| PDSCH Reference measurement channel | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell}$ 1 | | CCR.1.2 FDD |
| | $Config_{SCell}$ 2 | | CCR.1.2 TDD |
| | $Config_{SCell}$ 3 | | CCR.2.4 TDD |
| TRS Configuration | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| OCNG Patterns | $Config_{SCell}$ 1,2 | | OP.1 Note 5 |
| | $Config_{SCell}$ 3 | | OP.1 Note 6 |
| SSB Configuration | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$Note 2 | $Config_{SCell}$ 1,2 | dBm/SCS | -104 |
| | $Config_{SCell}$ 3 | | -101 |
| $N_{oc}$Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | $Config_{SCell}$ 1,2 | dBm/SCS | -87 |
| | $Config_{SCell}$ 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io$Note3 | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$. |
| Note 3 | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |
| Note 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 6: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| Note 7: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS 38.101-1 [2] with configured $BW_{channel}$. |

During T1, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$).

During T3, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$).

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ($i$+ $T_{BWPswitchDelay}$+$k_1$), ($j$+ $T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX

#### 6.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6.

#### 6.5.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 6.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.2.

6.5.6.1.2.4 Test description

6.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.1.2.4.1-1.

**Table 6.5.6.1.2.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch in non-DRX**

| Config | Description |
|---|---|
| 6.5.6.1.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.5.6.1.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.5.6.1.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: A UE which fulfils the requirements in test case A.6.5.6.1.1 can skip the test cases in A.6.5.6.1.2 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.2.4.1-2.

**Table 6.5.6.1.2.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.5.6.1.2.4.1-3.

2. Message contents are defined in clause 6.5.6.1.2.4.3.

3. The test scenario comprises of one NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 on radio channel 1.

   - UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1.

- UE is configured with a bwp-InactivityTimer timer value for PCell.

**Table 6.5.6.1.2.4.1-3: General test parameters for DL BWP switch in SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell 1 on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

#### 6.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

The Cell 1 has constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.2.4.3-2. UE is configured with a bwp-InactivityTimer timer value for PCell.

4. The SS shall send a DCI format 1_1 command for Cell 1 DL BWP switch.

5. The UE shall receive the DCI format 1_1 command in slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   If the UE starts to report valid ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$). The number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

6. If the UE sends valid ACK/NACK for the Cell 1 on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on Cell 1.

7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1:

   If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$). The number of successful subtests is increased by one and go to step 8 after T3 expires. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

   8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 6.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.6.1.2.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 6.5.6.1.2.4.3-1A: *Void***

**Table 6.5.6.1.2.4.3-1B: *Void***

**Table 6.5.6.1.2.4.3-1C: *RRCReconfiguration* (Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.6.1.2.4.3-1D | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-1D: *CellGroupConfig* (Table 6.5.6.1.2.4.3-1C)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.5.6.1.2.4.3-2 | |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-2: *ServingCellConfig* (Table 6.5.6.1.2.4.3-1D)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 6.5.6.1.2.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 6.5.6.1.2.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |

| | | | |
|---|---|---|---|
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 6.5.6.1.2.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 6.5.6.1.2.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-3: *BWP-Downlink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 6.5.6.1.2.4.3-8 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-4: *BWP-Uplink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-5: *Void***

**Table 6.5.6.1.2.4.3-6: *PDSCH-TimeDomainResourceAllocationList* (Table 6.5.6.1.1.4.3-8)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 6.5.6.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 6.5.6.1.2.4.3-7: *Void***

**Table 6.5.6.1.2.4.3-8: *PDSCH-ConfigCommon* (Table 6.5.6.1.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 6.5.6.1.2.4.3-6 | |
| } | | | |

### 6.5.6.1.2.5 Test requirements

Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1 define the primary level settings including test tolerances.

**Table 6.5.6.1.2.5-1: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |

| | | | |
|---|---|---|---|
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1,2,3 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | Config 1,2,3 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | Config 1,2,3 | | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | Config 1,2,3 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | Config 1,2,3 | | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | Config 1 | | N/A |
| | Config 2,3 | | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.2 FDD |
| | Config 2 | | CCR.1.2 TDD |
| | Config 3 | | CCR.2.4 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1,4 | | TRS.1.1 FDD |
| | Config 2,5 | | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs right after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$).

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in TS 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot ($i$+ $T_{BWPswitchDelay}$+$k_1$), ($j$+ $T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 6.5.6.2 RRC-based active BWP switch

### 6.5.6.2.0 Minimum conformance requirements

#### 6.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

### 6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX

#### 6.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.

#### 6.5.6.2.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs.

#### 6.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.2.1.

#### 6.5.6.2.1.4 Test description

##### 6.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.2.1.4.1-1.

**Table 6.5.6.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch in non-DRX**

| Config | Description |
|---|---|
| 6.5.6.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.5.6.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.5.6.2.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.2.1.4.1-2.

**Table 6.5.6.2.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.5.6.2.1.4.1-3.
2. Message contents are defined in clause 6.5.6.2.1.4.3.
3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.
4. By step 4 of the test procedure:
   - UE is connected to Cell 1 on radio channel 1.
   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 of initial condition in Cell

**Table 6.5.6.2.1.4.1-3: General test parameters for DL BWP switch in SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |

#### 6.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Cell 1 has constant signal level throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 6.5.6.2.1.5-1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 6.5.6.2.1.5-1. T1 starts.
6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.
7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + X + k1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where:

   - X = 16 for test configuration 6.5.6.2.1-1 and 6.5.6.2.1-2

   - X = 32 for test configuration 6.5.6.2.1-3.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.
9. After the RRC connection release, the SS:

   -transmits in NR Cell 1 a Paging message for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PCell by counting the slots from the time when the RRC Reconfiguration message including updated BWP configuration is sent till a valid ACK/NACK is received.

#### 6.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.6.2.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 6.5.6.2.1.4.3-1A: *Void***

**Table 6.5.6.2.1.4.3-1B: *Void***

**Table 6.5.6.2.1.4.3-1C: *RRCReconfiguration* (1, Step 3, Step 5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.6.2.1.4.3-1D | |
| dedicatedNAS-MessageList | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.2.1.4.3-1D: *CellGroupConfig* (Table 6.5.6.2.1.4.3-1C)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.5.6.2.1.4.3-1E | |
| } | | | |
| } | | | |

**Table 6.5.6.2.1.4.3-1E: *ServingCellConfig* (Table 6.5.6.2.1.4.3-1D)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 6.5.6.2.1.4.3-1F | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |

| | | | |
|---|---|---|---|
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 6.5.6.2.1.4.3-1G | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 6.5.6.2.1.4.3-1F: *BWP-Downlink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 6.5.6.2.1.4.3-1G: *BWP-Uplink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 6.5.6.2.1.4.3-2: *Void***

### 6.5.6.2.1.5 Test requirements

Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1 define the primary level settings including test tolerances.

**Table 6.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |

| | | | | |
|---|---|---|---|---|
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1,2,3 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1,2,3 | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1,2,3 | | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | Config 1,2,3 | | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | Config 1,2,3 | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | Config 1,2,3 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.3 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2 | | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1,2 | dBm/SCS | -104 |
| | | Config 3 | | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -87 |
| | | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |
| Io Note3 | | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | | Config 3 | dBm/ 38.16MHz | -52.86 |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

During T1, the UE shall be ready for the reception of uplink grant for Cell from the first DL slot that occurs right after the beginning of slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1$.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

### 6.5.6.3.0 Minimum conformance requirements

#### 6.5.6.3.0.1 Minimum conformance requirements for Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

The minimum requirements given in clause 4.5.6.3.0.1 applies.

### 6.5.6.3.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA

Editor's note: This test case is incomplete in following aspects:

- Test parameters are still in brackets.

#### 6.5.6.3.1.1 Test purpose

To verify the requirement of DL BWP switch delay on multiple CCs in TS 38.133 [6] clause 8.6.2A.1, and interruption requirement for NR victim cell, defined in 38.133 [6] clause 8.2.

#### 6.5.6.3.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, supporting incremental delay for DCI and timer based active BWP switching on multiple CCs simultaneously and 3DL CA.

#### 6.5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.3.1.

#### 6.5.6.3.1.4 Test description

##### 6.5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for NR PCell is shown in Table 6.5.6.3.1.4.1-1. Supported test configurations for NR SCells are shown in Table 6.5.6.3.1.4.1-2. Test configuration for NR PCell and test configuration for NR SCells are chosen independently.

**Table 6.5.6.3.1.4.1-1: Supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.<br>NOTE 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration. | |

**Table 6.5.6.3.1.4.1-2: Supported test configurations for NR SCells**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration<br>Note 3: Test configurations of two NR SCells are selected independently. | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.3.1.4.1-3.

**Table 6.5.6.3.1.4.1-3: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.5.6.3.1.4.1-4.

2. Message contents are defined in clause 6.5.6.3.1.4.3.

3. The test scenario comprises of one NR PCell (Cell 1) and two NR SCells (Cell 2 and Cell 3). The power levels and settings for Cell 1, Cell 2 and Cell 3 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (NR PCell) on radio channel 1 (PCC), Cell 2 (SCell) on radio channel 2 (SCC #1) and Cell 3 (SCell) on radio channel 3 (SCC #2).

   - UE is configured with 2 different UE-specific downlink bandwidth parts for Cell 1, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is configured with 2 different UE-specific downlink bandwidth parts for Cell 2, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for SCell (Cell 3). BWP-0 includes the bandwidth of the initial DL BWP and SSB.

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell and SCell (Cell 2).

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in SCell (Cell 3).

- UE is configured with a bwp-InactivityTimer timer value for PCell and SCell (Cell 2).

**Table 6.5.6.3.1.4.1-4: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2,3 | Two NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active SCell | | Cell 2 | SCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 | For both PSCell and SCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for Cell 1 on SCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for Cell 2 on SCC. |
| Cell 2 and Cell 3 timing offset to Cell 1 | µs | 3 | Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. |
| T1 | s | [0.2] | |
| T2 | s | [0.2] | |
| T3 | s | [0.2] | |

### 6.5.6.3.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR* , Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 2 and Cell 3 are added as the SCells and activated.

2. Set the parameters according to Tables 6.5.6.3.1.4.1-4, Table 6.5.6.3.1.5-1 and Table 6.5.6.3.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of NR Cell 1 and NR Cell 2. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB for NR Cell 1 and NR Cell 2. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.3.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PCell (Cell 1) and SCell (Cell 2).

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on NR PCell (Cell 1), SCell (Cell 2) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send a DCI format 1_1 command on PCell (Cell 1) to trigger PCell DL BWP switch and a DCI format 1_1 command on SCell (Cell 2) to trigger SCell DL BWP switch. Two DCI format 1_1 commands should be sent in the same slot.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the DCI format 1_1 commands in PCell and SCell (Cell 2), then the UE shall switch its bandwidth part from BWP-1 to BWP-2.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$); and

   b) the UE starts to report valid ACK/NACK for SCell (Cell 2) from the first UL slot that occurs after the beginning of the DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$); and

c) the number of consecutive missing ACK/NACK for SCell (Cell 3) is no more than 1; and

d) no missing ACK/NACK for SCell (Cell 3) is observed from the first UL subframe that occurs after the beginning of the DL slot ($i$+$T_{MultipleBWPswitchDelay}$+$k_1$).

then count a success for the event "DCI based BWP switch" and go to step 8, otherwise count a fail for the event "DCI based BWP switch", switch off/on the UE and go to step 1.

8. T2 starts when the SS receives valid ACK/NACK for the PCell and SCell (Cell 2) on BWP-2. The SS stops sending PDCCHs scheduling new transmissions on PCell and SCell (Cell 2).

9. T3 starts from the first slot (denoted as slot #j) of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send PDCCHs scheduling new transmissions on PCell and SCell (Cell 2). Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PCell and SCell (Cell 2).

   If the SS observes that,

   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+ $T_{MultipleBWPswitchDelay}$ +$k_1$); and

   b) If the UE starts to report valid ACK/NACK for SCell (Cell 2) from the first UL slot that occurs after the beginning of the DL slot ($j$+ $T_{MultipleBWPswitchDelay}$ +$k_1$); and

   c) If the number of consecutive missing ACK/NACK for SCell (Cell 3) is no more than 1; and

   d) no missing ACK/NACK for SCell (Cell 3) is observed from the first UL subframe that occurs after the beginning of the DL slot ($j$+$T_{MultipleBWPswitchDelay}$+$k_1$).

   then count a success for the event "Timer based BWP switch" and go to step 10. Otherwise, count a fail for the event "Timer based BWP switch", switch off/on the UE and go to step 1.

10. Repeat steps 5-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved. Each of the events "DCI based BWP switch" and "Timer based BWP switch" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 6.5.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.6.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 6.5.6.3.1.4.3-2: *RRCReconfiguration* (Test procedure, step3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.6.3.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.3.1.4.3-3: *CellGroupConfig* (Table 6.5.6.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.5.6.3.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell (Cell 2) | | |
| sCellConfigDedicated | ServingCellConfig | Table 6.5.6.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.3.1.4.3-4: *ServingCellConfig* (Table 6.5.6.3.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 6.5.6.3.1.4.3-5 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 6.5.6.3.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 6.5.6.3.1.4.3-6 | |

| | | | |
|---|---|---|---|
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 6.5.6.3.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.3.1.4.3-5: *BWP-Downlink* (Table 6.5.6.3.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 6.5.6.3.1.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.3.1.4.3-6: BWP-Uplink (Table 6.5.6.3.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 6.5.6.3.1.4.3-7: PDSCH-ConfigCommon (Table 6.5.6.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 6.5.6.3.1.4.3-8 | |
| } | | | |

**Table 6.5.6.3.1.4.3-8: PDSCH-TimeDomainResourceAllocationList (Table 6.5.6.3.1.4.3-7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 6.5.6.3.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

### 6.5.6.3.1.5 Test requirements

Tables 6.5.6.3.1.4.1-4, 6.5.6.3.1.5-1, 6.5.6.3.1.5-2 and 6.5.6.3.1.5-3 define the primary level settings including test tolerances.

**Table 6.5.6.3.1.5-1: NR Cell specific test parameters for PCell (NR Cell 1)**

| **Parameter** | | **Unit** | **Cell 1** |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | | | DLBWP.0.2 Note4 |
| Initial UL BWP Configuration | | | ULBWP.0.2 Note4 |
| Active DL BWP-0 Configuration | | | N.A. |
| Active DL BWP-1 Configuration | | | DLBWP.1.1 Note4 |
| Active DL BWP-2 Configuration | | | DLBWP.1.3 Note4 |
| Active UL BWP-0 Configuration | | | N.A. |
| Active UL BWP-1 Configuration | | | ULBWP.1.1 Note4 |
| Active UL BWP-2 Configuration | | | ULBWP.1.3 Note4 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |

| | | | |
|---|---|---|---|
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 6.5.6.3.1.5-2: NR Cell specific test parameters for SCell (NR Cell 2)**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell2}$ 1 | | FDD |
| | $Config_{SCell2}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell2}$ 1 | | Not Applicable |
| | $Config_{SCell2}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell2}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | $Config_{SCell2}$ 1,2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | $Config_{SCell2}$ 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | | | DLBWP.0.2 Note4 |
| Initial UL BWP Configuration | | | ULBWP.0.2 Note4 |
| Active DL BWP-0 Configuration | | | N.A. |
| Active DL BWP-1 Configuration | | | DLBWP.1.1 Note4 |
| Active DL BWP-2 Configuration | | | DLBWP.1.3 Note4 |

| | | | |
|---|---|---|---|
| Active UL BWP-0 Configuration | | | N.A. |
| Active UL BWP-1 Configuration | | | ULBWP.1.1[Note4] |
| Active UL BWP-2 Configuration | | | ULBWP.1.3[Note4] |
| PDSCH Reference measurement channel | $Config_{SCell2}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell2}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell2}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell2}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell2}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell2}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell2}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell2}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell2}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | $Config_{SCell2}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell2}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$[Note 2] | $Config_{SCell2}$ 1,2 | dBm/SCS | -104 |
| | $Config_{SCell2}$ 3 | | -101 |
| $N_{oc}$[Note 2] | | dBm/15kHz | -104 |
| SS-RSRP [Note 3] | $Config_{SCell2}$ 1,2 | dBm/SCS | -87 |
| | $Config_{SCell2}$ 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io[Note3] | $Config_{SCell2}$ 1,2 | dBm/ 9.36MHz | -58.96 |
| | $Config_{SCell2}$ 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 6.5.6.3.1.5-3: NR Cell specific test parameters for SCell (NR Cell 3)**

| Parameter | | Unit | Cell 3 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | $Config_{SCell3}$ 1 | | FDD |
| | $Config_{SCell3}$ 2,3 | | TDD |
| TDD configuration | $Config_{SCell3}$ 1 | | Not Applicable |
| | $Config_{SCell3}$ 2 | | TDDConf.1.1 |
| | $Config_{SCell3}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | $Config_{SCell3}$ 1,2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | $Config_{SCell3}$ 3 | | 40 MHz: $N_{RB,c}$ = 106 |

| | | | |
|---|---|---|---|
| Active BWP ID | | | 0 |
| Initial DL BWP Configuration | | | DLBWP.0.2[Note4] |
| Initial UL BWP Configuration | | | ULBWP.0.2[Note4] |
| Active DL BWP-0 Configuration | | | DLBWP.0.2[Note4] |
| Active DL BWP-1 Configuration | | | N.A. |
| Active DL BWP-2 Configuration | | | N.A. |
| Active UL BWP-0 Configuration | | | ULBWP.0.2[Note4] |
| Active UL BWP-1 Configuration | | | N.A. |
| Active UL BWP-2 Configuration | | | N.A. |
| PDSCH Reference measurement channel | $Config_{SCell3}$ 1 | | SR.1.1 FDD |
| | $Config_{SCell3}$ 2 | | SR.1.1 TDD |
| | $Config_{SCell3}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | $Config_{SCell3}$ 1 | | CR.1.1 FDD |
| | $Config_{SCell3}$ 2 | | CR.1.1 TDD |
| | $Config_{SCell3}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | $Config_{SCell3}$ 1 | | CCR.1.1 FDD |
| | $Config_{SCell3}$ 2 | | CCR.1.1 TDD |
| | $Config_{SCell3}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | $Config_{SCell3}$ 1,2 | | SSB.1 FR1 |
| | $Config_{SCell3}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$[Note 2] | $Config_{SCell3}$ 1,2 | dBm/SCS | -104 |
| | $Config_{SCell3}$ 3 | | -101 |
| $N_{oc}$[Note 2] | | dBm/15kHz | -104 |
| SS-RSRP[Note 3] | $Config_{SCell3}$ 1,2 | dBm/SCS | -87 |
| | $Config_{SCell3}$ 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io[Note3] | $Config_{SCell3}$ 1,2 | dBm/ 9.36MHz | -58.96 |
| | $Config_{SCell3}$ 3 | dBm/ 38.16MHz | -52.86 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot ($i+T_{MultipleBWPswitchDelay}+k_1$).

During T3, the UE shall start to send the ACK/NACK for PCell and SCell (Cell 2) from the first UL slot that occurs after the beginning of DL slot ($j+T_{MultipleBWPswitchDelay}+k_1$).

Where,

$k_1$ is the timing between PDSCHs on PCell and SCell (Cell 2) and their corresponding acknowledgement as specified in TS 38.214 [9].

$T_{MultipleBWPswitchDelay} = T_{BWPswitchDelay} + D$, is the simultaneous BWP switching delay on multiple CCs specified in TS 38.133 [6] clause 8.6.2A.1.

$T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in 38.133 [6] Table 8.6.2-1 and depends on UE capability *bwp-SwitchingDelay* [13].

D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [13].

All of the above test requirements shall be fulfilled in order for the observed PCell and SCell (Cell 2) active BWP switch delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of SCell (Cell 3) interruption during PCell and SCell active BWP switch shall not happen outside the BWP switch delay and the interruption of SCell (Cell 3) shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.2.2.2.5.

During T3, the start time of SCell (Cell 3) interruption of during PCell and SCell active BWP switch shall not happen outside the BWP switch delay and the interruption of SCell (Cell 3) shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell (Cell 3) active BWP switch interruption to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot ($i$+ $T_{BWPswitchDelay}$+$k_1$), ($j$+ $T_{BWPswitchDelay}$+$k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 6.5.6.4

## 6.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

### 6.5.6.5.0 Minimum conformance requirements

#### 6.5.6.5.0.1 Minimum conformance requirements for Simultaneous RRC-based Active BWP Switch on multiple CCs

The minimum requirements given in clause 6.5.6.5.0.1 applies.

### 6.5.6.5.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA

Editor's note: This test case is incomplete in following aspects:

- Test parameters are still in brackets.

#### 6.5.6.5.1.1 Test purpose

To verify the DL BWP switch delay requirement on multiple CCs for RRC-based BWP switch defined in 38.133 [6] clause 8.6.3A.1.

#### 6.5.6.5.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, supporting incremental delay for DCI and timer based active BWP switching on multiple CCs simultaneously and 2DL CA.

#### 6.5.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.5.1.

#### 6.5.6.5.1.4 Test description

#### 6.5.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for PCell are shown in Table 6.5.6.5.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.6.5.1.4.1-2. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.5.6.5.1.4.1-1: Supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration | |

**Table 6.5.6.5.1.4.1-2: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.5.1.4.1-3.

**Table 6.5.6.5.1.4.1-3: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.5.6.5.1.4.1-4.
2. Message contents are defined in clause 6.5.6.5.1.4.3.
3. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The power levels and settings for Cell 2 and Cell 3 are configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (NR PCell) on radio channel 1 (PCC) and Cell 2 (SCell) on radio channel 2 (SCC).
   - UE has dedicated bandwidth part BWP-1 in its RRC configuration for PCell (Cell 1) and SCell (Cell 2)
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell (Cell 1) and SCell (Cell 2).

**Table 6.5.6.5.1.4.1-4: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two NR radio channels are used for this test |

| | | | |
|---|---|---|---|
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active SCell | | Cell 2 | SCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and SCell (Cell 2) |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cell on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cell on SCC. |
| Cell 2 timing offset to Cell 1 | µs | 3 | Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. |
| T1 | s | [0.2] | |

#### 6.5.6.5.1.4.2 Test procedure

The test consists of 1 time periods with durations of T1. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 2 is added as the SCell and activated.

2. Set the parameters according to Tables 6.5.6.5.1.4.1-4, Table 6.5.6.5.1.5-1 and Table 6.5.6.5.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* on NR Cell 1 and NR Cell 2. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 6.5.6.5.1.5-1 and Table 6.5.6.5.1.5-2 for NR Cell 1 and NR Cell 2, respectively.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for PCell and SCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 4.5.6.2.1.5-1 and Table 6.5.6.5.1.5-2.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the RRC message reconfiguring PCell and SCell BWP, then it reconfigures its bandwidth part with the updated bandwidth part configuration.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$; and

   b) the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$,

   then count a success for the test, otherwise count a fail for the test.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.

9. After the RRC connection release, the SS:

   - transmits in NR Cell 1 a Paging message for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5), NR Cell 2 is added as the SCell and activated,

   or

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. NR Cell 2 is added as the SCell and activated.

10. Repeat steps 3-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.6.5.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 6.5.6.5.1.4.3-2: *RRCReconfiguration* (Test procedure, step3 and step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 6.5.6.5.1.4.3-3 | |
| dedicatedNAS-MessageList | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.5.1.4.3-3: *CellGroupConfig* (Table 6.5.6.5.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig | Table 6.5.6.5.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell | | |
| sCellConfigDedicated | ServingCellConfig | Table 6.5.6.5.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.5.1.4.3-4: *ServingCellConfig* (Table 6.5.6.5.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 6.5.6.5.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 6.5.6.5.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.6.5.1.4.3-5: *BWP-Downlink* (Table 6.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

**Table 6.5.6.5.1.4.3-6: BWP-Uplink (Table 6.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |

| | | | |
|---|---|---|---|
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

6.5.6.5.1.5 Test requirements

Tables 6.5.6.5.1.4.1-4, 6.5.6.5.1.5-1 and 6.5.6.5.1.5-2 define the primary level settings including test tolerances.

**Table 6.5.6.5.1.5-1: NR Cell specific test parameters for PSCell (NR Cell 1)**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2,3 | | TDD |
| TDD configuration | | Config 1 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1,2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | | | DLBWP.0.2 Note4 |
| Initial UL BWP Configuration | | | | ULBWP.0.2 Note4 |
| Initial Condition | Active DL BWP-1 Configuration | | | DLBWP.1.3 Note4 |
| | Active UL BWP-1 Configuration | | | ULBWP.1.3 Note4 |
| Final Condition | Active DL BWP-1 Configuration | | | DLBWP.1.1 Note4 |
| | Active UL BWP-1 Configuration | | | ULBWP.1.1 Note4 |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2 | | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Correlation Matrix and Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1,2 | dBm/SCS | -104 |
| | | Config 3 | | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -87 |
| | | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |

| | | | |
|---|---|---|---|
| Io[Note3] | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

**Table 6.5.6.5.1.5-2: NR Cell specific test parameters for SCell (NR Cell 2)**

| Parameter | | | Unit | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | $Config_{SCell}$ 1 | | FDD |
| | | $Config_{SCell}$ 2,3 | | TDD |
| TDD configuration | | $Config_{SCell}$ 1 | | Not Applicable |
| | | $Config_{SCell}$ 2 | | TDDConf.1.1 |
| | | $Config_{SCell}$ 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | $Config_{SCell}$ 1,2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | $Config_{SCell}$ 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | | | DLBWP.0.2[Note4] |
| Initial UL BWP Configuration | | | | ULBWP.0.2[Note4] |
| Initial Condition | Active DL BWP-1 Configuration | | | DLBWP.1.3 [Note4] |
| | Active UL BWP-1 Configuration | | | ULBWP.1.3 [Note4] |
| Final Condition | Active DL BWP-1 Configuration | | | DLBWP.1.1 [Note4] |
| | Active UL BWP-1 Configuration | | | ULBWP.1.1 [Note4] |
| PDSCH Reference measurement channel | | $Config_{SCell}$ 1 | | SR.1.1 FDD |
| | | $Config_{SCell}$ 2 | | SR.1.1 TDD |
| | | $Config_{SCell}$ 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | | $Config_{SCell}$ 1 | | CR.1.1 FDD |
| | | $Config_{SCell}$ 2 | | CR.1.1 TDD |
| | | $Config_{SCell}$ 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | $Config_{SCell}$ 1 | | CCR.1.1 FDD |
| | | $Config_{SCell}$ 2 | | CCR.1.1 TDD |
| | | $Config_{SCell}$ 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | $Config_{SCell}$ 1,2 | | SSB.1 FR1 |
| | | $Config_{SCell}$ 3 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | $Config_{SCell}$ 1 | | TRS.1.1 FDD |
| | | $Config_{SCell}$ 2 | | TRS.1.1 TDD |
| | | $Config_{SCell}$ 3 | | TRS.1.2 TDD |
| Correlation Matrix and Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$[Note 2] | | $Config_{SCell}$ 1,2 | dBm/SCS | -104 |

| | | | |
|---|---|---|---|
| | $Config_{SCell}$ 3 | | -101 |
| SS-RSRP Note 3 | $Config_{SCell}$ 1,2 | dBm/SCS | -87 |
| | $Config_{SCell}$ 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | $Config_{SCell}$ 1,2 | dBm/ 9.36MHz | -58.96 |
| | $Config_{SCell}$ 3 | dBm/ 38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall start to send the ACK/NACK for PCell and SCell from the first UL slot that occurs after the beginning of DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$.

Where,

$k_1$ is the timing between PDSCHs on PCell and SCell and their corresponding acknowledgement as specified in TS 38.214 [9].

$T_{RRCprocessingDelay} = 10$ ms, is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13],

$T_{BWPswitchDelayRRC} = 6$ ms, is the time used by the UE to perform BWP switch as defined in 38.133 [6] clause 8.6.3,

$D_{RRC} = 0$ if the UE is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [11]. $D_{RRC} = D$ for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [13]

D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [13].

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.7 DL interruptions at switching between two uplink carriers

### 6.5.7.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR uplink carrier 1 is capable of one transmit antenna connector and NR uplink carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR carrier 1 or carrier 2 as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 6.5.7.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

**Table 6.5.7.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod* | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10.

## 6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7.1.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

### 6.5.7.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with *uplinkTxSwitchingPeriod*.

### 6.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7.1

### 6.5.7.1.4 Test description

#### 6.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.1.4.1-1.

**Table 6.5.7.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7.1-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.1.4.1-2.

**Table 6.5.7.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7.1.4.1-3.

2. Message contents are defined in clause 6.5.7.1.4.3.

3. The test scenario comprises of two NR Cells (Cell 1 and Cell 2). Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7.1.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.1.5 FDD<br>Cell 2: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

### 6.5.7.1.4.2 Test procedure

The test consists of two active NR cells: Cell 1 (PCell) and Cell 2 (SCell). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1 and Cell 2 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on both PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure PCell (Cell 1) and SCell (Cell 2) according to Table 6.5.7.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message to configure PCell (Cell 1) and SCell (Cell 2) as per TS 38.508-1 [13] clause 7 with the message content exceptions defined in clause 6.5.7.1.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 6.5.7.1.5-1. T1 starts.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on PCell and SCell:

   For PCell (Cell 1), on the following symbol in the slot overlapping with the 1st special slot of every radio frame of the NR TDD carrier (Cell 2)

   - symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,
  - symbol #8 if UE capability uplinkTxSwitchingPeriod is 210us or
  - symbol #9 if UE capability uplinkTxSwitchingPeriod is 140us or
  - symbol #10 if UE capability uplinkTxSwitchingPeriod is 35us.
- For SCell(Cell 2) , on the following symbol in the 2nd special slot of every radio frame
- symbol#9 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #2 if UE capability uplinkTxSwitchingPeriod is 210us or
  - symbol #3 if UE capability uplinkTxSwitchingPeriod is 140us or
  - symbol #6 if UE capability uplinkTxSwitchingPeriod is 35us.

7. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report for Cell 1 and Cell 2 while meeting the test requirements in Table 6.5.7.1.5-3, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
8. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
9. Repeat step 3-8 until a test verdict has been achieved.

#### 6.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7.1.4.3-1: Common Exception messages for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 1T-2T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T-2T and PCELL<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD and SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7.1.4.3-2 - Table 6.5.7.1.4.3-9: Void**

**Table 6.5.7.1.4.3-10: Physical layer parameters for DCI format 0_1 (Test procedure, step 6, Cell 1 and Cell 2)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

6.5.7.1.5 Test requirements

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

**Table 6.5.7.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1 | | FDD | TDD |
| TDD configuration | Config 1 | | N/A | TDDConf.2.1 except that: S='11DL:1GP:2UL'; *nrofDownlinkSymbols:11 nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 | | SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl10,6 | SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.1 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/ SSB SCS | -87 | -87 |
| CSI-RS RSRP Note6 | | dBm/SCS | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -104 | -101 |
| Io Note3 on symbols without CSI-RS | Config 1 | dBm/9.36 MHz | -58.96 | - |
| | | dBm/ 38.16MHz | - | -55.78 |

| | | | | |
|---|---|---|---|---|
| $Io^{Note6}$ on symbols with CSI-RS | Config 1 | dBm/9.36 MHz | -56.58 | - |
| | | dBm/ 38.16MHz | - | -53.43 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 |
| Propagation Condition | | | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.1.5-2

**Table 6.5.7.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod* | | | | |

The UE shall send L1-RSRP report for Cell 1 and Cell 2 after the reception of corresponding DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-3.

**Table 6.5.7.1.5-3: L1-RSRP absolute accuracy requirements for the reported valuesof CSI-RS**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#0) | 65 |
| Highest reported value (CSI-RS#0) | 86 |

**Table 6.5.7.1.5-4: Void**

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7.2.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

#### 6.5.7.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with *uplinkTxSwitchingPeriod*.

#### 6.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7.2

#### 6.5.7.2.4 Test description

##### 6.5.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.2.4.1-1.

**Table 6.5.7.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7.2-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.2.4.1-2.

**Table 6.5.7.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7.2.4.1-3.
2. Message contents are defined in clause 6.5.7.2.4.3.
3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7.2.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

#### 6.5.7.2.4.2 Test procedure

Same as in 6.5.7.1.4.2 with the following exception in step 6.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the special slot on PCell and SCell:

   For PCell (Cell 1), on the following symbol in the 1st special slot of every even radio frame:

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
   - otherwise,
     - symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
     - symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
     - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.

   For SCell (Cell 2), on the following symbol on the 2nd special slot of every even radio frame:

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
   - otherwise,
     - symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
     - symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
     - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.

#### 6.5.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 1T-2T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T-2T and PCELL<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**Table 6.5.7.2.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6, Cell 1 and Cell 2)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

6.5.7.2.5 Test requirements

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

**Table 6.5.7.2.5-1:Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1 | | TDD | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that S='11DL:1GP:2UL'; *nrofDownlinkSymbols:11 nrofUplinkSymbols: 2* | TDDConf.2.2 |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 | | SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,5 | SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/ SSB SCS | -87 | -87 |
| CSI-RS RSRP Note6 | | dBm/SCS | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 | -101 |
| Io Note3 on symbols without CSI-RS | Config 1 | dBm/ 38.16MHz | -55.78 | -55.78 |
| Io Note6 on symbols with CSI-RS | Config 1 | dBm/ 38.16MHz | -53.43 | -53.43 |
| Time offset to Cell 1 Note 5 | | μs | - | 0 |
| Propagation Condition | | | AWGN | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Void |
| Note 5: | Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. |
| Note 6: | CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.2.5-2

**Table 6.5.7.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod* | | | | |

The UE shall send L1-RSRP report for Cell 1 and Cell 2 after the reception of corresponding DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-3.

**Table 6.5.7.2.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#0) | 65 |
| Highest reported value (CSI-RS#0) | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7A NR SA FR1 DL interruptions at switching between two uplink carriers with two transmit antenna connectors

### 6.5.7A.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *[uplinkTxSwitchingPeriod2T2T]* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR UL carrier 1 is capable of two transmit antenna connectors and NR UL carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR carrier 1 or carrier 2 as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 8.2.2.2.10A-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

**Table 6.5.7A.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*]. | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10A.

## 6.5.7A.1 NR SA FR1 DL interruptions at switching between two uplink carriers in FDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in 38.133

This test case is incomplete in following aspects:

- Test parameter are still in brackets in 38.1336.5.7A.1.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

### 6.5.7A.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards configured with *uplinkTxSwitchingPeriod2T2T*.

### 6.5.7A.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7A.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7A.1.

### 6.5.7A.1.4 Test description

#### 6.5.7A.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7A.1.4.1-1.

**Table 6.5.7A.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7A.1-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7A.1.4.1-2.

**Table 6.5.7A.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7A.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | |

1. The general test parameter settings are set up according to Table 6.5.7A.1.4.1-3.

2. Message contents are defined in clause 6.5.7A.1.4.3.

3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7A.1.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.1.5 FDD<br>Cell 2: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

### 6.5.7A.1.4.2 Test procedure

The test consists of two active NR cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1 and Cell 2 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on both PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure PCell (Cell 1) and SCell (Cell 2) according to Table 6.5.7A.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an RRCReconfiguration message to configure PCell (Cell 1) and SCell (Cell 2) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7A.1.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 6.5.7A.1.5-1. T1 starts.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for PCell (Cell 1), on the following symbol in the slot overlapping with the 1st special slot of every radio frame of the SCell (Cell 2):

   PCell (Cell 1)

   - symbol#12 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;

   - otherwise,

- symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
- symbol #9 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
- symbol #10 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for SCell (Cell 2), on the following symbol in the 2nd special slot of every radio frame:

   SCell (Cell 2)

   - symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16;*
   - otherwise,
     - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
     - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
     - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements in Table 6.5.7A.1.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

#### 6.5.7A.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7A.1.4.3-0A: Common Exception messages for NR SA FR1 DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 2T-2T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 2T-2T and PCELL<br>Table H.3.11-4 with condition FDD, SwitchFrom and 2TX<br>Table H.3.11-5 with condition FDD-TDD abd SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7.1.4.3-0B: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, Cell 1 and Cell 2)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

**Table 6.5.7.1.4.3-1 - Table 6.5.7.1.4.3-2: Void**

### 6.5.7A.1.5 Test requirements

Table 6.5.7A.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

**Table 6.5.7A.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1 | | FDD | TDD |
| TDD configuration | Config 1 | | N/A | TDDConf.2.1 except that: S='11DL: 1GP:2UL'; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 | | SRSConf.1 in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl10,6 nrofSRS-Ports: ports2 | SRSConf.1 in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.1 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/SCS | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -104 | -101 |
| Io Note3 | Config 1 | dBm/9.36 MHz | -58.96 | - |

| | | | | |
|---|---|---|---|---|
| | | dBm/ 38.16MHz | - | -55.78 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 |
| Propagation Condition | | | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7A.1.5-2

**Table 6.5.7A.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*]. | | | | |

The UE shall send L1-RSRP report for Cell 1 and Cell 2 after the reception of corresponding DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7A.1.5-3.

**Table 6.5.7A.1.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7A.2 NR SA FR1 DL interruptions at switching between two uplink carriers in TDD-TDD CA

Editor's Notes:

This test case is incomplete in following aspects:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in 38.133
- Test parameter are still in brackets in 38.1336.

### 5.7A.2.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

### 6.5.7A.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards configured with *uplinkTxSwitchingPeriod2T2T* and supports *simultaneousRxTxInterBandCA*.

### 6.5.7A.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7A.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7A.2

### 6.5.7A.2.4 Test description

#### 6.5.7A.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7A.2.4.1-1.

**Table 6.5.7A.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7A.2-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7A.2.4.1-2.

**Table 6.5.7A.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7A.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7A.2.4.1-3.
2. Message contents are defined in clause 6.5.7A.2.4.3.
3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7A.2.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD | |

| | | | | |
|---|---|---|---|---|
| T1 | s | Config 1 | 5 | |

### 6.5.7A.2.4.2 Test procedure

The test consists of two active NR cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1 and Cell 2 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on both PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure PCell (Cell 1) and SCell (Cell 2) according to Table 6.5.7A.2.5-1. Propagation conditions are set according to Annex C clause C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message to configure PCell (Cell 1) and SCell (Cell 2) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7A.2.4.3. *UplinkTxSwitching* is configured to the UE.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Tables 6.5.7A.2.5-1. T1 starts.
6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the 1st special slot of every even radio frame on PCell (Cell 1):
   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
   - otherwise,
     - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
     - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
     - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.
7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the 2nd special slot of every even radio frame on SCell (Cell 2):

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
  - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
  - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements given in Table 6.5.7A.2.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

### 6.5.7A.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7.2.4.3-0A: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 2T-2T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 2T-2T and PCELL<br>Table H.3.11-4 with condition TDD, SwitchFrom and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**T Table 6.5.7.2.4.3-0B: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, , Cell 1 and Cell 2)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

**Table 6.5.7.2.4.3-1 - Table 6.5.7.2.4.3-2: Void**

### 6.5.7A.2.5 Test requirements

Table 6.5.7A.2.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in TDD-TDD CA.

**Table A.6.5.7A.2.5-1: Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1 | | TDD | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that<br>S='1 1DL: :2UL';<br>*nrofDownlinkSymbols: 11*<br>*nrofUplinkSymbols: 2* | TDDConf.2.2 |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 | | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2<br>periodicityAndOffset-p: sl20,5<br>nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2<br>periodicityAndOffset-p: sl20,3<br>nrofSRS-Ports: ports2 |

| | | | | |
|---|---|---|---|---|
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/SCS | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 | -101 |
| Io Note3 | Config 1 | dBm/38.16 MHz | -55.78 | -55.78 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 |
| Propagation Condition | | | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7A.2.5-2

**Table 6.5.7A.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |

Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*].

The UE shall send L1-RSRP report for Cell 1 and Cell 2 after the reception of corresponding DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7A.2.5-3.

**Table 6.5.7A.2.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|

| | |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%

## 6.5.7B DL interruptions at switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors

### 6.5.7B.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink bands specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *[uplinkTxSwitchingPeriod]* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR UL carrier 1 in band A is capable of one transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

When dynamic switching between two uplink bands is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR band A or band B as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 8.2.2.2.10-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

**Table 6.5.7B.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod* | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10B.

### 6.5.7B.1 NR SA FR1 DL Interruptions at switching between two uplink bands in FDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

#### 6.5.7B.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands.

#### 6.5.7B.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards configured with *uplinkTxSwitchingPeriod*.

#### 6.5.7B.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7B.0.

The normative reference for this requirement is TS 38.133 [6] A.6.5.7B.1.

6.5.7B.1.4 Test description

6.5.7B.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7B.1.4.1-1.

**Table 6.5.7B.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7B.1-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7B.1.4.1-2.

**Table 6.5.7B.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink bands in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7B.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7B.1.4.1-3.
2. Message contents are defined in clause 6.5.7B.1.4.3.
3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7B.1.4.1-3: General test parameters for DL interruptions at switching between two uplink bands in FDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell | Cell 1: FR1 PCell on RF channel number 1 in band A<br>Cell 2: FR1 SCell on RF channel number 2 in band B<br>Cell 3: FR1 SCell on RF channel number 3 in band B<br>Note: Cell 2 and Cell 3 are two contiguous aggregated carriers |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.1.5 FDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

### 6.5.7B.1.4.2 Test procedure

The test consists of three active NR cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where Cell 1 in band A is with 1TX, Cell 2 and Cell 3 in band B with 2Tx, Cell 2 and Cell 3 are two contiguous aggregated carriers. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1, Cell 2 and Cell 3 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on PCell and SCells on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure PCell (Cell 1) and SCells (Cell 2 and Cell 3) according to Table 6.5.7B.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message to configure PCell (Cell 1) and SCells (Cell 2 and Cell 3) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7B.1.4.3. *UplinkTxSwitching* is configured to the UE.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Tables 6.5.7B.1.5-1. T1 starts.
6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for PCell (Cell 1), on the following symbol in the slot overlapping with the 1st special slot of of every radio frame the SCells (Cell 2 and Cell 3):
   - symbol#12 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
   - otherwise,
     - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 210us or
     - symbol #9 if UE capability *uplinkTxSwitchingPeriod* is 140us or
     - symbol #10 if UE capability *uplinkTxSwitchingPeriod* is 35us.
7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for SCells (Cell 2 and Cell 3), on the following symbol in the 2nd special slot of every radio frame:
   - symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16*;
   - otherwise,
     - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or
     - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
     - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.
8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements in Table 6.5.7B.1.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

#### 6.5.7B.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7B.1.4.3-0A: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 1T-2T and 2SCELLS |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T-2T and PCELL<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD, SwitchFrom and 2SCELLS |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7B.1.4.3-0B: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

**Table 6.5.7B.1.4.3-1 - Table 6.5.7B.1.4.3-4: *Void***

#### 6.5.7B.1.5 Test requirements

Table 6.5.7B.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink bands in FDD-TDD CA.

**Table 6.5.7B.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink bands in FDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 | | FDD | TDD | TDD |
| TDD configuration | Config 1 | | N/A | TDDConf.2.1 except that: S='11DL: 1GP:2UL'; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* | TDDConf.2.1 except that: S='11DL: 1GP:2UL'; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| SRS configuration | Config 1 | | SRSConf.1 in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl10,6 | SRSConf.1 in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 | SRSConf.1 in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.1 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | dBm/ 15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/ SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/ SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/ SCS | -104 | -101 | -101 |
| Io Note3 | Config 1 | dBm/ 9.36 MHz | -58.96 | - | - |
| | | dBm/ 38.16 MHz | - | -55.79 | -55.79 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 | 0 |
| Propagation Condition | | | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7B.1.5-2

**Table 6.5.7B.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink bands**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod*. | | | | |

The UE shall send L1-RSRP report for Cell 1, Cell 2 and Cell 3 after the reception of DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7B.1.5-3.

**Table 6.5.7B.1.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7B.2 NR SA FR1 DL Interruptions at switching between two uplink bands in TDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7B.2.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands.

### 6.5.7B.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards configured with *uplinkTxSwitchingPeriod* and supports *simultaneousRxTxInterBandCA*.

### 6.5.7B.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7B.0.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.5.7B.2

### 6.5.7B.2.4 Test description

#### 6.5.7B.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7B.2.4.1-1.

**Table 6.5.7B.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7B.2-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7B.2.4.1-2.

**Table 6.5.7B.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7B.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7B.2.4.1-3.

2. Message contents are defined in clause 6.5.7B.2.4.3.

3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7B.2.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2, 3 | Two radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell | Cell 1: FR1 PCell on RF channel number 1 in band A<br>Cell 2: FR1 SCell on RF channel number 2 in band B<br>Cell 3: FR1 SCell on RF channel number 3 in band B<br>Note: Cell 2 and Cell 3 are two contiguous aggregated carriers |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

### 6.5.7B.2.4.2 Test procedure

FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3) where Cell 1 in band A is with 1TX, Cell 2 and Cell 3 in band B with 2Tx, cell2 and Cell 3 are two contiguous aggregated carriers. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1, Cell 2 and Cell 3 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on all the PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure PCell (Cell 1) and SCell (Cell 2 and Cell 3) according to Table 6.5.7B.2.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an RRCReconfiguration message to configure PCell (Cell 1) and SCell (Cell 2 and Cell 3) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7B.2.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 6.5.7B.2.5-1. T1 starts.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the 1st special slot of every even radio frame on PCell (Cell 1):

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

   - otherwise,

   - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or

   - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or

   - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

7. For NR TDD Cell 2 and NR TDD Cell 3, SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the 2nd special slot of every even radio frame on SCells (Cell 2 and Cell 3):

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

- otherwise,

   - symbol #4 if UE capability *uplinkTxSwitchingPeriod* is 210us or

   - symbol #5 if UE capability *uplinkTxSwitchingPeriod* is 140us or

   - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements given in Table 6.5.7A.2.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

### 6.5.7B.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7B.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 1T-2T and 2SCELLS |

| | |
|---|---|
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T-2T and PCELL<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD, SwitchFrom and 2SCELLS<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 1T-2T<br>Table H.3.11-4 with condition SwitchTo and 2TX<br>Table H.3.11-5<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**Table 6.5.7B.2.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

**Table 6.5.7B.2.4.3-1 - Table 6.5.7B.2.4.3-4: Void**

### 6.5.7B.2.5 Test requirements

Table 6.5.7B.2.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in TDD-TDD CA.

**Table 6.5.7B.2.5-1: Cell specific test parameters for DL interruptions at switching between two uplink bands in TDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 | | TDD | TDD | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that S='1 1DL: :2UL'; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* | TDDConf.2.2 | TDDConf.2.2 |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | Config 1 | | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,5 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 |

| | | | | | |
|---|---|---|---|---|---|
| SMTC Configuration | | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 14 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 14 | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 | -101 | -101 |
| Io Note3 | Config 1 | dBm/38.16 MHz | -55.78 | -55.78 | -55.78 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 | 0 |
| Propagation Condition | | | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7B.2.5-2.

**Table 6.5.7B.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |

Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod*.

The UE shall send L1-RSRP report from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0, CSI-RS#1 and CSI-RS#2. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7A.2.5-3.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.7C DL interruptions at switching between two uplink bands with two transmit antenna connectors

## 6.5.7C.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink bands specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod2T2T* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR UL carrier 1 in band A is capable of two transmit antenna connectors, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies.

When dynamic switching between two uplink bands is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR band A or band B as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 6.5.7C.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DLInterruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

**Table 6.5.7C.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*]. | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10C.

## 6.5.7C.1 NR SA FR1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7C.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA.

### 6.5.7C.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards configured with *uplinkTxSwitchingPeriod2T2T*.

### 6.5.7C.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7C.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7C.1

### 6.5.7C.1.4 Test description

#### 6.5.7C.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7C.1.4.1-1.

**Table 6.5.7C.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7C.1-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7C.1.4.1-2.

**Table 6.5.7C.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7C.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7C.1.4.1-3.
2. Message contents are defined in clause 6.5.7C.1.4.3.
3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7C.1.4.1-3: General test parameters for DL interruptions at switching between two uplink bands with two antenna transmit connectors in FDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 Scell<br>Cell 3: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.1.5 FDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

### 6.5.7C.1.4.2 Test procedure

The test consists of three active NR cells: FR1 FDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be

connected to Cell 1, Cell 2 and Cell 3 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on PCell (Cell 1), Scell (Cell 2) and SCell (Cell 3) on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure FDD PCell (Cell 1), TDD SCell(Cell 2) and TDD SCell(Cell 3) according to Table 6.5.7C.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message to configure FDD PCell (Cell 1), TDD SCell(Cell 2) and TDD SCell(Cell 3) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7C.1.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 6.5.7C.1.5-1. T1 starts.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for NR FDD carrier (Cell 1), on the following symbol in the slot overlapping with the 1st special slot of every radio frame of the NR TDD carrier (Cell 2) and NR TDD carrier (Cell 3):

   - symbol#12 if UE does not report *uplinkTxSwitching-DL-Interruption*;

   - otherwise,

     - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or

     - symbol #9 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or

     - symbol #10 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for NR TDD carrier (Cell 2) and NR TDD carrier (Cell 3), on the following symbol in the 2nd special slot of every radio frame:
   - symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption*;

   - otherwise,

     - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or

     - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or

     - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements in Table 6.5.7C.1.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

### 6.5.7C.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7C.1.4.3-0A: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 2T-2T and 2SCELLS |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 2T-2T and PCELL<br>Table H.3.11-4 with condition FDD, SwitchFrom and 2TX<br>Table H.3.11-5 with condition FDD-TDD, SwitchFrom and 2SCELLS |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7C.1.4.3-0B: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | “1” | |

**Table 6.5.7C.1.4.3-1 - Table 6.5.7C.1.4.3-4 Void**

## 6.5.7C.1.5 Test requirements

Table 6.5.7C.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA.

**Table 6.5.7C.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 | | FDD | TDD | TDD |
| TDD configuration | Config 1 | | N/A | TDDConf.2.1 except that: S=’11DL: 1GP:2UL’; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* | TDDConf.2.1 except that: S=’11DL: 1GP:2UL’; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| SRS configuration | Config 1 | | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition:0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl10,6 nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.1 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -104 | -101 | -101 |
| Io Note3 | Config 1 | dBm/9.36 MHz | -58.96 | - | - |

| | | | | | |
|---|---|---|---|---|---|
| | | dBm/ 38.16M Hz | - | -55.79 | -55.79 |
| Time offset to Cell 1 Note 5 | | µs | - | 0 | 0 |
| Propagation Condition | | | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.<br>Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Void<br>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | |

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7C.1.5-2.

**Table 6.5.7C.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink bands**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*]. | | | | |

The UE shall send L1-RSRP report for Cell 1, Cell 2 and Cell 3 after the reception of corresponding DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7C.1.5-3.

**Table 6.5.7C.1.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7C.2 NR SA FR1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7C.2.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA.

### 6.5.7C.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards, configured with *uplinkTxSwitchingPeriod2T2T*.and supports *simultaneousRxTxInterBandCA.*

### 6.5.7C.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7C.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7C.2

6.5.7C.2.4 Test description

6.5.7C.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7C.2.4.1-1.

**Table 6.5.7C.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7C.2-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7C.2.4.1-2.

**Table 6.5.7C.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7C.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.7C.2.4.1-3.
2. Message contents are defined in clause 6.5.7C.2.4.3.
3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7C.2.4.1-3: General test parameters for DL interruptions at switching between two uplink bands with two antenna transmit connectors in TDD-TDD CA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Config 1 | Cell 1: FR1 PCell<br>Cell 2: FR1 Scell<br>Cell 3: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |

| | | | | |
|---|---|---|---|---|
| T1 | s | Config 1 | 5 | |

### 6.5.7C.2.4.2 Test procedure

The test consists of three active NR cells: FR1 TDD PCell (Cell 1), FR1 TDD SCell (Cell 2) and FR1 TDD SCell (Cell 3). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell 1, Cell 2 and Cell 3 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on PCell (Cell 1), Scell (Cell 2) and SCell (Cell 3) on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure TDD PCell (Cell 1), TDD SCell(Cell 2) and TDD SCell(Cell 3) according to Table 6.5.7C.2.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message to configure TDD PCell (Cell 1), TDD SCell(Cell 2) and TDD SCell(Cell 3) as per TS 38.508-1 [14] clause 7 with the message content exceptions defined in clause 6.5.7C.2.4.3. *UplinkTxSwitching* is configured to the UE.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Tables 6.5.7C.2.5-1. T1 starts.

6. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for NR TDD carrier (Cell 1), on the following symbol in the 1st special slot of every even radio frame on PCell (Cell 1):

   - symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption*;
   - otherwise,
     - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
     - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
     - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB for NR TDD carrier SCell (Cell 2) and NR TDD carrier SCell (Cell 3), on the following symbol on the 2nd special slot of every even radio frame on SCells (Cell 2 and Cell 3):

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption*;

- otherwise,

  - symbol #4 if UE capability *uplinkTxSwitchingPeriod2T2T* is 210us or
  - symbol #5 if UE capability *uplinkTxSwitchingPeriod2T2T* is 140us or
  - symbol #8 if UE capability *uplinkTxSwitchingPeriod2T2T* is 35us.

8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report while meeting the test requirements given in Table 6.5.7C.2.5-3, if so, increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

### 6.5.7C.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.7C.2.4.3-0A: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-1 with condition 2T-2T and 2SCELLS |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 2T-2T and PCELL<br>Table H.3.11-4 with condition TDD, SwitchFrom and 2TX<br>Table H.3.11-5 with condition TDD-TDD, SwitchFrom and 2SCELLS<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 2T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**Table 6.5.7C.2.4.3-0B: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 and step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

**Table 6.5.7.2.4.3-1 - Table 6.5.7.2.4.3-2: Void**

## 6.5.7C.2.5 Test requirements

Table 6.5.7C.2.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA.

**Table 6.5.7C.2.5-1: Cell specific test parameters for DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 | FR1 |
| Duplex mode | Config 1 | | TDD | TDD | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that S='1 1DL: :2UL'; *nrofDownlinkSymbols: 11 nrofUplinkSymbols: 2* | TDDConf.2.2 | TDDConf.2.2 |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| SRS configuration | Config 1 | | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,5 nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2 periodicityAndOffset-p: sl20,3 nrofSRS-Ports: ports2 |
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | 2x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | | dBm/SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | | dBm/SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | | dB | 14 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | | dB | 14 | 14 | 14 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 | -101 | -101 |
| Io Note3 | Config 1 | | | - | - |

| | | | | | |
|---|---|---|---|---|---|
| | | dBm/ 38.16MHz | -55.78 | -55.78 | -55.78 |
| Time offset to Cell 1 Note 5 | | μs | - | 0 | 0 |
| Propagation Condition | | | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Void<br>Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | | |

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 [6] clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7C.2.5-2

**Table 6.5.7C.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink bands**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| 2 | 0.25 | 4 | 10 | 14 |
| Note 1: Uplink Tx switching period depends on UE capability [*uplinkTxSwitchingPeriod2T2T*]. | | | | |

The UE shall send L1-RSRP report for Cell 1, Cell 2 and Cell 3 after the reception of DCI trigger. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7C.2.5-3.

**Table 6.5.7C.2.5-3: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.7D DL interruptions at UE switching across three or four uplink bands

## 6.5.7D.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching across three or four uplink bands specified in this clause are applicable for an NR inter-band CA configuration and SUL band configuration with inter-band CA when the capability *BandCombination-UplinkTxSwitch-v1800* is present, and are only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [9]. In the NR inter-band CA configuration and SUL band configuration with inter-band CA, the number of NR uplink bands with different carrier frequencies is three or four. NR UL carrier(s) in each of the three or four uplink bands are capable of one or two transmit antenna connector(s), according to the UE capability.

When dynamic switching across three or four uplink bands is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL Tx switching period located in uplink NR band(s) as indicated in RRC signalling [13]. The DL interruption lengths of X for single TAG and for 2-TAG are defined in Table 6.5.7D.0-1 and Table 6.5.7D.0-2.

Note: If one downlink carrier is indicated to be interrupted by two band pairs for dynamic switching simultaneously, the DL interruption length on the victim carrier is determined by the maximum of uplink switching periods of the two band pairs. If *UplinkTxSwitchingAdditionalPeriodDualUL-r18* is reported, DL interruption length is determined by the uplink Tx switching period, which is indicated by *UplinkTxSwitchingAdditionalPeriodDualUL-r18*. If *periodOnULBands-r18* is reported, DL interruption length is determined by the uplink Tx switching period, which is indicated by *periodOnULBands-r18*.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations and SUL band configurations with inter-band CA as specified in TS 38.101-1 [2].

**Table 6.5.7D.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching across three or four uplink bands for single TAG**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 7 |
| Note 1: Uplink Tx switching period depends on UE capability.<br>Note 2: RTD=3us is assumed to derive the DL interruption length. | | | | |

**Table 6.5.7D.0-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching across three or four uplink bands for two TAGs**

| $\mu$ | NR Slot length (ms) | Uplink Tx switching period Note1 | | |
|---|---|---|---|---|
| | | 35us | 140us | 210us |
| 0 | 1 | 2 | 3 | 4 |
| 1 | 0.5 | 3 | 6 | 8 |
| Note 1: Uplink Tx switching period depends on UE capability.<br>Note 2: RTD=9 us is assumed to derive the DL interruption length. | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10D.

## 6.5.7D.1 NR SA FR1 DL interruptions at switching across three uplink bands in TDD-TDD CA for single TAG

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7D.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching across three uplink bands for single TAG defined in TS 38.133 [6] clause 8.2.2.2.10D.

### 6.5.7D.1.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting of inter-band UL CA (three bands), dynamic UL Tx switching across up to 4 bands and simultaneous transmission and reception in TDD-TDD inter-band NR CA.

### 6.5.7D.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7D.0.

The normative reference for this requirement is TS 38.133 [6] A.6.5.7D.1

### 6.5.7D.1.4 Test description

The test consists of three active FR1 NR cells: PCell (Cell 1), SCell (Cell 2) and SCell (Cell 3), where

- Cell 1, Cell 2 and Cell 3 are on NR UL carrier 1 in band A, NR UL carrier 2 in band B and NR UL carrier 3 in band C, respectively;

- Cell 1, Cell 2 and Cell 3 belong to the same TAG;
- Band A, B and C are three different TDD bands.
- UE is capable to transmit with one, one and two transmitting antenna connector(s) on Cell 1, Cell 2 and Cell 3, respectively;

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *UplinkTxSwitchingMoreBands-r18* is indicated to UE.

#### 6.5.7D.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7D.1.4.1-1.

**Table 6.5.7D.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7D.1-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7D.1.4.1-2.

**Table 6.5.7D.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7D.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |
| Exceptions to connection diagram | Without LTE link<br>Without Fader | | |

1. The general test parameter settings are set up according to Table 6.5.7D.1.4.1-3.
2. Message contents are defined in clause 6.5.7D.1.4.3.
3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7D.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| Filter coefficient | | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |
| T1 | s | 5 | |

#### 6.5.7D.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS transmits an *RRCReconfiguration* message with *UplinkTxSwitchingMoreBands-r18* to the UE to configure Cell 2 and Cell 3 as SCells according to Table 6.5.7D.1.5-1.
3. The UE shall transmit an *RRCReconfigurationComplete* message.
4. The SS activates Cell 2 and Cell 3.
5. Set the parameters according to T1 in Table 6.5.7D.1.4.1-3 and Table 6.5.7D.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.
6. For Cell 1 and Cell 2, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 1st special slot of every even radio frame:
   - symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #4 if UE capability uplink Tx switching period is 210 us, or
     - symbol #5 if UE capability uplink Tx switching period is 140us, or
     - symbol #8 if UE capability uplink Tx switching period is 35us.
7. For Cell 3, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 2nd special slot of every even radio frame:
   - symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #4 if UE capability uplink Tx switching period is 210 us, or
     - symbol #5 if UE capability uplink Tx switching period is 140us, or
     - symbol #8 if UE capability uplink Tx switching period is 35us.
8. If the UE sends L1-RSRP report containing valid L1-RSRP results for Cell 1, Cell 2 and Cell 3 and each L1-RSRP result meet the test requirements given in Table 6.5.7D.1.5-3, increase the number of passed iterations by one otherwise increase the number of failed iterations by one.
9. SS transmits in Cell 1 an *RRCReconfiguration* message to release all SCells and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the reconfiguration fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5)

   or

   switches off and on the UE and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 2-9 until a test verdict has been achieved.

#### 6.5.7D.1.4.3 Message contents

**Table 6.5.7D.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.11-2 with condition 1T1T-2T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T1T-2T<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T1T-2T<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 1T1T-2T<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**Table 6.5.7D.1.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 & step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

### 6.5.7D.1.5 Test requirements

Table 6.5.7D.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 DL interruptions at switching across three uplink bands in TDD-TDD CA for single TAG.

**Table 6.5.7D.1.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | FR1 | FR1 | FR1 |
| Duplex mode | | TDD | TDD | TDD |
| TDD configuration | | TDDConf.2.1 except that S='11DL: 1GP :2UL' | TDDConf.2.1 except that S='11DL: 1GP :2UL' | TDDConf.2.2 |
| $BW_{channel}$ | MHz | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | | SRSConf.1 in Table 6.5.7D.1.5-2 | SRSConf.1 in Table 6.5.7D.1.5-2 | SRSConf.2 in Table 6.5.7D.1.5-2 |
| PDSCH RMC | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET RMC | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET RMC | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note 2 | dBm/ 15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | dBm/ SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | dBm/ SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 14 | 14 | 14 |
| $N_{oc}$ Note 2 | dBm/ SCS | -101 | -101 | -101 |
| Io Note3 | dBm/ 38.16 MHz | -53.43 | -53.43 | -53.43 |
| Time offset to Cell 1 Note 4 | µs | - | 0 | 0 |
| Propagation Condition | | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

**Table 6.5.7D.1.5-2: SRS Configurations**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| | SRS-ResourceSetId | 0 | 0 |
| SRS-Resource | nrofSRS-Ports | Port1 | Ports2 |
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n2 | n2 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 25 | 25 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl20,5 | sl20,3 |
| | sequenceId | 0 | 0 |

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7D.1.5-3.

**Table 6.5.7D.1.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7D.2 NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7D.2.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching across four uplink bands for single TAG defined in TS 38.133 [6] clause 8.2.2.2.10D.

### 6.5.7D.2.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting of inter-band UL CA (four bands), dynamic UL Tx switching across up to 4 bands and simultaneous transmission and reception in FDD-TDD inter-band NR CA.

### 6.5.7D.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7D.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7D.2

### 6.5.7D.2.4 Test description

The test consists of four active FR1 NR cells: PCell (Cell 1), SCell (Cell 2), SCell (Cell 3) and SCell (Cell 4), where

- Cell 1, Cell 2, Cell 3 and Cell 4 are on NR UL carrier 1 in band A, NR UL carrier 2 in band B, NR UL carrier 3 in band C and NR UL carrier 4 in band D, respectively;
- Cell 1, Cell 2, Cell 3 and Cell 4 belong to the same TAG;
- Band A and B are two different FDD bands, Band C and D are two different TDD bands;
- UE is capable to transmit with one transmitting antenna connector on Cell 1, Cell 2, Cell 3 and Cell 4, respectively;

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *UplinkTxSwitchingMoreBands-r18* is indicated to UE.

#### 6.5.7D.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7D.2.4.1-1.

**Table 6.5.7D.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7D.2-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 4: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7D.2.4.1-2.

**Table 6.5.7D.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7D.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE link<br>Without fader | | |

1. The general test parameter settings are set up according to Table 6.5.7D.2.4.1-3.

2. Message contents are defined in clause 6.5.7D.2.4.3.

3. The test scenario comprises of four NR Cells. (Cell 1, Cell 2, Cell 3 and Cell 4). Cell 1, Cell 2, Cell 3 and Cell 4 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7D.2.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3, 4 | Four radio channels are used for this test. |
| Active cell | | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell<br>Cell 4: FR1 SCell | Cell 1: FR1 PCell on RF channel 1 in band A<br>Cell 2: FR1 SCell on RF channel 2 in band B<br>Cell 3: FR1 SCell on RF channel 3 in band C<br>Cell 4: FR1 SCell on RF channel 4 in band D |
| CP length | | Normal | |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| Filter coefficient | | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Cell 1: CSI-RS.1.5 FDD<br>Cell 2: CSI-RS.1.5 FDD<br>Cell 3: CSI-RS.2.5 TDD<br>Cell 4: CSI-RS.2.5 TDD | |
| T1 | s | 5 | |

### 6.5.7D.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS transmits an *RRCReconfiguration* message with *UplinkTxSwitchingMoreBands-r18* to the UE to configure Cell 2, Cell 3 and Cell 4 as SCells according to Table 6.5.7D.2.5-1.

3. The UE shall transmit an *RRCReconfigurationComplete* message.

4. The SS activates Cell 2, Cell 3 and Cell 4.

5. Set the parameters according to T1 in Table 6.5.7D.2.4.1-3 and Table 6.5.7D.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

6. For Cell 1 and Cell 2, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the slot overlapping with the 1st special slot of every radio frame of Cell 3:

   - symbol #12 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #8 if UE capability uplink Tx switching period is 210 us, or

- symbol #9 if UE capability uplink Tx switching period is 140us, or
- symbol #10 if UE capability uplink Tx switching period is 35us.

7. For Cell 3 and Cell 4, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 2nd special slot of every radio frame:

- symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
- otherwise,
  - symbol #4 if UE capability uplink Tx switching period is 210 us, or
  - symbol #5 if UE capability uplink Tx switching period is 140us, or
  - symbol #8 if UE capability uplink Tx switching period is 35us.

8. If the UE sends L1-RSRP report containing valid L1-RSRP results for Cell 1, Cell 2, Cell 3 and Cell 4 and each L1-RSRP result meet the test requirements given in Table 6.5.7D.2.5-3, increase the number of passed iterations by one otherwise increase the number of failed iterations by one.

9. SS transmits in Cell 1 an *RRCReconfiguration* message to release all SCells and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the reconfiguration fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5)

   or

   switches off and on the UE and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

### 6.5.7D.2.4.3 Message contents

**Table 6.5.7D.2.4.3-1: Common Exception messages for NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-2 with condition 1T1T-1T1T |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD and SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD and SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition TDD and SwitchTo<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 4 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition TDD and SwitchTo<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7D.2.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 & step 7, Cell 1, Cell 2, Cell 3 and Cell 4)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |

| | | | |
|---|---|---|---|
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

### 6.5.7D.2.5 Test requirements

Table 6.5.7D.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG.

**Table 6.5.7D.2.5-1: Cell specific test parameters**

| | | | | | |
|---|---|---|---|---|---|
| Frequency Range | | FR1 | FR1 | FR1 | FR1 |
| Duplex mode | | FDD | FDD | TDD | TDD |
| TDD configuration | | N/A | N/A | TDDConf.2.1 except that: S='11DL: 1GP:2UL'; | TDDConf.2.1 except that: S='11DL: 1GP:2UL'; |
| $BW_{channel}$ | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | | SRSConf.1 in Table 6.5.7D.2.5-2 | SRSConf.1 in Table 6.5.7D.2.5-2 | SRSConf.2 in Table 6.5.7D.2.5-2 | SRSConf.2 in Table 6.5.7D.2.5-2 |
| PDSCH Reference measurement channel | | SR.1.1 FDD | SR.1.1 FDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET parameters | | CR.1.1 FDD | CR.1.1 FDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET parameters | | CCR.1.1 FDD | CCR.1.1 FDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | | SSB.1 FR1 | SSB.1 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -104 | -104 | -104 | -104 |
| SS-RSRP Note 3 | dBm/ SCS | -87 | -87 | -87 | -87 |
| CSI-RSRP Note 3 | dBm/ SCS | -81 | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | dB | 17 | 17 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 17 | 17 | 14 | 14 |
| $N_{oc}$ Note 2 | dBm/ SCS | -104 | -104 | -101 | -101 |

| | | | | | |
|---|---|---|---|---|---|
| Io[Note3] | dBm/9.36 MHz | -56.58 | -56.58 | - | - |
| | dBm/38.16 MHz | - | - | -53.43 | -53.43 |
| Time offset to Cell 1 Note 4 | µs | - | 0 | 0 | 0 |
| Propagation Condition | | AWGN | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

**Table 6.5.7D.2.5-2: SRS Configurations**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| | SRS-ResourceSetId | 0 | 0 |
| SRS-Resource | nrofSRS-Ports | Port1 | Port1 |
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n2 | n2 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 14 | 25 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl10,6 | sl20,3 |
| | sequenceId | 0 | 0 |

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7D.2.5-3.

**Table 6.5.7D.2.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7D.3 NR SA FR1 DL interruptions at switching across three uplink bands in FDD-TDD CA for two TAGs

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in RAN4

### 6.5.7D.3.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching across 3 bands with one or two transmit antenna connectors for two TAGs defined in TS 38.133 [6] clause 8.2.2.2.10D.

### 6.5.7D.3.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting of inter-band UL CA (three bands), dynamic UL Tx switching across up to 4 bands, simultaneous transmission and reception in FDD-TDD inter-band NR CA and at least two TAGs.

### 6.5.7D.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7D.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7D.3

### 6.5.7D.3.4 Test description

The test consists of three active FR1 NR cells: PCell (Cell 1), SCell (Cell 2) and SCell (Cell 3), where

- Cell 1, Cell 2 and Cell 3 are on NR UL carrier 1 in band A, NR UL carrier 2 in band B and NR UL carrier 3 in band C, respectively;
- Cell 1 and Cell 2 belong to one TAG, and Cell 3 belongs to the other TAG;
- Band A and B are two different FDD bands, Band C is a TDD band.
- UE is capable to transmit with one, one and two transmitting antenna connector(s) on Cell 1, Cell 2 and Cell 3, respectively;

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *UplinkTxSwitchingMoreBands-r18* is indicated to UE.

#### 6.5.7D.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7D.3.4.1-1.

**Table 6.5.7D.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7D.3-1 | NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 2: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7D.3.4.1-2.

**Table 6.5.7D.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7D.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2b | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4a | |

| | | |
|---|---|---|
| Exceptions to connection diagram | Without LTE link<br>Without fader | |

1. The general test parameter settings are set up according to Table 6.5.7D.3.4.1-3.

2. Message contents are defined in clause 6.5.7D.3.4.3.

3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7D.3.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | Three radio channels are used for this test. |
| Active cell | | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2<br>FR1 SCell on RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| Filter coefficient | | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Cell 1: CSI-RS.1.5 TDD<br>Cell 2: CSI-RS.1.5 TDD<br>Cell 3: CSI-RS.2.5 TDD | |
| T1 | s | 5 | |

### 6.5.7D.3.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS transmits an *RRCReconfiguration* message with *UplinkTxSwitchingMoreBands-r18* to the UE to configure Cell 2 and Cell 3 as SCells according to Table 6.5.7D.3.5-1.

3. The UE shall transmit an *RRCReconfigurationComplete* message.

4. The SS activates Cell 2 and Cell 3.

5. Set the parameters according to T1 in Table 6.5.7D.3.4.1-3 and Table 6.5.7D.3.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

6. For Cell 1 and Cell 2, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in slot overlapping with the 1st special slot of every radio frame of the NR TDD carrier (Cell 3):

   - symbol #12 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #8 if UE capability uplink Tx switching period is 210 us, or
     - symbol #9 if UE capability uplink Tx switching period is 140us, or
     - symbol #10 if UE capability uplink Tx switching period is 35us.

7. For Cell 3, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 2nd special slot of every radio frame:

   - symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;

- otherwise,
  - symbol #3 if UE capability uplink Tx switching period is 210 us, or
  - symbol #5 if UE capability uplink Tx switching period is 140us, or
  - symbol #8 if UE capability uplink Tx switching period is 35us.

8. If the UE sends L1-RSRP report containing valid L1-RSRP results for Cell 1, Cell 2 and Cell 3 and each L1-RSRP result meet the test requirements given in Table 6.5.7D.3.5-3, increase the number of passed iterations by one otherwise increase the number of failed iterations by one.
9. SS transmits in Cell 1 an *RRCReconfiguration* message to release all SCells and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the reconfiguration fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5)

   or

   switches off and on the UE and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 2-9 until a test verdict has been achieved.

### 6.5.7D.3.4.3 Message contents

**Table 6.5.7D.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-2 with condition 1T1T-2T and DualTAGS |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T1T-2T<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD and SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T1T-2T<br>Table H.3.11-4 with condition FDD and SwitchFrom<br>Table H.3.11-5 with condition FDD-TDD and SwitchFrom |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 1T1T-2T and 2ND_TAG<br>Table H.3.11-4 with condition TDD, SwitchTo and 2TX<br>Table H.3.11-5 with condition FDD-TDD and SwitchTo<br>Table H.3.11-11 |

**Table 6.5.7D.3.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 & step 7, Cell 1, Cell 2 and Cell 3)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

### 6.5.7D.3.5 Test requirements

Table 6.5.7D.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 DL interruptions at switching across three uplink bands in FDD-TDD CA for two TAGs.

**Table 6.5.7D.3.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | FR1 | FR1 | FR1 |
| Duplex mode | | FDD | FDD | TDD |

| | | | | |
|---|---|---|---|---|
| TDD configuration | | N/A | N/A | TDDConf.2.1 except that S='11DL: 1GP :2UL' |
| $BW_{channel}$ | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| SRS configuration | | SRSConf.1 in Table 6.5.7D.3.5-2 | SRSConf.1 in Table 6.5.7D.3.5-2 | SRSConf.2 in Table 6.5.7D.3.5-2 |
| PDSCH RMC | | SR.1.1 FDD | SR.1.1 FDD | SR.2.1 TDD |
| RMSI CORESET RMC | | CR.1.1 FDD | CR.1.1 FDD | CR.2.1 TDD |
| Dedicated CORESET RMC | | CCR.1.1 FDD | CCR.1.1 FDD | CCR.2.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | | SSB.1 FR1 | SSB.1 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 2x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note 2 | dBm/ 15 kHz | -104 | -104 | -104 |
| SS-RSRP Note 3 | dBm/ SCS | -87 | -87 | -87 |
| CSI-RSRP Note 3 | dBm/ SCS | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | dB | 17 | 17 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 17 | 17 | 14 |
| $N_{oc}$ Note 2 | dBm/ SCS | -104 | -104 | -101 |
| Io Note3 | dBm/9.36 MHz | -56.58 | -56.58 | N/A |
| | dBm/ 38.16 MHz | N/A | N/A | -53.43 |
| Time offset to Cell 1 Note 4 | µs | - | 0 | 9 |
| Propagation Condition | | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

**Table 6.5.7D.3.5-2: SRS Configurations**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| | SRS-ResourceSetId | 0 | 0 |
| SRS-Resource | nrofSRS-Ports | Port1 | Ports2 |
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n2 | n2 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 14 | 25 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl10,6 | sl20,3 |
| | sequenceId | 0 | 0 |

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7D.3.5-3.

**Table 6.5.7D.3.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.7D.4 NR SA FR1 DL interruptions at switching across four uplink bands in TDD-TDD CA for two TAGs

Editor's Notes:

- EPRE ratio of the AP NZP-CSI-RS to SSS needs to be added in 38.133

This test case is incomplete in following aspects:

- Test parameter are still in brackets in 38.133

### 6.5.7D.4.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching across four uplink bands for two TAGs defined in TS 38.133 [6] clause 8.2.2.2.10D.

### 6.5.7D.4.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting of inter-band UL CA (four bands), dynamic UL Tx switching across up to 4 bands, and simultaneous transmission and reception in TDD-TDD inter-band NR CA and at least two TAGs.

### 6.5.7D.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7D.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.7D.4

### 6.5.7D.4.4 Test description

The test consists of four active FR1 NR cells: PCell (Cell 1), SCell (Cell 2), SCell (Cell 3) and SCell (Cell 4), where

- Cell 1, Cell 2, Cell 3 and Cell 4 are on NR UL carrier 1 in band A, NR UL carrier 2 in band B, NR UL carrier 3 in band C and NR UL carrier 4 in band D, respectively;
- Cell 1 and Cell 2 belong to one TAG, and Cell 3 and Cell 4 belong to the other TAG;
- Band A, B, C and D are four different TDD bands.
- UE is capable to transmit with one transmitting antenna connector on Cell 1, Cell 2, Cell 3 and Cell 4, respectively;

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *UplinkTxSwitchingMoreBands-r18* is indicated to UE.

#### 6.5.7D.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7D.4.4.1-1.

**Table 6.5.7D.4.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.5.7D.4-1 | NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 3: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR Cell 4: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.5.7D.4.4.1-2.

**Table 6.5.7D.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.7D.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE link<br>Without Fader | | |

1. The general test parameter settings are set up according to Table 6.5.7D.4.4.1-3.
2. Message contents are defined in clause 6.5.7D.4.4.3.
3. The test scenario comprises of four NR Cells. (Cell 1, Cell 2, Cell 3 and Cell 4). Cell 1, Cell 2, Cell 3 and Cell 4 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.7D.4.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3, 4 | Four radio channels are used for this test. |

| | | | |
|---|---|---|---|
| Active cell | | Cell 1: FR1 PCell<br>Cell 2: FR1 SCell<br>Cell 3: FR1 SCell<br>Cell 4: FR1 SCell | FR1 PCell on RF channel number 1<br>FR1 SCell on RF channel number 2<br>FR1 SCell on RF channel number 3<br>FR1 SCell on RF channel number 4 |
| CP length | | Normal | |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| Filter coefficient | | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Cell 1: CSI-RS.2.5 TDD<br>Cell 2: CSI-RS.2.5 TDD<br>Cell 3: CSI-RS.2.5 TDD<br>Cell 4: CSI-RS.2.5 TDD | |
| T1 | s | 5 | |

### 6.5.7D.4.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS transmits an *RRCReconfiguration* message with *UplinkTxSwitchingMoreBands-r18* to the UE to configure Cell 2, Cell 3 and Cell 4 as SCells according to Table 6.5.7D.4.5-1.
3. The UE shall transmit an *RRCReconfigurationComplete* message.
4. The SS activates Cell 2, Cell 3 and Cell 4.
5. Set the parameters according to T1 in Table 6.5.7D.4.4.1-3 and Table 6.5.7D.4.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.
6. For Cell 1 and Cell 2, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 1st special slot of every even radio frame:
   - symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #3 if UE capability uplink Tx switching period is 210 us, or
     - symbol #5 if UE capability uplink Tx switching period is 140us, or
     - symbol #8 if UE capability uplink Tx switching period is 35us.
7. For Cell 3 and Cell 4, the SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boost of 6dB on the following symbol in the 2nd special slot of every even radio frame:
   - symbol #10 if UE does not report *uplinkTxSwitching-DL-Interruption-r18*;
   - otherwise,
     - symbol #3 if UE capability uplink Tx switching period is 210 us, or
     - symbol #5 if UE capability uplink Tx switching period is 140us, or
     - symbol #8 if UE capability uplink Tx switching period is 35us.
8. If the UE sends L1-RSRP report containing valid L1-RSRP results for Cell 1, Cell 2, Cell 3 and Cell 4 and each L1-RSRP result meet the test requirements given in Table 6.5.7D.4.5-3, increase the number of passed iterations by one otherwise increase the number of failed iterations by one.
9. SS transmits in Cell 1 an *RRCReconfiguration* message to release all SCells and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the reconfiguration fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5)

or

switches off and on the UE and ensures UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

### 6.5.7D.4.4.3 Message contents

**Table 6.5.7D.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.11-2 with condition 1T1T-1T1T and DualTAGS |
| Cell-specific messages and information elements contents exceptions for Cell 1 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 2 | Table H.3.11-3 with condition 1T1T-1T1T<br>Table H.3.11-4 with condition TDD and SwitchFrom<br>Table H.3.11-5 with condition TDD-TDD and SwitchFrom<br>Table H.3.11-11 |
| Cell-specific messages and information elements contents exceptions for Cell 3 | Table H.3.11-3 with condition 1T1T-1T1T and 2ND_TAG<br>Table H.3.11-4 with condition TDD and SwitchTo<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |
| Cell-specific messages and information elements contents exceptions for Cell 4 | Table H.3.11-3 with condition 1T1T-1T1T and 2ND_TAG<br>Table H.3.11-4 with condition TDD and SwitchTo<br>Table H.3.11-5 with condition TDD-TDD and SwitchTo<br>TS 38.508-1 [14] Table 7.3.1-1 with condition TDDConf.2.2 |

**Table 6.5.7D.4.4.3-2: Physical layer parameters for DCI format 0_1 (Test procedure, step 6 & step 7, Cell 1, Cell 2, Cell 3 and Cell 4)**

| Derivation Path: 38.508-1[14] Table 4.3.6.1.1.2-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| CSI request | First entry in CSI-AperiodicTriggerStateList | "1" | |

### 6.5.7D.4.5 Test requirements

Table 6.5.7D.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 DL interruptions at switching across four uplink bands in TDD-TDD CA for two TAGs.

**Table 6.5.7D.4.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 | Cell 4 |
|---|---|---|---|---|---|
| Frequency Range | | FR1 | FR1 | FR1 | FR1 |
| Duplex mode | | TDD | TDD | TDD | TDD |
| TDD configuration | | TDDConf.2.1 except that S='11DL: 1GP :2UL' | TDDConf.2.1 except that S='11DL: 1GP :2UL' | TDDConf.2.2 | TDDConf.2.2 |
| $BW_{channel}$ | MHz | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| UL dedicated BWP configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| SRS configuration | | SRSConf.1 in Table 6.5.7D.4.5-2 | SRSConf.1 in Table 6.5.7D.4.5-2 | SRSConf.2 in Table 6.5.7D.4.5-2 | SRSConf.2 in Table 6.5.7D.4.5-2 |
| PDSCH RMC | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET RMC | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET RMC | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC Configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB Configuration | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note 2 | dBm/ 15 kHz | -104 | -104 | -104 | -104 |
| SS-RSRP Note 3 | dBm/ SCS | -87 | -87 | -87 | -87 |
| CSI-RSRP Note 3 | dBm/ SCS | -81 | -81 | -81 | -81 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 | 14 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 14 | 14 | 14 | 14 |
| $N_{oc}$ Note 2 | dBm/ SCS | -101 | -101 | -101 | -101 |
| Io Note3 | dBm/ 38.16 MHz | -53.43 | -53.43 | -53.43 | -53.43 |
| Time offset to Cell 1 Note 4 | µs | - | 0 | 9 | 9 |
| Propagation Condition | | AWGN | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

**Table 6.5.7D.4.5-2: SRS Configurations**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| | SRS-ResourceSetId | 0 | 0 |
| SRS-Resource | nrofSRS-Ports | Port1 | Port1 |
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n2 | n2 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 25 | 25 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl20,5 | sl20,3 |
| | sequenceId | 0 | 0 |

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7D.4.5-3.

**Table 6.5.7D.4.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value | 65 |
| Highest reported value | 86 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.5.8 UE specific CBW change

### 6.5.8.0 Minimum conformance requirements

#### 6.5.8.0.1 Minimum conformance requirements for UE specific CBW change

The requirements in this clause apply for a UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

- DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and
- $T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in TS 36.331 [29] clause 11.2 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in TS 38.331 [13] clause 12, and
- $T_{CBWchangeDelayRRC} = 6\,ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.13.1 and 8.13.2.

## 6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX

### 6.5.8.1.1 Test purpose

To verify the UE specific CBW change delay requirement defined in 38.133 [6] clause 8.13.

### 6.5.8.1.2 Test applicability

This test applies to all types of NR UEs from Release 16 onwards.

### 6.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.8.1.

### 6.5.8.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

During T1 the TE sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received.

#### 6.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.8.1.4.1-1.

**Table 6.5.8.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.5.8.1-1 | FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.8.1-2 | TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth |
| 6.5.8.1-3 | TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.8.1.4.1-2.

**Table 6.5.8.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. The general test parameter settings are set up according to Table 6.5.8.1.4.1-3.

2. Message contents are defined in clause 6.5.8.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.5.8.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

### 6.5.8.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.

3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

4. T1 starts from the beginning of slot i, where slot i is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ , then the number of successful tests is increased by one.
Otherwise, the number of failure tests is increased by one.

6. After the SS receives the ACK/NACK in step 5 or when T1 expires, the SS shall

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

7. Depending on the choice in step 6, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 6. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 6.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.8.1.4.3-1:*ServingCellConfigCommon* (step 1, 3 and 8, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon::= SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| genericParameters | Set according to DLBWP.0.2 | | |
| } | | | |
| uplinkConfigCommon SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters | Set according to ULBWP.0.2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.8.1.4.3-2: *ServingCellConfig* (step 1, 3 and 8, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-UL | Entry 1 Table 6.5.8.1.4.3-4 | |
| } | | | |
| } | | | |
| downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-DL | Entry 1 Table 6.5.8.1.4.3-3 | |
| } | | | |
| } | | | |

**Table 6.5.8.1.4.3-3: *SCS-SpecificCarrier-DL* (Table 6.5.8.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | The offset between point A and the lowest PRB index to guarantee the CBW including SSB and CORESET#0 | CBW-1 (DLCBW.1.1) | step 1 or step 8 |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in 38.508-1[14] clause 4.3.1. | CBW-2 (DLCBW.1.2) | step 3 |
| } | | | |

**Table 6.5.8.1.4.3-4: *SCS-SpecificCarrier-UL* (Table 6.5.8.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | Any offset within the CBW of test frequency given in 38.508-1[14] clause 4.3.1.and different | CBW-1 (ULCBW.1.1) | step 1 or step 8 |

| | | | |
|---|---|---|---|
| | with offsetToCarrier of ULCBW.1.2 | | |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in 38.508-1[14] clause 4.3.1. | CBW-2 (ULCBW.1.2) | step 3 |
| } | | | |

6.5.8.1.5 Test requirement

Tables 6.5.8.1.4.1-3 and 6.5.8.1.5-1 define the primary level settings including test tolerances.

**Table 6.5.8.1.5-1: NR Cell specific test parameters**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2,3 | | TDD |
| TDD configuration | | Config 1 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | Config 1,2, 3 | | 0 |
| Initial DL BWP Configuration (BWP-1) | | Config 1,2, 3 | | DLBWP.0.2 |
| Initial UL BWP Configuration (BWP-1) | | Config 1,2, 3 | | ULBWP.0.2 |
| Initial Condition | Active DL CBW Configureation (CBW-1) | Config 1, 2, 3 | | DLCBW.1.1 |
| | Active UL CBW Configuration (CBW-1) | Config 1, 2, 3 | | ULCBW.1.1 |
| Final Condition | Active DL CBW Configureation (CBW-2) | Config 1, 2, 3 | | DLCBW.1.2 |
| | Active UL CBW Configuration (CBW-2) | Config 1, 2, 3 | | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1,2 | | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |

| | | | |
|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -58.96 |
| | Config 3 | dBm/ 38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the beginning of slot $i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1$.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.213 [8].

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.9 to 6.5.11

## 6.5.12 Subsequent conditional PSCell addition/change

### 6.5.12.0 [title missing]

#### 6.5.12.0.1 Minimum conformance requirements for Intra-frequency subsequent CPC from FR1-FR1 NR-DC to FR1-FR1 NR-DC

[TS 38.133 8.11E.2]

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

The UE shall be capable to transmit PRACH preamble towards the new target PSCell no later than in slot *n* + $T_{config_PSCell_Subsequent_Change_Conditional}$:

Where:

- Slot n is the time when UE transmits SN *RRCReconfigurationcomplete* message for the previous PSCell addition or change.
- $T_{config_PSCell_Subsequent_Change_Conditional} = T_{Event_DU} + T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

- $T_{Event_DU}$ is the delay uncertainty which is the time from when UE transmits SN *RRCReconfigurationcomplete* message for the previous PSCell addition or change until a condition exists at the measurement reference point which will trigger the subsequent conditional PSCell change.

- $T_{measure}$ is the measurements time stated in clause 8.11E.2.1.

- $T_{UE_preparation}$ is the UE preparation time for subsequent conditional PSCell change, and starts after UE realizes the condition of PSCell change is met and identity of new PSCell is determined. $T_{UE_preparation}$ is up to 10 ms.

- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing}$ = 20 ms when source and target cells are in the same FR, and $T_{processing}$ = 40 ms when source and target cells are in different FRs.

- $T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = 3*T_{rs}$ ms for PSCell operating with 12 PRB SSB BW. Otherwise, $T_{\Delta} = 1*T_{rs}$.

  - $T_{rs}$ is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise $T_{rs}$ is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

- $T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in table 8.1-1 of TS 38.213 [3].

The PCell interruption specified in clause 8.2 is allowed only after the UE starts to execute a subsequent conditional PSCell change.

#### 6.5.12.0.1.1 Measurement time

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a PSCell change to a target cell and interruption time starts.

For intra-frequency PSCell change, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency PSCell change, the measurement time delay measured without TTT and L3 filtering shall be less than $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PSCell change or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PSCell change. If a cell, which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency PSCell change or the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency PSCell change, becomes undetectable for a period and then the cell becomes detectable again and triggers a PSCell change, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

### 6.5.12.0.2 Minimum conformance requirements for Inter-frequency subsequent CPA from FR1-FR1 NR-DC to FR1-FR1 NR-DC

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

Upon receiving RRC Command containing MR-DCRelease configuration and sending an *RRCReconfigurationComplete* message confirming the release in subframe *n*, the UE shall be capable to transmit PRACH preamble towards PSCell no later than in subframe $n + T_{config_PSCell_Addition_Conditional}$:

Where:

- $T_{config_PSCell_Addition_Conditional} = T_{Event_DU} + T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

- $T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully transmits an *RRCReconfigurationComplete* message confirming the release of SCG configuration until a condition exists at the measurement reference point which will trigger the conditional PSCell addition.

- $T_{measure}$ is the measurements time stated in clause 8.9C.2.1.

- $T_{UE_preparation}$ is the UE preparation time for conditional PSCell addition, and starts after UE realizes the condition of PSCell addition is met and identity of the PSCell is determined. $T_{UE_preparation}$ is up to 10 ms.

- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing}$ = 20 ms when PSCell is in FR1, and $T_{processing}$ = 40 ms when PSCell is in FR2.

- $T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = 3*T_{rs}$ ms for target PSCell operating with 12 PRB SSB BW. Otherwise, $T_{\Delta} = 1*Trs$ ms.

  - Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

- $T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in table 8.1-1 of TS 38.213 [3].

The PCell interruption specified in clause 8.2 is allowed only after the UE starts to execute a conditional PSCell addition.

#### 6.5.12.0.2.1 Measurement time

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a PSCell addition and interruption time starts.

The measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ defined in clause 9.3.4. When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_inter_with_index}$ for PSCell addition. If a cell, which has been detectable at least for the time period $T_{identify_inter_with_index}$ for PSCell addition, becomes undetectable for a period and then the cell becomes detectable again and triggers a PSCell addition, the measurement time delay shall be less than $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

### 6.5.12.1 Intra-frequency subsequent CPC from FR1-FR1 NR-DC to FR1-FR1 NR-DC

Editor's Note: This test case is incomplete in following aspects:

- Message contents is TBD.

- Test applicability is missing

- TT analysis is missing

#### 6.5.12.1.1 Test purpose

The purpose of this test is to verify that the subsequent conditional NR PSCell change under NR-DC is within the requirements stated in clause 8.11E.2 of TS 38.133.

#### 6.5.12.1.2 Test applicability

This test applies to all types of NR UE release 18 onwards.

6.5.12.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.12.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.12.1

6.5.12.1.4 Test description

6.5.12.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.12.1.4.1-1.

**Table 6.5.12.1.4.1-1: Supported test configurations for Intra-frequency CPC from FR1-FR1 NR-DC to FR1-FR1 NR-DC**

| Configuration | Description |
|---|---|
| 1 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode. PSCell: FDD |
| 2 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode. PSCell: FDD |
| 3 | PCell: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode. PSCell: FDD |
| 4 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode. PSCell: TDD |
| 5 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode. PSCell: TDD |
| 6 | PCell: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode. PSCell: TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.12.1.4.1-2.

**Table 6.5.12.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.12.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.12.1.4.1-3.

2. Message contents are defined in clause 6.5.12.1.4.3.

3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.12.1.4.1-3: General Test Parameters for Intra-frequency CPC from FR1-FR1 NR-DC to FR1-FR1 NR-DC**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for PCell and second for NR PSCell |
| Initial | Active PCell | | Cell 1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2, Cell 3 | Neighbour cells on RF channel number 2. |
| Final Condition | Active PCell | | Cell 1 | PCell on RF channel number 1. |
| | active PSCell | | Cell 3 | PSCell on RF channel number 2. |
| A4 | Hysteresis | dB | 0 | Used to trigger conditional PSCell addition of Cell 2 |
| | Threshold RSRP | dBm | -118 | |

| | | | |
|---|---|---|---|
| Time to Trigger | s | 0 | |
| A3 | dB | 0 | Used to trigger conditional PSCell change from Cell 2 to Cell 3 |
| DRX | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | | 0 | Gaps are configured during T1, T2 and released upon T3 starts. |
| PRACH configuration on cell2 and cell3 | | FR1 PRACH configuration 1 | Captured in clause A.3.8.2.1 |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | s | 1 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | s | ≤5 | During this time Cell 2 meets the PSCell addition condition and UE adds this PSCell. |
| T3 | s | ≤5 | During this time Cell 3 meets the PSCell change condition and UE sends PRACH to Cell 3. |

#### 6.5.12.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS transmits a SN *RRCReconfiguration* message to the UE to configure Cell 2 and Cell 3 as SCells according to Table 6.5.12.4.5-1.

3. The UE shall transmit an *RRCReconfigurationComplete* message.

4. The SS activates Cell 2 and Cell 3

5. Set the parameters according to T1 in Table 6.5.12.4.4.1-3 and Table 6.5.12.4.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.5.12.4.5-1. T2 starts.

7. When T2 expires, the SS shall switch the power settings at T2 to power setting at T3 as per Tables 6.5.12.4.5-1 and 6.5.12.4.5-2. T3 starts.

8. If

   a) The UE shall start to transmit the PRACH to Cell 2 less than Tmeasure + TUE_preparation + Tprocessing + TΔ + TPSCell_DU + 2 ms = 920+10+62 ms=992 ms from the start of T2.

   b) The UE shall start to transmit the PRACH to Cell 3 less than TEvent_DU + Tmeasure + TUE_preparation + processing + TΔ + TPSCell_DU + 2 ms = 0+920+10+62 ms=992 ms from the start of T3.

   and

   c) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 1 in Table 6.5.3.12.4.1-1
   - $X = T_{interrupt}$ for test configuration 2 in Table 6.5.3.12.4.1-1
   - $X = 2 \cdot T_{interrupt}$ for test configuration 3 in Table 6.5.3.12.4.1-1.

9. When T3 expires the UE shall be capable to transmit PRACH preamble towards the Cell3.

10. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

11. Repeat steps 2-10 until the confidence is achieved.

6.5.12.1.4.3 Message contents

TBD

6.5.12.1.5 Test requirements

**Table A.6.5.12.1.2-3: Cell Specific Parameters for Intra-frequency CPC from FR1-FR1 NR-DC to FR1-FR1 NR-DC**

| Parameter | Unit | Config | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | 1,2,3,4,5,6 | 1 | | | 1 | | |
| NR RF Channel Number | | 1,2,3,4,5,6 | 1 | | | 1 | | |
| TDD configuration | | 1,4 | Not Applicable | | | Not Applicable | | |
| | | 2,5 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3,6 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 | | |
| | | 2,5 | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 | | |
| | | 3,6 | 40: $N_{PRB,c}$ = 106 | | | 40: $N_{PRB,c}$ = 106 | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1 ULBWP.1.1 | | | DLBWP.1.1 ULBWP.1.1 | | |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2,5 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3,6 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2,5 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3,6 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2,5 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3,6 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | | | OP.1 | | |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| | | 3,6 | SSB.2 FR1 | | | SSB.2 FR1 | | |
| SMTC configuration | | 1,2,4,5 | SMTC.1 | | | SMTC.1 | | |
| | | 3,6 | SMTC.1 | | | SMTC.1 | | |
| TRS Configuration | | 1,4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2,5 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3,6 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD | | | CSI-RS.1.1 FDD | | |
| | | 2,5 | CSI-RS.1.1 TDD | | | CSI-RS.1.1 TDD | | |
| | | 3,6 | CSI-RS.2.1 TDD | | | CSI-RS.2.1 TDD | | |
| reportConfigType | | 1,2,3,4,5,6 | Periodic | | | periodic | | |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | 5 | | |
| | | 3,6 | 10 | | | 10 | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | 2 | | |
| | | 3,6 | 4 | | | 4 | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | | |

| Parameter | Unit | Config | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 + TT | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -98 + TT | | | | | |
| | | 3,6 | -95 + TT | | | | | |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 8 + TT | -3.3 + TT | -infinity | -infinity | 2.36 + TT |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 8 + TT | 8+ TT | -infinity | -infinity | 11 + TT |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -infinity | -90 + TT | -90 + TT | -infinity | -infinity | -87 + TT |
| | | 3,6 | -infinity | -87 + TT | -87 + TT | -infinity | -infinity | -84 + TT |
| Io Note3 | dBm/9.36 MHz | 1,2,4,5 | -70.05 + TT | -61.41 + TT | -57.06 + TT | -70.05 + TT | -61.41 + TT | -57.06 + TT |
| | dBm/38.1 MHz | 3,6 | -63.94 + TT | -55.31 + TT | -50.96 + TT | -63.94 + TT | -55.31 + TT | -50.96 + TT |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | | | AWGN | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

$T_{RRC_delay}$ + $T_{Event_DU}$ for PSCell addition (Cell 2) occurs during T1 as the addition condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure}$ + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta}$ + $T_{PSCell_DU}$ + 2 ms = 920+10+62 ms=992 ms from the start of T2.

The UE shall start to transmit the PRACH to Cell 3 less than $T_{Event_DU}$ + $T_{measure}$ + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta}$ + $T_{PSCell_DU}$ + 2 ms = 0+920+10+62 ms=992 ms from the start of T3.
All of the above test requirements shall be fulfilled in order for the observed conditional PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90 %.

## 6.5.12.2 Inter-frequency subsequent CPA from FR1-FR1 NR-DC to FR1-FR1 NR-DC

Editor's Note: This test case is incomplete in following aspects:

- Message content is TBD.

- Test applicability is missing

- TT analysis is missing

### 6.5.12.2.1 Test purpose

The purpose of this test is to verify that the subsequent conditional NR PSCell addition under NR-DC is within the requirements stated in clause 8.9C.2 of 38.133.

### 6.5.12.2.2 Test applicability

This test applies to all types of NR UE release 18 onwards.

#### 6.5.12.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.12.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.12.2

#### 6.5.12.2.4 Test description

##### 6.5.12.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.12.2.4.1-1.

**Table 6.5.12.2.4.1-1: Supported test configurations for Inter-frequency Subsequent CPA from FR1-FR1 NR-DC to FR1-FR1 NR-DC**

| Configuration | Description |
|---|---|
| 1 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode. PSCell: FDD |
| 2 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode. PSCell: FDD |
| 3 | PCell: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode. PSCell: FDD |
| 4 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode. PSCell: TDD |
| 5 | PCell: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode. PSCell: TDD |
| 6 | PCell: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode. PSCell: TDD |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.12.2.4.1-2.

**Table 6.5.12.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.12.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.<br>- Without LTE link<br>- Without Faders | | |

1. The general test parameter settings are set up according to Table 6.5.12.1.4.1-3.
2. Message contents are defined in clause 6.5.12.1.4.3.
3. The test scenario comprises of three NR Cells. (Cell 1, Cell 2 and Cell 3). Cell 1, Cell 2 and Cell 3 are configured according to Annex C.1.2 and C.1.3.

**Table 6.5.12.2.4.1-3: General Test Parameters for Subsequent Conditional PSCell Addition and Release**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2, 3 | Three radio channels are used for NR Cells for this test. |
| Initial | Active PCell | | Cell 1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell 2 | Neighbour cell on RF channel number 2. |
| | | | Cell 3 | Neighbour cell on RF channel number 3. |
| Final Condition | Active PCell | | Cell 1 | PCell on RF channel number 1. |
| | Active PSCell | | Cell 3 | PSCell on RF channel number 3 |
| | Neighbour Cell | | Cell 2 | Neighbour cell on RF channel number 2 |
| A4 | Hysteresis | dB | 0 | Hysteresis for evaluation of event A1. |

| | | | | |
|---|---|---|---|---|
| | Threshold RSRP | dBm | -118 | A4 event is used to trigger conditional PSCell addition of Cell 2. |
| | Time to Trigger | s | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | | | 0 | Gaps are configured during T1, T2, T3 and T4. |
| PRACH configuration on cell2 | | | FR1 PRACH configuration 1 | Captured in clause A.3.8.2.1 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of Cell 2. |
| Cell-individual offset for cells on RF channel number 3 | | dB | 0 | Individual offset for cells on carrier frequency of Cell 3. |
| T1 | | s | 1 | During this time the PCell is known, PSCell 1 and PSCell 2 are unknown. |
| T2 | | s | ≤7 | During this time PSCell 1 meets the PSCell addition condition and UE adds this PSCell. |
| T3 | | s | ≤1 | During this time the UE releases the PSCell 1. |
| T4 | | s | ≤7 | During this time PSCell 2 meets the addition condition and UE adds this PSCell. |

#### 6.5.12.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS transmits a SN *RRCReconfiguration* message to the UE to configure Cell 2 and Cell 3 as SCells according to Table 6.5.12.2.4.5-1.

3. The UE shall transmit an *RRCReconfigurationComplete* message.

4. The SS activates Cell 2 and Cell 3

5. Set the parameters according to T1 in Table 6.5.12.2.4.4.1-3 and Table 6.5.12.2.4.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.5.12.2.5-1. T2 starts.

7. When T2 expires, the SS shall switch the power settings at T2 to power setting at T3 as per Tables 6.5.12.2.5-1 and 6.5.12.2.5-2. T4 starts.

8. If

   a) The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU}$ + 2 ms = 1040+10+62 ms=1112 ms from the start of T2.

   b) The UE shall start to transmit the PRACH to Cell 3 less than $T_{Event_DU} + T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU}$ + 2 ms = 0+1040+10+62 ms=1112 ms from the start of T4.

   and

   c) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 1 in Table 6.5.12.1.4.1-1
   - $X = T_{interrupt}$ for test configuration 2 in Table 6.5.12.1.4.1-1
   - $X = 2 \cdot T_{interrupt}$ for test configuration 3 in Table 6.5.12.1.4.1-1.

9. When T4 expires the UE shall be capable to transmit PRACH preamble towards the Cell3.

10. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure

the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

11. Repeat steps 2-10 until the confidence is achieved.

6.5.12.2.4.3 Message contents

TBD

6.5.12.2.5 Test requirements

**Table 6.5.12.2.5-1: Cell Specific Parameters for Subsequent Conditional PSCell Addition and Release**

| Parameter | Unit | Config | Cell 2 | | | | Cell 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| NR RF Channel Number | | 1,2,3,4,5,6 | 2 | | | | 3 | | | |
| TDD configuration | | 1,4 | Not Applicable | | | | Not Applicable | | | |
| | | 2,5 | TDDConf.1.1 | | | | TDDConf.1.1 | | | |
| | | 3,6 | TDDConf.2.1 | | | | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{PRB,c}$ = 52 | | | | 10: $N_{PRB,c}$ = 52 | | | |
| | | 2,5 | 10: $N_{PRB,c}$ = 52 | | | | 10: $N_{PRB,c}$ = 52 | | | |
| | | 3,6 | 40: $N_{PRB,c}$ = 106 | | | | 40: $N_{PRB,c}$ = 106 | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | | | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 | | | | DLBWP.1.1<br>ULBWP.1.1 | | | |
| PDSCH Reference measurement channel | | 1,4 | SR.1.1 FDD | | | | SR.1.1 FDD | | | |
| | | 2,5 | SR.1.1 TDD | | | | SR.1.1 TDD | | | |
| | | 3,6 | SR.2.1 TDD | | | | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | 1,4 | CR.1.1 FDD | | | | CR.1.1 FDD | | | |
| | | 2,5 | CR.1.1 TDD | | | | CR.1.1 TDD | | | |
| | | 3,6 | CR.2.1 TDD | | | | CR.2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | 1,4 | CCR.1.1 FDD | | | | CCR.1.1 FDD | | | |
| | | 2,5 | CCR.1.1 TDD | | | | CCR.1.1 TDD | | | |
| | | 3,6 | CCR.2.1 TDD | | | | CCR.2.1 TDD | | | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | | | | OP.1 | | | |
| SSB configuration | | 1,2,4,5 | SSB.1 FR1 | | | | SSB.1 FR1 | | | |
| | | 3,6 | SSB.2 FR1 | | | | SSB.2 FR1 | | | |
| SMTC configuration | | 1,2,4,5 | SMTC.1 | | | | SMTC.1 | | | |
| | | 3,6 | SMTC.1 | | | | SMTC.1 | | | |
| TRS Configuration | | 1,4 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | | |
| | | 2,5 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | | |
| | | 3,6 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | | |
| CSI-RS configuration for CSI reporting | | 1,4 | CSI-RS.1.1 FDD | | | | CSI-RS.1.1 FDD | | | |
| | | 2,5 | CSI-RS.1.1 TDD | | | | CSI-RS.1.1 TDD | | | |
| | | 3,6 | CSI-RS.2.1 TDD | | | | CSI-RS.2.1 TDD | | | |
| reportConfigType | | 1,2,3,4,5,6 | Periodic | | | | periodic | | | |
| reportQuantity | | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | | cri-RI-PMI-CQI | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | | 5 | | | |
| | | 3,6 | 10 | | | | 10 | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | | 2 | | | |
| | | 3,6 | 4 | | | | 4 | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | |

| Parameter | Unit | Config | Cell 2 | | | | Cell 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -85 + TT | | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -85+ TT | | | | | | | |
| | | 3,6 | -82+ TT | | | | | | | |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 0+ TT | -infinity | -infinity | -infinity | -infinity | -infinity | 0+ TT |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 0+ TT | -infinity | -infinity | -infinity | -infinity | -infinity | 0+ TT |
| SS-RSRP Note3 | dBm/SCS | 1,2,4,5 | -infinity | -85+ TT | -infinity | -infinity | -infinity | -infinity | -infinity | -85+ TT |
| | | 3,6 | -infinity | -82+ TT | -infinity | -infinity | -infinity | -infinity | -infinity | -82+ TT |
| Io Note3 | dBm/9.36 MHz | 1,2,4,5 | -57+ TT | -54+ TT | -57+ TT | -57+ TT | -57+ TT | -57+ TT | -57+ TT | -54+ TT |
| | dBm/38.1 MHz | 3,6 | -57+ TT | -48+ TT | -57+ TT | -57+ TT | -57+ TT | -57+ TT | -57+ TT | -48+ TT |
| Propagation condition | | 1,2,3,4,5,6 | AWGN | | | | AWGN | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

$T_{RRC_delay}$ + $T_{Event_DU}$ for PSCell addition (Cell 2) occurs during T1 as the addition condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure}$ + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta}$ + $T_{PSCell_DU}$ + 2 ms = 1040+10+62 ms=1112 ms from the start of T2.

The UE shall start to transmit the PRACH to Cell 3 less than $T_{Event_DU}$ + $T_{measure}$ + $T_{UE_preparation}$ + $T_{processing}$ + $T_{\Delta}$ + $T_{PSCell_DU}$ + 2 ms = 0+1040+10+62 ms=1112 ms from the start of T4.

All of the above test requirements shall be fulfilled in order for the observed conditional PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90 %.

## 6.5.13 Active TCI state switch delay

### 6.5.13.0 Minimum conformance requirements

If the MAC-CE from two TRPs indicating TCI state switch are not overlapped, requirements specified in TS 38.133 [6] clause 8.15.3 are applicable for each target TCI state switch.

The requirements in this clause shall apply for DL TCI state switch using separate DL TCI state or joint TCI state of unified TCI state switch framework.

In case that source RS in DL TCI state or joint TCI state is associated with a PCI different from that of the serving cell, the requirements in this clause shall apply if the cell with different PCI satisfies the known cell condition defined in TS 38.133 [6] clause 8.15.1. If the known cell condition is not met, longer delay may be expected.

In case of joint TCI state switch, if the target PL-RS is not maintained, UE is not expected to receive on DL based on the target TCI state before UE completes the DL and UL TCI state switch.

Upon receiving PDSCH carrying MAC-CE activation command in slot n, if the target TCI state is known, the UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$+ OL*$T_{SSB}$) / *NR slot length*.

Upon receiving PDSCH carrying MAC-CE activation command in slot n, if the target TCI state is unknown, the UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ +$3N_{slot}^{subframe,\mu}$ + ($T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$+ $T_{SSB\text{-}proc}$+ OL*$T_{SSB}$)) / *NR slot length*.

The UE shall be able to receive UE-dedicated PDCCH/PDSCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

Where

- $T_{HARQ}$ (in slot) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];
- $T_{first\text{-}SSB}$ is the time to the first SSB transmission after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB\text{-}proc}$ = 2 ms;
- $TO_k$ = 0 if the target TCI state have QCL relationship with a RS of a TCI state in the active list of TCI states or if the target TCI state is in the active list of TCI states, otherwise $TO_k$ = 1;
- OL = 1 if the SSB overlaps or is adjacent to the SSB from the other TRP in FR2 and the SSB is associated to the TRP with the lowest corestPoolIndex, 0, otherwise.
- $T_{L1\text{-}RSRP}$ = 0 in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
- $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1, when receive timing difference is within CP,
  - with the assumption of M=1
  - with $T_{Report}$ = 0
- $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2, when receive timing difference is within CP
  - CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell
  - configured with higher layer parameter *repetition* set to ON
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with $T_{Report}$ = 0
  - $TO_{uk}$ = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD
- $TO_{uk}$ = 1 when TCI state switching involves other QCL types only
- $T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

The normative reference for this requirement is TS 38.133 [6] clause 8.22.3.

## 6.5.13.1 NR SA FR1 MAC-CE based joint TCI state switch for mDCI with two TA when RTD is larger than CP

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- MU/TT analysis is missing.
- Message content is imcomplete.

### 6.5.13.1.1 Test purpose

To verify the active TCI state switch delay requirement defined in 38.133 [6] clause 8.22.3.

### 6.5.13.1.2 Test applicability

This test applies to all types of NR UEs from Release 18 onwards supporting unified TCI with joint DL/UL TCI update for multi-DCI based multi-TRP.

### 6.5.13.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.13.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.13.1.

### 6.5.13.1.4 Test description

#### 6.5.13.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.13.1.4.1-1.

**Table 6.5.13.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 6.5.13.1.4.1-2 and Table 6.5.13.1.4.1-3.

**Table 6.5.13.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.13.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 6.5.13.1.4.1-3: General test parameters for TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |

| | | | |
|---|---|---|---|
| Timing offset between SSB 0 and SSB1 | µs | 25 | |
| Timing offset between SSB0 and SSB2 | µs | 33 | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |

1. Message contents are defined in clause 6.5.13.1.4.3.

2. Single Cell is used, which is NR FR1 PCell containing two TRPs (i.e., TRP 0 and TRP 1) belonging to two TAGs. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in Table 6.5.13.1.4.1-3.

#### 6.5.13.1.4.2 Test procedure

PDCCHs associated with corsetPoolIndex 0 and 1 indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending on PUCCH associated with TRP 0.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 1 different TCI states associated with coresetPoolIndex 0 for PCell, PDCCH TCI state 0 (QCL'd to SSB0), in Cell 1 before starting the test. UE is configured with 2 TCI states associated with coresetPoolIndex 1 for PCell, PDCCH TCI state 0 (QCL'd to SSB1) and TCI state 1 (QCL'd to SSB2).
- UE is indicated in TCI state 0 as the active PDCCH TCI state for PDCCH associated with coresetPoolIndex 0, and UE is indicated in TCI state 0 as the active PDCCH TCI state for PDCCH associated with coresetPoolIndex 1.
- Target TCI state is not in the active TCI state list.

The test consists of two time periods, T1 and T2. During T1 only SSB0 and SSB2 are transmitted. At the beginning of T2, the SSB1 corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1 for PDCCH associated with coresetPoolIndex 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 associated with coresetPoolIndex 0 till n+ $T_{HARQ}$ +3 ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 associated with coresetPoolIndex 0 after n+ $T_{HARQ}$ +3 ms + ($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 6.5.13.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 and SSB2 are transmitted.
3. When T1 expires the SS starts transmitting SSB1 corresponding to TCI state 1. T2 starts.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5 The UE transmits an *RRCReconfigurationComplete* message
6. The SS sends a MAC-CE to indicate a switch to TCI state 1 for PDCCH associated with coresetPoolIndex 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) receives ACK/NACK on each UL transmission occasion scheduled on TCI state 0 associated with coresetPoolIndex 0 and

b) receives ACK/NACK on each UL transmission occasion scheduled on TCI state 0 associated with coresetPoolIndex 1 until slot n+$T_{HARQ}$+3ms, and

c) receives ACK/NACK on each UL transmission occasion scheduled on TCI state 1 associated with coresetPoolIndex 1 after n+ $T_{HARQ}$ +5 ms + $T_{first-SSB}$

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI state 0 for PDCCH associated with coresetPoolIndex 1.

9. Wait 1s for the UE to switch to TCI state 0 for PDCCH associated with coresetPoolIndex 1. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI state 0 associated with coresetPoolIndex 1 continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.13.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.5.13.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

### 6.5.13.1.5 Test requirement

Table 6.5.13.1.4.1-3 defines the primary level settings including test tolerances.

**Table 6.5.13.1.5-1: NR Cell specific test parameters for TCI state switch**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.1.2 |
| $BW_{channel}$ | Config 1,2 | | 10: $N_{PRB,c}$ = 52 |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| PDSCH Reference measurement channel Note 4 | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.1.2 FDD |
| | Config 2 | | CCR.1.2 TDD |
| | Config 3 | | CCR.2.4 TDD |
| | Config 1 | | TRS.1.1 FDD |

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| TRS Configuration for TRP 0 | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| TRS Configuration for TRP 1 Set 1 | Config 1 | | TRS.1.5 FDD |
| | Config 2 | | TRS.1.5 TDD |
| | Config 3 | | TRS.1.7 TDD |
| TRS Configuration for TRP 1 Set 2 | Config 1 | | TRS.1.6 FDD |
| | Config 2 | | TRS.1.6 TDD |
| | Config 3 | | TRS.1.8 TDD |
| OCNG Patterns | Config 1,2 | | OP.1 |
| | Config 3 | | OP.1 |
| SSB Configuration for TRP 0 | Config 1,2 | | SSB.2 FR1 |
| | Config 3 | | SSB.4 FR1 |
| SSB Configuration for TRP 1 | Config 1,2 | | SSB.7 FR1 |
| | Config 3 | | SSB.8 FR1 |
| TCI state 0 associated with coresetPoolIndex 0 | | | DLorJoint TCI.State.0 |
| TCI state 0 associated with coresetPoolIndex 1 | | | DLorJoint TCI.State.6 |
| TCI state 1 associated with coresetPoolIndex 1 | | | DLorJoint TCI.State.7 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1,2 | dBm/SCS | -104+TT |
| | Config 3 | | -101+TT |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104+TT |
| SS-RSRP Note 3 | Config 1,2 | dBm/SCS | -87+TT |
| | Config 3 | | -84+TT |
| $\hat{E}_s/I_{ot}$ | | dB | 17+TT |
| $\hat{E}_s/N_{oc}$ | | dB | 17+TT |
| Io Note3 | Config 1,2 | dBm/ 9.36 MHz | -58.96+TT |
| | Config 3 | dBm/ 38.16 MHz | -52.86+TT |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: PDSCH RMC for TRP0 and TRP1 are scheduled in non-overlapping PRBs

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall be able to continue receive on TRP 0, and for TRP 1, UE shall:

- be able to continue to receive on TCI state 0 till slot n+ $T_{HARQ}$ +3 ms
- be able to start receiving on TCI state 1 after slot n+ $T_{HARQ}$ +5 ms + $T_{first\text{-}SSB}$

The rate of correct events observed during repeated tests shall be at least 90 %.

# 6.6 Measurement procedures

## 6.6.1 Intra-frequency measurements

### 6.6.1.0 Minimum conformance requirements

#### 6.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

Same as 4.6.1.0.1

#### 6.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}\ \text{ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 6.6.1.0.2-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement within outside measurement gaps.

**Table 6.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range 1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle > 320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 6.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range 1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max( 200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 200ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

### 6.6.1.0.3 Void

### 6.6.1.0.4 Minimum conformance requirements for event-triggered measurement with gap with SSB index reading

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$.

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 6.6.1.0.4-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.1.0.4-2.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.4-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,\ i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted within measurement gaps.

When intrafrequency SMTC is fully non-overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, $K_p$=1

When intrafrequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

**Table 6.6.1.0.4-1: Time period for PSS/SSS detection (Frequency range 1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 6.6.1.0.4-2: Time period for time index detection (Frequency range 1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|

| | |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(3 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 6.6.1.0.4-3: Measurement period for intra-frequency measurements with gaps (Frequency Range 1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max( 200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 200ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than Tidentify_intra_with_index defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

### 6.6.1.0.5 Void

### 6.6.1.0.6 Minimum conformance requirements for event-triggered measurement with MUSIM gap configured

[TS 38.133 [6], clause 9.1.10]

If the UE requires gap patterns for MUSIM purpose, the network may provide one or more per-UE MUSIM gap pattern(s) for concurrent monitoring of all frequency layers for MUSIM via *MUSIM-GapConfig* [13]. The UE can be configured with no more than three periodic MUSIM gap patterns and/or one aperiodic MUSIM gap pattern for MUSIM via *MUSIM-GapConfig* [13]. The MUSIM gap patterns specified in Table 6.6.1.0.6-1 are applicable only for MUSIM operation.

The UE is not required to perform cell identification and measurement, paging monitoring, SIB acquisition, and/or on-demand SI request of the target cell in the target network that is outside the MUSIM gaps.

The UE is not required to conduct reception or transmission from or to the [source] network during MUSIM gaps that are not dropped due to collisions, as defined in TS 38.133 [6] clauses 9.1.10.4 and 9.1.10.5.

UE supporting MUSIM capability shall support the MUSIM gap patterns listed in Table 6.6.1.0.6-1 based on UE's capability specified in TS 38.306[11] and the applicability specified in Table 6.6.1.0.6-2.

UE determines MUSIM gap timing based on gap offset configuration from serving cell provided by higher layer signalling as specified in TS 38.331 [13].

**Table 6.6.1.0.6-1: MUSIM Gap Pattern Configurations**

| MUSIM Gap Pattern Id | MUSIM Gap Length (MGL, ms) | MUSIM Gap Repetition Period (MGRP, ms) |
|---|---|---|
| 0 | 6 | 40 |
| 1 | 6 | 80 |
| 2 | 3 | 40 |
| 3 | 3 | 80 |
| 4 | 6 | 20 |
| 5 | 6 | 160 |
| 6 | 4 | 20 |
| 7 | 4 | 40 |
| 8 | 4 | 80 |
| 9 | 4 | 160 |
| 10 | 3 | 20 |
| 11 | 3 | 160 |
| 12 | 10 | 80 |
| 13 | 20 | 160 |
| 14 | 6 | 320 |
| 15 | 6 | 640 |
| 16 | 6 | 1280 |
| 17 | 6 | 2560 |
| 18 | 10 | 320 |
| 19 | 10 | 640 |
| 20 | 10 | 1280 |
| 21 | 10 | 2560 |
| 22 | 20 | 320 |
| 23 | 20 | 640 |
| 24 | 20 | 1280 |
| 25 | 20 | 2560 |
| 26 | 20 | 5120 |
| 27 | 10 | NA |
| 28 | 20 | NA |
| NOTE 1: Measurement gap pattern #27, #28 are the aperiodic gap pattern without MGRP. | | |

**Table 6.6.1.0.6-2: Applicability for MUSIM Gap Pattern Configurations supported by the UE with NR standalone operation (with single carrier, NR CA configuration)**

| MUSIM gap pattern configuration | Serving cell | Gap Purpose | Applicable MUSIM Gap Pattern Id |
|---|---|---|---|
| Per-UE MUSIM gap | FR1, FR2, or FR1 + FR2 | MUSIM Note1 | 0-13, 14-26, 27, 28 |

NOTE 1: Inclusion of MUSIM procedures for per-UE MUSIM gaps only in NR single carrier, NR CA mode: MUSIM purpose which includes cell identification and measurement, paging monitoring, SIB acquisition, and/or on-demand SI request of the target cell in the target network.

[TS 38.133 [6], clause 9.1.10.2]

Priority levels are applied for each periodic MUSIM gap. A UE shall request a priority for all requested periodic MUSIM gaps when the UE requests MUSIM gaps via *MUSIM-GapConfig-r17* [13]. The UE shall request different priority level for each periodic MUSIM gaps. The network may assign priority to each periodic MUSIM gaps. The allocated priorities may differ from the priorities requested by the UE. The UE MUSIM requirements apply if the configured MUSIM gap priorities retain the same relative priorities among MUSIM gaps as requested by the UE.

The requirements in TS 38.133 [6] clause 9.1.10 apply provided different priority levels are allocated to each periodic MUSIM gaps and different priority levels are allocated to each periodic MUSIM gap and each measurement gap configured via *GapConfig-r17* without *preConfigInd-r17* or *ncsgInd-r17*.

An aperiodic MUSIM gap, when configured, is unconditionally kept in case of collisions with any other gap occasions, including MUSIM gaps and measurement gaps.

[TS 38.133 [6], clause 9.1.10.3]

The UE can request use of “keep solution” via *musim-GapKeepPreference* in [13]. Keep solution is for handling collisions among different MUSIM gaps. If the use of “keep solution” is granted, the UE shall keep all colliding periodic and aperiodic MUSIM gaps irrespectively of the priority of the periodic MUSIM gaps.

[TS 38.133 [6], clause 9.1.10.4]

MUSIM gap occasions are considered colliding if at least one of the following conditions is met:

- the MUSIM gap occasions are fully overlapping in time domain, or
- the MUSIM gap occasions partially overlapping in time domain, or
- the distance between the two MUSIM gap occasions is equal to or smaller than 4ms.

The distance between two MUSIM gap occasions is defined as the time difference between the ending point of the first occasion and the starting point of the second occasion, where the first MUSIM gap occasion occurs earlier in time than the second MUSIM gap occasion.

When “keep solution” in TS 38.133 [6] clause 9.1.10.3 is not used, a periodic MUSIM gap occasion colliding with an aperiodic MUSIM gap is dropped.

When “keep solution” in TS 38.133 [6], clause 9.1.10.3 is not used, collisions between periodic MUSIM gap occasions are resolved based on the assigned MUSIM gap priorities. Collisions are resolved sequentially in order of decreasing priority, starting with the gap that has the highest priority. For each collision, the occasion of the MUSIM gap with highest priority shall be kept and the occasion of the MUSIM gap with lower priority shall be dropped.

[TS 38.133 [6], clause 9.1.10.5]

MUSIM gap and measurement gap occasions are considered colliding if at least one of the following conditions is met:

- the MUSIM gap and measurement gap occasions are fully overlapping in time domain, or
- the MUSIM gap and measurement gap occasions are partially overlapping in time domain, or
- the distance between any of the MUSM gap and the measurement gap occasions is equal to or smaller than 4ms.

The distance between two gap occasions is defined as the time difference between the ending point of the first occasion and the starting point of the second occasion, where the first gap occasion occurs earlier in time than the second gap occasion. The gap occasion can be either a MUSIM gap occasion or a measurement gap occasion.

The measurement gap occasion colliding with an aperiodic MUSIM gap is dropped.

Collisions between MUSIM gaps and measurement gaps configured via *GapConfig-r17* with assigned priority but without *preConfigInd-r17* or *ncsgInd-r17* are handled based on their assigned priorities. Collisions are resolved

sequentially in order of decreasing priority, starting with the gap that has the highest priority. For each collision, the occasion of the MUSIM gap or measurement gap with highest priority shall be kept and the occasion of the MUSIM gap or measurement gap with lower priority shall be dropped.

Collisions between MUSIM gaps and measurement gaps configured via GapConfig or configured via *GapConfig-r17* without assigned priority are handled based on MGRP of the colliding gaps. Collisions are resolved sequentially in order of decreasing MGRP, starting with the gap that has the longest MGRP. For each collision, the occasion of the MUSIM gap or measurement gap with longer MGRP shall be kept and the occasion of the MUSIM gap or measurement gap with shorter MGRP shall be dropped. If the colliding MUSIM gap and measurement gap have the same MGRP, the requirements in clause 9 shall not apply.

[TS 38.133 [6], clause 9.1.10.6]

A slot is interrupted by a MUSIM gap if it overlaps with any occasion of the configured MUSIM gap, except for a dropped MUSIM gap occasion.

### 6.6.1.1 NR SA FR1 event-triggered reporting without gap in non-DRX

#### 6.6.1.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX.

#### 6.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

#### 6.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.1.

#### 6.6.1.1.4 Test description

##### 6.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.1.4.1-1.

**Table 6.6.1.1.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX**

| Test Case ID | Description |
|---|---|
| 6.6.1.1-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.1.1-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.1.1-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.1.1.4.1-2.

**Table 6.6.1.1.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 below.

2. Message contents are defined in clause 6.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

### 6.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

- transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

OR

- switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
- if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
Or
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.1.4.3-1: Common Exception messages SA intra-frequency event triggered reporting tests without gap under non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for configuration 6.6.1.1-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.1-3<br><br>Table H.3.1-4 with A3-offset = -4.5dB<br><br>Table H.3.1-5 with Condition INTRA-FREQ<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.1-8 with Condition SSB RLM |

#### 6.6.1.1.5 Test requirement

Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1 define the primary level settings including test tolerances for NR SA event triggered reporting test without gap under non-DRX.

**Table 6.6.1.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | | |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index}$ = ($T_{PSS/SSS_sync_intra}$ + $T_{SSB_measurement_period_intra}$) ms

$T_{PSS/SSS_sync_intr}$= max [ 600 ms, ceil (5 × $K_p$) × SMTC period ] × $CSSF_{intra}$ = 600 ms

$T_{SSB_measurement_period_intra}$= max [ 200 ms, ceil( 5 × $K_p$) × SMTC period ] × $CSSF_{intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.1.2 NR SA FR1 event-triggered reporting without gap in DRX

### 6.6.1.2.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX.

### 6.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle. Test 1 can be skipped if test case 6.6.1.13 is executed.

### 6.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.2.

### 6.6.1.2.4 Test description

#### 6.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.2.4.1-1.

**Table 6.6.1.2.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in DRX**

| Test Case ID | Description |
|---|---|
| 6.6.1.2-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.1.2-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.1.2-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.2.4.1-2.

**Table 6.6.1.2.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 below.

2. Message contents are defined in clause 6.6.1.2.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.2.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | | |
| SSB configuration | | 1 | SSB.1 FR1 | | |
| | | 2 | SSB.1 FR1 | | |
| | | 3 | SSB.2 FR1 | | |
| SMTC configuration | | 1 | SMTC.2 | | |
| | | 2 | SMTC.1 | | |
| | | 3 | SMTC.1 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | 1 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1 |
| | | 2 | 3 us | | Synchronous cells |
| | | 3 | 3 us | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 5 | 10 | |

### 6.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 and Table 6.6.1.2.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.2.4.1-1 as appropriate.

### 6.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.2.4.3-1: Common Exception messages for SA intra-frequency event triggered reporting tests without gap under DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO SSB.1 FR1, SMTC.2 for configuration 6.6.1.2-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.2-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO SSB.2 FR1, SMTC .1 and synchronous cells for configuration 6.6.1.2-3<br><br>Table H.3.1-4 with A3-offset = -4.5dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.1-8 with Condition SSB RLM<br><br>Table H.3.7-1 with Condition DRX.1 and Offset for test 1<br>Table H.3.7-1 with Condition DRX.7 and Offset for test 2 |

### 6.6.1.2.5 Test requirement

Table 6.6.1.2.4.1-3 and Table 6.6.1.2.5-1 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

**Table 6.6.1.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| | | 1 | SR.1.1 FDD | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH RMC configuration | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | | |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = \max[600ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 600ms$

$T_{SSB_measurement_period_intra} = \max[200ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 320ms$

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of 922 ms.

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200ms$

$T_{SSB_measurement_period_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200ms$

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of 6402 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 6.6.1.3 NR SA FR1 event-triggered reporting with gap in non-DRX

#### 6.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements.

#### 6.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting 5GS NR SA FR1, CSI-RS-based RLM and BWP operation without bandwidth restriction.

#### 6.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.3.

#### 6.6.1.3.4 Test description

##### 6.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.3.4.1-1.

**Table 6.6.1.3.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Test Case ID | Description |
|---|---|
| 6.6.1.3-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.1.3-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.1.3-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

**Table 6.6.1.3.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.3.4.1-3.

2. Message contents are defined in clause 6.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.3.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2, 3 | 40 | |
| Measurement gap length | ms | 1, 2, 3 | 6 | |
| Measurement gap offset | ms | 1, 2, 3 | 39 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

#### 6.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.3-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and Synchronous cells for Configuration 6.6.1.3-2<br>Table H.3.1-3 with ConditionINTRA-FREQ MO, SSB.2 FR1, SMTC.1 and Synchronous cells for Configuration 6.6.1.3-3<br><br>Table H.3.1-4 with A3-offset = -4.5dB<br><br>Table H.3.1-5 with Condition INTRA-FREQ<br><br>Table H.3.1-6 with Condition Pattern #0<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.1.3.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

### 6.6.1.3.5 Test requirement

Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

**Table 6.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | | |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.1.4 NR SA FR1 event-triggered reporting with gap in DRX

### 6.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements.

### 6.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

### 6.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.4.

### 6.6.1.4.4 Test description

#### 6.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.4.4.1-1.

**Table 6.6.1.4.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in DRX**

| Test Case ID | Description |
|---|---|
| 6.6.1.4-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.1.4-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.1.4-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.4.4.1-2.

**Table 6.6.1.4.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.4.4.1-3.
2. Message contents are defined in clause 6.6.1.4.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.4.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1, 2, 3 | 40 | | |
| Measurement gap length | ms | 1, 2, 3 | 6 | | |
| Measurement gap offset | ms | 1, 2, 3 | 39 | | |
| SSB configuration | | 1 | SSB.1 FR1 | | |
| | | 2 | SSB.1 FR1 | | |
| | | 3 | SSB.2 FR1 | | |
| SMTC configuration | | 1 | SMTC.2 | | |
| | | 2 | SMTC.1 | | |
| | | 3 | SMTC.1 | | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | 1 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | | Synchronous cells |
| | | 3 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 5 | 10 | |

### 6.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.4.4.1-3 and Table 6.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.4.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.4.4.1-3 as appropriate.

#### 6.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.4.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for configuration 6.6.1.4-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.4-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.4-3<br><br>Table H.3.1-4 with A3-offset = -4.5dB<br><br>Table H.3.1-5 with Condition INTRA-FREQ<br><br>Table H.3.1-6 with Condition Pattern #0<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.7-1 with Condition DRX.1 and Gap for test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap for test 2<br><br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.1.4.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

6.6.1.4.5 Test requirement

Table 6.6.1.4.4.1-3 and Table 6.6.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

**Table 6.6.1.4.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | | |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra}$ =3200 ms for Test 2

$T_{SSB_measurement_period_intra}$ = 320 ms for Test 1, and $T_{SSB_measurement_period_intra}$ = 3200 ms for Test 2

TTI insertion uncertainty = 2 ms

For Test 1, the overall delays measured shall be less than a total of 922 ms (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2, the overall delays measured shall be less than a total of 6402 ms (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.1.5 NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

### 6.6.1.5.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search without gaps requirements.

### 6.6.1.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

### 6.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.5.

6.6.1.5.4 Test description

6.6.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.5.4.1-1.

**Table 6.6.1.5.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading**

| Configuration | Description |
|---|---|
| 6.6.1.5-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.5.4.1-2.

**Table 6.6.1.5.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.5.4.1-3.
2. Message contents are defined in clause 6.6.1.5.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.5.4.1-3: General test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | Cell 1 | |
| Neighbour cell | | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| A3-Offset | dB | 1 | -4.5 | |
| CP length | | 1 | Normal | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 5 | |

#### 6.6.1.5.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.5.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.5.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.5.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.5-1<br>Table H.3.1-4 with SSB Index and A3-offset = -4.5 dB<br>Table H.3.1-5 with Condition INTRA-FREQ<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with Condition SSB RLM |

6.6.1.5.5 Test requirement

Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1 define the primary level settings including test tolerances for SA event triggered reporting without gap under non-DRX with SSB index reading test.

**Table 6.6.1.5.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Patterns | | 1 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| Propagation Condition | | 1 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_time_index_intra}$ = 120 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 6.6.1.6 NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

#### 6.6.1.6.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search with gaps requirements.

#### 6.6.1.6.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting 5GS NR SA FR1, CSI-RS-based RLM and BWP operation without bandwidth restriction.

#### 6.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.6.

#### 6.6.1.6.4 Test description

##### 6.6.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.6.4.1-1.

**Table 6.6.1.6.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading**

| Configuration | Description |
|---|---|
| 6.6.1.6-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

**Table 6.6.1.6.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.6.4.1-3.

2. Message contents are defined in clause 6.6.1.6.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.6.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | Cell 1 | |
| Neighbour cell | | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1 | 40 | |
| Measurement gap length | ms | 1 | 6 | |
| Measurement gap offset | ms | 1 | 39 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | |
| A3-Offset | dB | 1 | -4.5 | |
| CP length | | 1 | Normal | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 5 | |

### 6.6.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.6.5-1.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the

UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.6.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.6-1<br>Table H.3.1-4 with SSB index and A3-offset = -4.5dB.<br>Table H.3.1-5 with Condition INTRA-FREQ<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB index<br><br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.1.6.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

### 6.6.1.6.5 Test requirement

Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1 define the primary level settings including test tolerances for SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading test.

**Table 6.6.1.6.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| OCNG Patterns | | 1 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| Propagation Condition | | 1 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_time_index_intra}$ = 120 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

#### 6.6.1.7.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX for UE configured with highSpeedMeasFlag-r16.

#### 6.6.1.7.2 Test applicability

This test applies to all types of NR UE release 15 onwards that supports measurement enhancements in high speed scenario.

#### 6.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.7.

#### 6.6.1.7.4 Test description

##### 6.6.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.7.4.1-1.

**Table 6.6.1.7.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Configuration | Description |
|---|---|
| 6.6.1.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.1.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.1.7-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.7.4.1-2.

**Table 6.6.1.7.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.2.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.7.4.1-3 below.

2. Message contents are defined in clause 6.6.1.7.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.7.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| *highSpeedMeasFlag-r16* | | 1,2,3 | Present | To enable high speed measurement enhancements |
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.7 | 640ms DRX cycle |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 6 | |

### 6.6.1.7.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.7.4.1-3 and Table 6.6.1.7.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.7.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.7.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.7.4.3-1: Common Exception messages for SA intra-frequency event triggered reporting tests without gap under DRX for UE configured with highSpeedMeasFlag-r16**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.7-1 with Condition DRX.7 and Offset |
| Specific message contents exceptions for Test Configuration 6.6.1.7-1 | Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 6.6.1.7-2 | Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 6.6.1.7-3 | Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.2 FR1 |

6.6.1.7.5 Test requirement

Table 6.6.1.7.4.1-3 and Table 6.6.1.7.5-1 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used

**Table 6.6.1.7.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TN/A | | TN/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94+TT | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25T | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2 | AWGN | | AWGN 1944Hz Note 4 | |
| | | 3 | AWGN | | AWGN 3334Hz Note 5 | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2. When DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200ms$

$T_{SSB_measurement_period_intra} = ceil(Y \times K_p) \times DRX\ cycle \times CSSF_{intra} = 1920ms$

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of 5122 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.1.8 NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

### 6.6.1.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasCA-Scell-r17. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2.5.1 and 9.2.5.2.

### 6.6.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced NR CA measurement requirements in high-speed scenario.

### 6.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.8.

### 6.6.1.8.4 Test description

#### 6.6.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.8.4.1-1.

**Table 6.6.1.8.4.1-1: Supported PCell test configurations for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Configuration | Description |
|---|---|
| 6.6.1.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.1.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.1.8-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration. | |

**Table 6.6.1.8.4.1-1A: Supported SCell test configurations for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| $Configuration_{SCell}$ | Description |
|---|---|
| 6.6.1.8-1A | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.1.8-2A | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.1.8-3A | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration.<br>Note 3: NR Cell 3 has the same SCS, BW and duplex mode as NR Cell 2. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.8.4.1-2.

**Table 6.6.1.8.4.1-2: Initial conditions for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.8.4.1-3.

2. Message contents are defined in clause 6.6.1.8.4.3.

3. There is two carriers and three cells specified in the test. NR Cell 1 is the PCell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test. NR Cell 2 is is a FR1 deactivated SCell and NR Cell 3 is a neighbour cell on the same frequency as the SCell.

**Table 6.6.1.8.4.1-3: General test parameters for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| highSpeedMeasCA-Scell-r17 | | 1,2,3 | Present | To enable high speed measurement enhancements |
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A6-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.6 | |

| | | | | |
|---|---|---|---|---|
| measCycleSCell | | 1, 2, 3 | 640ms | |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 10 | |

#### 6.6.1.8.4.2 Test procedure

Same test procedure as in 6.6.1.7.4.2 except following step 6:

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5762 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 6.6.1.8.4.3 Message contents

**Table 6.6.1.8.4.3-1: Common Exception messages for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.7-1 with Condition DRX.6 |
| Specific message contents exceptions for Test Configuration 6.6.1.8-1 | Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 6.6.1.8-2 | Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 6.6.1.8-3 | Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.2 FR1 |

**Table 6.6.1.8.4.3-2: *ReportConfigNR-DEFAULT* (a6-offset): NR report configuration for event A6**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA6 SEQUENCE { | | | |
| a6-Offset CHOICE { | | | |
| rsrp | -9 | The actual value is field value * 0.5 dB. | |
| } | | | |
| hysteresis | 0 | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.1.8.4.3-3: *ServingCellConfigCommon***

| Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| HighSpeedConfig-v1700 SEQUENCE { | | | |
| highSpeedMeasCA-Scell-r17 | true | | |
| } | | | |
| } | | | |

**Table 6.6.1.8.4.3-4: *MeasObjectNR-DEFAULT*: measCycleSCell configuration for SCell intra-frequency measurements**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

6.6.1.8.5 Test requirement

Table 6.6.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

**Table 6.6.1.8.5-1: NR cell specific test parameters for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17**

| Parameter | Unit | Test configuration | Cell 1 | Cell 2 | Cell 3Cell 3 |
|---|---|---|---|---|---|
| TDD configuration | | 1 | N/A | N/A | N/A |
| | | 2 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
| | | 3 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | N/A | N/A |
| | | 2 | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | N/A | N/A |
| | | 2 | CR.1.1 TDD | N/A | N/A |
| | | 3 | CR.2.1 TDD | N/A | N/A |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | N/A | N/A |
| | | 2 | CCR.1.1 TDD | N/A | N/A |
| | | 3 | CCR.2.1 TDD | N/A | N/A |
| OCNG Patterns | | 1, 2, 3 | OP.1 | OP.1 | OP.1 |
| TRS configuration | | 1 | TRS.1.1 FDD | N/A | N/A |
| | | 2 | TRS.1.1 TDD | N/A | N/A |
| | | 3 | TRS.1.2 TDD | N/A | N/A |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3 | SSB | SSB | SSB |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | |
| | | 2 | -98 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -64.60 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -64.60 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -58.50 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1,2 | AWGN | | | | AWGN 1944Hz Note 4 | |
| | | 3 | AWGN | | | | AWGN 3334Hz Note 5 | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 5: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 5760 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.1.9 NR SA FR1 event triggered reporting with MUSIM gap configured

### 6.6.1.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event on an intra-frequency layer based on measurement performed without measurement gaps when the UE is also configured with MUSIM gaps. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2.5.1 and 9.2.5.2.

### 6.6.1.9.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting providing MUSIM assistance information with MUSIM gap preference and related MUSIM gap configuration.

### 6.6.1.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1.0.1 and 6.6.1.0.6.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.9.

### 6.6.1.9.4 Test description

#### 6.6.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.9.4.1-1.

**Table 6.6.1.9.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with MUSIM gap configured**

| Configuration | Description |
|---|---|
| 6.6.1.9-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.1.9-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.1.9-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.9.4.1-2.

**Table 6.6.1.9.4.1-2: Initial conditions for NR SA FR1 event triggered reporting with MUSIM gap configured**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.9.4.1-3.

2. Message contents are defined in clause 6.6.1.9.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.9.4.1-3: General test parameters for SA intra-frequency event triggered reporting with MUSIM gap configured**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| MUSIM gap Pattern ID | | 1,2,3 | 0 | |
| MUSIM gap offset | ms | 1,2,3 | 0 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

#### 6.6.1.9.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.9.4.1-3 and Table 6.6.1.9.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.9.5-1.

3. SS shall transmit an *RRCReconfiguration* message with *measConfig* and *musim-GapConfig-r17*.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.9.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

- transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

OR

- switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   Or
   - if the device has been switched off, switch on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.9.4.3 Message contents

**Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.6.1.9.4.3-1: Common Exception messages SA intra-frequency event triggered reporting with MUSIM gap configured**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 6.6.1.9-1 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.6.1.9-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.6.1.9-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 |

**Table 6.6.1.9.4.3-2: RRCReconfiguration: NR measurement Configuration (Step 3, Test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT specified in Table H.3.1-2 with Condition INTRA-FREQ | Measurement configuration | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| musim-GapConfig-r17 CHOICE { | | | |
| setup | MUSIM-GapConfig | MUSIM gap configuration Table 6.6.9.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.1.9.4.3-3: MUSIMGapConfig (Table 6.6.1.9.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-82BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MUSIM-GapConfig-r17 ::= SEQUENCE { | | | |
| musim-GapToReleaseList-r17 | not present | | |
| musim-GapToAddModList-r17 SEQUENCE (SIZE (1..3)) OF MUSIM-Gap-r17 { | 1 entry | | |
| MUSIM-Gap-r17 SEQUENCE { | | Entry 1 | |
| musim-GapId-r17 | 0 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #0 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | Pattern #0 | |
| ms40 | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| musim-AperiodicGap-r17 | not present | | |
| } | | | |

6.6.1.9.5 Test requirement

Table 6.6.1.9.4.1-3 and Table 6.6.1.9.5-1 define the primary level settings including test tolerances for NR SA event triggered reporting test with MUSIM gap configured.

**Table 6.6.1.9.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with MUSIM gap configured**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | | |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ms

$T_{PSS/SSS_sync_intra}$= max [ 600 ms, ceil (5 × $K_p$) × SMTC period ] × $CSSF_{intra}$= 600 ms

$T_{SSB_measurement_period_intra}$ = max [ 200 ms, ceil( 5 × $K_p$) × SMTC period ] × $CSSF_{intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.1.10 to 6.6.1.12

## 6.6.1.12 NR SA FR1 event triggered reporting with SSB index detection without measurement gap in non-DRX mode for UE operating with 12 PRB SSB bandwidth

### 6.6.1.12.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event when the intra-frequency target cell is transmitting 12 PRB SSB. This test will partly verify the FDD intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2.5.1 and 9.2.5.2.

### 6.6.1.12.2 Test applicability

This test applies to all types of NR UE Release 18 supporting less than 5 MHz bandwidth.

### 6.6.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in TS 38.133 [6] clauses 9.2.5.1 and 9.2.5.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.12.

### 6.6.1.12.4 Test description

#### 6.6.1.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.12.4.1-1.

**Table 6.6.1.12.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with SSB index reading for 12 PRB bandwidth**

| Configuration | Description |
|---|---|
| 6.6.1.12-1 | 15 kHz SSB SCS, 3 MHz bandwidth, FDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.12.4.1-2.

**Table 6.6.1.12.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with SSB index reading for 12 PRB bandwidth**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.12.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.1.5.4.1-3 with test configuration 1, except those specified in Table 6.6.1.12.4.1-3.

2. Message contents are defined in clause 6.6.1.12.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.1.12.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with SSB index reading for 12 PRB bandwidth**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| SSB configuration | | 1 | SSB.13 FR1 | |

### 6.6.1.12.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.5.4.1-3 config 1 with the exceptions specified in Table 6.6.1.12.4.1-3 and Table 6.6.1.5.5-1 config 1 with the exceptions specified in Table 6.6.1.12.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

During time duration T1, the UE shall not have any timing information of Cell 2.

The test steps are same as 6.6.1.5.4.2 except these steps:

2. Set the parameters according to T1 in Table 6.6.1.5.5-1 with the exceptions specified in Table 6.6.1.12.5-1.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.5.5-1 with the exceptions specified in Table 6.6.1.12.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 942 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

### 6.6.1.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.12.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with SSB index reading for 12 PRB bandwidth**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, [SSB.13 FR1], SMTC.2<br>Table H.3.1-4 with SSB Index and A3-offset = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with Condition SSB RLM |

#### 6.6.1.12.5 Test requirement

Table 6.6.1.5.4.1-3 config 1 with the exceptions specified in Table 6.6.1.12.4.1-3 and Table 6.6.1.5.5-1 config 1 with the exceptions specified in Table 6.6.1.12.5-1 define the primary level settings.

**Table 6.6.1.12.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with SSB index reading for 12 PRB bandwidth**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $BW_{channel}$ | MHz | 1 | 3: $N_{RB,c}$ = 15 | | 3: $N_{RB,c}$ = 15 | |
| PDSCH RMC configuration | | 1 | SR.1.2 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.1.3 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.7 FDD | | N/A | |
| Io | dBm/2.7 MHz | 1 | -70.00 | -67.65 | -70.00 | -67.65 |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra_less_than_5MHz}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_time_index_intra_less_than_5MHz}$ = 140 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 942 ms in this test case (note: this gives a total of 940 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 6.6.1.13 NR SA FR1 event-triggered reporting tests without gap under Cell DTX

#### 6.6.1.13.1 Test purpose

To verify the UE's ability to make correct reporting of an event within intra-frequency cell search without gap under Cell DTX configuration.

#### 6.6.1.13.2 Test applicability

This test applies to all types of NR UE release 18 and forward and support Cell DTX operation.

#### 6.6.1.13.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.13.

6.6.1.13.4 Test description

6.6.1.13.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.13.4.1-1.

**Table 6.6.1.13.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap with Cell DTX**

| Test Case ID | Description |
|---|---|
| 6.6.1.13-1 | 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.1.13-2 | 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.1.13-3 | 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE fulfils the requirements in this Cell DTX test case can skip the test case in 6.6.1.2 DRX.1 configuration. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.13.4.1-2.

**Table 6.6.1.13.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap with Cell DTX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.13.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.13.4.1-3 below.
2. Message contents are defined in clause 6.6.1.13.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.1.13.4.1-3: General test parameters for SA intra-frequency event triggered reporting without gap for FR1 with Cell DTX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |

| | | | | |
|---|---|---|---|---|
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.1 | |
| Cell DTX | | 1,2,3 | DTX.1 | |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

### 6.6.1.13.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.13.4.1-3 and Table 6.6.1.13.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2. During time duration T2, NW triggers the Cell DTX.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.13.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.13.5-1. T2 starts.

6. SS transmit an *RRCReconfiguration* message to configure and activate Cell DTX. The UE shall transmit *RRCReconfigurationComplete* message.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1082 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.1.13.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.1.13.4.3-1: Common Exception messages for SA intra-frequency event triggered reporting tests without gap with Cell DTX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for configuration 6.6.1.13-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.13-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.13-3<br><br>Table H.3.1-4 with A3-offset = -4.5<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.1-8 with Condition SSB RLM<br><br>Table H.3.7-1 with Condition DRX.1 and Offset |

**Table 6.6.1.13.4.3-2: RRCReconfiguration (step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.1.13.4.3-3: CellGroupConfig (Table 6.6.1.13.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| servingCellConfig SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| setup | PDCCH-Config | | |
| } | | | |
| cellDTX-DRX-Config-r18 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cellDTX-DRX-onDurationTimer-r18 CHOICE { | | | |
| milliSeconds | ms1 | | |

| | | | |
|---|---|---|---|
| } | | | |
| cellDTX-DRX-CycleStartOffset-r18 CHOICE { | | | |
| ms160 | 0 | | |
| } | | | |
| cellDTX-DRX-SlotOffset-r18 | 0 | | |
| cellDTX-DRX-ConfigType-r18 | dtx | | |
| cellDTX-DRX-ActivationStatus-r18 | activated | | |
| } | | | |
| } | | | |
| positionInDCI-cellDTRX-r18 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.1.13.5 Test requirement

Table 6.6.1.13.4.1-3 and Table 6.6.1.13.5-1 define the primary level settings including test tolerances for NR event-triggered reporting without gap under Cell DTX.

**Table 6.6.1.13.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap with Cell DTX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | N/A | |
| | | 2 | CCR.1.1 TDD | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 + 160 = 1080 ms from the beginning of time period T2, while 160ms is the Cell DTX cycle length, which is the delay uncertainty for next available PUSCH for L3 MR reporting during cell DTX. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2 Inter-frequency measurements

### 6.6.2.0 Minimum conformance requirements for Inter-frequency measurements

#### 6.6.2.0.1 Minimum conformance requirements for Inter-frequency measurement with measurement gaps

Same as clause 4.6.2.0 when measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps.

#### 6.6.2.0.2 Minimum conformance requirements for Inter-frequency measurement without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$. It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following condition is met:

- SFN and frame boundary across serving cell and inter-frequency neighbour cells is aligned

$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})$ ms

$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})$ ms

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 6.6.2.0-1

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.2.0-2.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 6.6.2.0-3 and table 6.6.2.0-4.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when inter-frequency SMTC is fully overlapping with measurement gaps.

$M_{pss/sss_sync_inter}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{pss/sss_sync_inter}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_inter}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =40 samples. For a vehicle mounted UE supporting FR2 power class 2, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 24 samples.

When inter-frequency SMTC is fully non overlapping with measurement gaps or inter-frequency SMTC is fully overlapping with MGs, Kp=1.

When inter-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

**Table 6.6.2.0-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 6.6.2.0-2: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{inter}$ |

| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. |
|---|

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 6.6.2.0-3 and 6.6.2.0-4, if UE supports inter-frequency measurement without measurement gaps:

**Table 6.6.2.0-3: Measurement period for inter-frequency measurements without gaps ((FR1)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$) x SMTC period)$^{Note\ 1}$ x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 6.6.2.0-4: Measurement period for inter-frequency measurements without gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(400ms, ceil($M_{meas_period_inter}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)$^{Note\ 1}$ x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x $M_{meas_period_inter}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil($M_{meas_period_inter}$ x$K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by *SSB-ToMeasure* [13], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [8] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in TS 38.133 [6] clause 9.3.9.3.1~9.3.9.3.3 are valid under the following conditions:

- SFN and frame boundary across serving cell and inter-frequency neighbour cells is aligned, and

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

For UE which do not support *simultaneousRxDataSSB-DiffNumerology-Inter-r16* [11] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If UE performs inter-frequency measurements without measurement gaps in a TDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

- If UE performs inter-frequency measurements without measurement gaps in a FDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

#### 6.6.2.0.3 Minimum conformance requirements for event-triggered measurement with MUSIM gap with lower and higher priority

Same as clause 6.6.1.0.6.

#### 6.6.2.0.4 Minimum conformance requirements for event triggered reporting using MUSIM gap with shorter MGRP

Same as clause 6.6.1.0.6.

### 6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX

#### 6.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

#### 6.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.1.

#### 6.6.2.1.4 Test description

##### 6.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.1.4.1-2. Test environment parameters are given in Table 6.6.2.1.4.1-3.

**Table 6.6.2.1.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.2.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.2.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.2.1-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 6.6.2.1.4.1-2: SA FR1-FR1 general test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

**Table 6.6.2.1.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 6.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

### 6.6.2.1.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.1.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.1.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 920 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR:
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.1.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9Table H.3.1-7 with Condition INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.1-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.1-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.1-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

### 6.6.2.1.5 Test requirement

Table 6.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | - | |
| | | | Config 2 | CCR.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{\mathrm{oc}}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{\mathrm{oc}}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. with a confidence level of 95%

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2\mathrm{xTTI}_{\mathrm{DCCH}}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX

### 6.6.2.2.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

### 6.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.2.

### 6.6.2.2.4 Test description

#### 6.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.2.4.1-2. Test environment parameters are given in Table 6.6.2.2.4.1-3.

**Table 6.6.2.2.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.2.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.2.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.2.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 6.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies are used |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 1.1 | 11 | |

**Table 6.6.2.2.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 6.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

### 6.6.2.2.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.2.4.1-2 and 6.6.2.2.5-1.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.2.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1 or 10240 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.2.4.1-2 as appropriate.

#### 6.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.2.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |
| Specific message contents exceptions for Test Configuration 6.6.2.2-1 | Table H.3.1-3 with Conditions INTER-FREQ MO and<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.2-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.2-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

#### 6.6.2.2.5 Test requirement

Table 6.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.2.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2,3 | TDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | - | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| | | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2, UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.3 Void

## 6.6.2.4 Void

## 6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

### 6.6.2.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

### 6.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 6.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.5.

### 6.6.2.5.4 Test description

#### 6.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.5.4.1-2. Test environment parameters are given in Table 6.6.2.5.4.1-3.

**Table 6.6.2.5.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.2.5-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.2.5-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.2.5-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 6.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2 |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1.1 | |

**Table 6.6.2.5.4.1-3: Environment test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 6.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

### 6.6.2.5.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.5.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.5.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1040 ms for Test 1 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.5.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Conditions INTER-FREQ and SSB Index |
| Specific message contents exceptions for Test Configuration 6.6.2.5-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.5-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.5-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

### 6.6.2.5.5 Test requirement

Table 6.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | - | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16MHz | Config 3 | -58.4 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection

### 6.6.2.6.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

### 6.6.2.6.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.6.

### 6.6.2.6.4 Test description

#### 6.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.6.4.1-2. Test environment parameters are given in Table 6.6.2.6.4.1-3.

**Table 6.6.2.6.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.2.6-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode |
| 6.6.2.64-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode |
| 6.6.2.6-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 6.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies are used |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2 |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | Synchronous cells |

| | | | | | |
|---|---|---|---|---|---|
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 1.3 | 13.5 | |

**Table 6.6.2.6.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 6.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Table Annex C.1.2.

### 6.6.2.6.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.6.4.1-2 and Table 6.6.2.6.5-1.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.6.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1 or 12160 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

- if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.6.4.1-2 as appropriate.

#### 6.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.6.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Conditions INTER-FREQ and SSB Index<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |
| Specific message contents exceptions for Test Configuration 6.6.2.6-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.6-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.6-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

#### 6.6.2.6.5 Test requirement

Table 6.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2,3 | TDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| Initial DL BWP | | | DLBWP.0.1 | | NA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial UL BWP | | Config 1, 2, 3 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR 2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR 2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | - | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2, UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 6.6.2.7 Void

### 6.6.2.8 Void

### 6.6.2.9 SA event triggered reporting tests with additional mandatory gap pattern

#### 6.6.2.9.1 Test purpose

To verify that the UE makes correct reporting of an event when mandatory gap pattern with 3ms MGL is configured within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

#### 6.6.2.9.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting *supportedGapPattern-NRonly-r16* and Gap Pattern 3.

#### 6.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.9.

#### 6.6.2.9.4 Test description

##### 6.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.9.4.1-1.

**Table 6.6.2.9.4.1-1: SA FR1 event triggered reporting tests with additional mandatory gap pattern supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.2.9-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 6.6.2.9-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 6.6.2.9-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.9.4.1-2.

**Table 6.6.2.9.4.1-2: Test Environment parameters for SA FR1 event triggered reporting tests with additional mandatory gap pattern**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.9.4.1-3.
2. Message contents are defined in clause 6.6.2.9.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.9.4.1-3: General test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 3 | As specified in clause TS 38.133 [6] 9.1.2-1. |
| Measurement gap offset | | Config 1 | 12 | |
| | | Config 2,3 | 9 | |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.10.1 |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

#### 6.6.2.9.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.9.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.9.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
     OR:

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.9.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.9-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.9<br>Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 12 |
| Specific message contents exceptions for Test Configuration 6.6.2.9-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br>Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 6.6.2.9-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br>Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |

### 6.6.2.9.5 Test requirement

Table 6.6.2.9.5-1 defines the primary level settings including test tolerances for SA inter-frequency event triggered reporting with additional mandatory gap pattern.

**Table 6.6.2.9.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB parameters | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | | Config 1 | SMTC.1 | | SMTC.9 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 6.6.2.10 SA event triggered reporting tests for FR1 when DRX is used

### 6.6.2.10.1 Test purpose

To verify that the UE makes correct reporting of an event when no gap is configured and DRX is used within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.9.

### 6.6.2.10.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

#### 6.6.2.10.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.10.

#### 6.6.2.10.4 Test description

##### 6.6.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.10.4.1-1.

**Table 6.6.2.10.4.1-1: SA event triggered reporting tests for FR1 without gap when DRX is used supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.2.10-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.2.10-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.2.10-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.10.4.1-2.

**Table 6.6.2.10.4.1-2: Test Environment parameters for SA event triggered reporting tests for FR1 without gap when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.10.4.1-3.
2. Message contents are defined in clause 6.6.2.10.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.10.4.1-3: General test parameters for SA event triggered reporting tests for FR1 without gap when DRX is used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |

| | | | | |
|---|---|---|---|---|
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

### 6.6.2.10.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.10.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.10.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test Configuration 1 and 900 ms for Test Configuration 2 and 3then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
     OR:

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.10.4.1-2 as appropriate.

6.6.2.10.4.3 Message contents

**Table 6.6.2.10.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.10-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.10-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.10-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

6.6.2.10.5 Test requirement

Table 6.6.2.10.5-1 defines the primary level settings including test tolerances for SA event triggered reporting tests for FR1 without gap when DRX is used.

**Table 6.6.2.10.5-1: Cell specific test parameters for SA event triggered reporting tests for FR1 without gap when DRX is used**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1 | SR.1.1 FDD | | NA | |
| | | Config 2 | SR.1.1 TDD | | NA | |
| | | Config 3 | SR2.1 TDD | | NA | |
| CORESET Reference Channel | | Config 1 | CR.1.1 FDD | | NA | |
| | | Config 2 | CR.1.1 TDD | | NA | |
| | | Config 3 | CR2.1 TDD | | NA | |
| SSB parameters | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test config 1, UE is required to report SSB time index. UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test config 2 and 3, UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 900 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.11 SA event triggered reporting tests for FR1 without gap when DRX is not used

### 6.6.2.11.1 Test purpose

To verify that the UE makes correct reporting of an event when no gap is configured and DRX is not used within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.9.

### 6.6.2.11.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

### 6.6.2.11.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.11.

### 6.6.2.11.4 Test description

#### 6.6.2.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.11.4.1-1.

**Table 6.6.2.11.4.1-1: SA event triggered reporting tests for FR1 without gap when DRX is not used supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.2.11-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode |
| 6.6.2.11-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode |
| 6.6.2.11-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode |
| NOTE.1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.11.4.1-2.

**Table 6.6.2.11.4.1-2: Test Environment parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.11.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.10.4.1-3.
2. Message contents are defined in clause 6.6.2.10.4.3.

3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.11.4.1-3: General test parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

### 6.6.2.11.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.11.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.11.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 800 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

- switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

- if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR:

  - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.11.4.1-2 as appropriate.

### 6.6.2.11.4.3 Message contents

**Table 6.6.2.11.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.11-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.11-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.11s-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

### 6.6.2.11.5 Test requirement

Table 6.6.2.11.5-1 defines the primary level settings including test tolerances for SA event triggered tests for FR1 without gap when DRX is not used.

**Table 6.6.2.11.5-1: Cell specific test parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2,3 | TDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |

| | | | | |
|---|---|---|---|---|
| Propagation Condition | | Config 1,2,3 | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The UE is not required to read the neighbour cell SSB index in this test.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 6.6.2.12 NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

### 6.6.2.12.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event when UE is configured with highSpeedMeasInterFreq-r17. This test will partly verify the SA inter-frequency NR cell search requirements in 38.133 [6] clause 9.3.4.

### 6.6.2.12.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward supporting enhanced inter-frequency NR measurement requirements in high-speed scenario (*measurementEnhancementInterFreq-r17*, as defined in TS 38.306 [11]).

### 6.6.2.12.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.12

### 6.6.2.12.4 Test description

#### 6.6.2.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.12.4.1-1.

**Table 6.6.2.12.4.1-1: Supported test configurations for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Config | Description |
|---|---|
| 6.6.2.12-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.2.12-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.2.12-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.12.4.1-2.

**Table 6.6.2.12.4.1-2: Initial conditions for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.12.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.12.4.1-3.

2. Message contents are defined in clause 6.6.2.12.4.3.

3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.12.4.1-3: General test parameters for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.14 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3µs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 2.3 | |

### 6.6.2.12.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.12.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.12.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2242 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and proceed with step 1,
   OR:
   - if the device has been switched off, proceed with step 1.

10. Repeat step 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.6.2.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.12.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.14 |
| Specific message contents exceptions for Test Configuration 6.6.2.12-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.12-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Test Configuration 6.6.2.12-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 6.6.2.12.4.3-2: *SIB4*: NR inter-frequency cell re-selection with highSpeedMeasInterFreq-r17**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| InterFreqCarrierFreqInfo-v1700 ::= SEQUENCE { | | | |
| highSpeedMeasInterFreq-r17 | TRUE | | |
| } | | | |
| } | | | |

6.6.2.12.5 Test requirement

Table 6.6.2.12.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17.

**Table 6.6.2.12.5-1: NR cell specific test parameters for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR.2.1 TDD | | NA | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | NA | |
| | | | Config 2 | CCR.1.1 TDD | | NA | |
| | | | Config 3 | CCR.2.1 TDD | | NA | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN 1944Hz Note 5 | |
| | | Config 3 | AWGN | | AWGN 3334Hz Note 6 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 6: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test is 2ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.13 NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority

### 6.6.2.13.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event on an inter-frequency layer based on measurement performed within measurement gaps when UE is also configured with MUSIM gaps. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4. In addition, the test will verify

that UE makes correct transmission/reception during occasions of measurement gaps and MUSIM gaps that are dropped due to collision handling as defined in TS 38.133 [6] clause 9.1.10.

#### 6.6.2.13.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting providing MUSIM assistance information with MUSIM gap preference and related MUSIM gap configuration.

#### 6.6.2.13.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1 and 6.6.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.13.

#### 6.6.2.13.4 Test description

##### 6.6.2.13.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.13.4.1-1.

**Table 6.6.2.13.4-1: Supported test configurations for NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority**

| Config | Description |
|---|---|
| 6.6.2.13-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.2.13-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.2.13-3 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.13.4.1-2.

**Table 6.6.2.13.4.1-2: Initial conditions for NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.13.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.13.4.1-3.

2. Message contents are defined in clause 6.6.2.13.4.3.

3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.13.4.1-3: General test parameters for NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used |

| | | | | |
|---|---|---|---|---|
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Measurement gap Pattern Id | | Config 1,2,3 | 0 | As specified in clause TS 38.133 [6] 9.1.2-1 |
| Measurement gap offset | ms | Config 1,2,3 | 9 | |
| MUSIM gap Pattern Id | | Config 1,2,3 | 1 | |
| MUSIM gap offset | ms | Config 1,2,3 | 2 | |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.1 |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |
| T3 | s | Config 1,2,3 | 5 | |
| T4 | s | Config 1,2,3 | 1.3 | |

### 6.6.2.13.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency from the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.2.13.4.1-3 and Table 6.6.2.13.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of four successive time periods, with time duration of T1, T2, T3 and T4 respectively. During time duration T1 and T3, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.13.5-1.

3. SS shall transmit an *RRCReconfiguration* message with *measConfig* and *musim-GapConfig-r17*. Priority of MISIM gap is lower than the priority of the measurement gap configured by *GapConfig-r17*.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. The SS starts continuously scheduling PDSCH reception on every DL slot not overlapped with measurement gap occasions.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.13.5-1. T2 starts.

7. If UE

a) transmits a *MeasurementReport* message triggered by Event A3 within 922ms from the beginning of time period T2, and

b) sends HQRQ ACK/NACK for every corresponding PDSCH scheduled in PCell if PDSCH and PUCCH are not overlapped with the measurement gap occasions in time period T1 and T2.

Then the number of successes for the event “low priority MUSIM gap” is increased by one. Otherwise, count a fail for the event “low priority MUSIM gap” and go to step 14.

8. when T2 expires, set the parameters according to T3 in Table 6.6.2.13.5-1. The SS stops scheduling PDSCH reception. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008).

9. SS shall transmit an *RRCReconfiguration* message to reconfigure MUSIM gap with priority higher than measurement gap configured by *GapConfig-r17*.

10. The UE shall transmit *RRCReconfigurationComplete* message. T3 starts.

11. The SS starts continuously scheduling PDSCH reception on every DL slot not overlapped with MUSIM gap occasions and measurement gap occasions that are not colliding with MUSIM gap.

12.When T3 expires, the SS shall switch the power setting from T3 to T4 as specified in Table 6.6.2.13.5-1. T4 starts.

13. If UE

a) transmits a *MeasurementReport* message triggered by Event A3 within 1282 ms from the beginning of time period T4, and

b) sends HQRQ ACK/NACK for every corresponding PDSCH scheduled in PCell if PDSCH and PUCCH are not overlapped with the MUSIM gap occasions and measurement gap occasions that are not colliding with MUSIM gap in time period T3 and T4.

Then the number of successes for the event “high priority MUSIM gap” is increased by one. Otherwise, count a fail for the event “high priority MUSIM gap” and go to step 14.

14. After the SS receive the *MeasurementReport* message in step 13) or when T4 expires, the SS shall stop scheduling PDSCH reception and:

- transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

or

- switch the UE off.

15. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

16. Depending on the choice in Step 14, the SS:
- if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
or
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

17. Repeat step 2-16 until the confidence level according to Tables G.2.3-1 in Annex G.2 is achieved. Each of the events “low priority MUSIM gap” and “high priority MUSIM gap” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. If all events pass, the test passes. If one event fails, the test fails.

6.6.2.13.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.13.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-4 with Condition SSB Index and A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.13-1 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.13-2 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |
| Specific message contents exceptions for Test Configuration 6.6.2.13-3 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

**Table 6.6.2.13.4.3-2: RRCReconfiguration: NR measurement Configuration (Step 3 and Step 9, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT specified in Table H.3.1-2 with Condition INTER-FREQ and GAP NEED | Measurement configuration | Step 3 |
| | Not present | | Step 9 |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| musim-GapConfig-r17 CHOICE { | | | |
| setup | MUSIM-GapConfig | MUSIM gap configuration Table 6.6.2.13.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.2.13.4.3-3: MeasGapConfig (Table 6.6.2.13.4.3-2)**

| Derivation Path: Table H.3.1-6 with condition MGe and Pattern #0 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR2 | not present | | |
| gapFR1 | not present | | |
| gapUE | not present | | |

| | | | |
|---|---|---|---|
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| gapOffset-r17 | 9 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.2.13.4.3-4: MUSIM-GapConfig (Table 6.6.2.13.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-82BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MUSIM-GapConfig-r17 ::= SEQUENCE { | | | |
| musim-GapToReleaseList-r17 | not present | | |
| musim-GapToAddModList-r17 SEQUENCE (SIZE (1..3)) OF MUSIM-Gap-r17 { | 1 entry | | |
| MUSIM-Gap-r17[1] SEQUENCE { | | Entry 1 | |
| musim-GapId-r17 | 0 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #1 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | | |
| ms80 | 2 | Pattern #1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| musim-AperiodicGap-r17 | not present | | |
| musim-GapToAddModListExt-v1820 SEQUENCE (SIZE (1..3)) OF MUSIM-GapExt-v1820 { | 1 entry | | |
| MUSIM-GapExt-v1820 SEQUENCE { | | Entry 1 | |
| gapPriority-r18 | 3 | | Step 3 |
| | 1 | | Step 9 |
| } | | | |
| musim-GapKeep-r18 | not present | | |
| } | | | |

6.6.2.13.5 Test requirement

Table 6.6.2.13.4.1-3 and Table 6.6.2.13.5-1 define the primary level settings including test tolerances for NR SA event triggered reporting test with MUSIM gap configured.

**Table 6.6.2.13.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|---|
| | | | | **T1, T3** | **T2, T4** | **T1, T3** | **T2, T4** |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

During T1 and T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the measurement gap occasions.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

During T3 and T4, after UE sends RRC ReconfigurationComplete message for the reconfiguration of MUSIM gap priority, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with

- MUSIM gap occasions, and
- measurement gap occasions that are not colliding with MUSIM gap.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T4. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90%.

The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.2.14 NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP

Editor's Note: This test case is incomplete in following aspects:

TT analysis is still missing.

### 6.6.2.14.1 Test purpose

The purpose of this test is to verify that the MUSIM gap capable UE makes correct reporting of an event when MUSIM gap collides with measurement gaps without assigned priority. This test will partly verify the SA inter-frequency NR cell search requirements in clause TS 38.133 [6] 9.3.4. This test is conducted assuming that the measurement gap is configured as Gap(s) configured via GapConfig without suffix, and the MUSIM gap parameters are configured as requested by UE.

### 6.6.2.14.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting providing MUSIM assistance information with MUSIM gap preference and related MUSIM gap configuration.

### 6.6.2.14.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1 and 6.6.2.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.14.

### 6.6.2.14.4 Test description

#### 6.6.2.14.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.14.4.1-1.

**Table 6.6.2.14.4.1-1: Supported test configurations for NR SA FR1-FR1 event-triggered reporting using MUSIM gap with shorter MGRP**

| Configuration | Description |
|---|---|
| 6.6.2.14-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.2.14-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.2.14-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations.<br>Note2: target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.14.4.1-2.

**Table 6.6.2.14.4.1-2: Initial conditions for NR SA FR1-FR1 event-triggered reporting using MUSIM gap with shorter MGRP**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.14.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.2.14.4.1-3.
2. Message contents are defined in clause 6.6.2.14.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

**Table 6.6.2.14.4.1-3: General test parameters for NR SA FR1-FR1 event-triggered reporting using MUSIM gap with shorter MGRP**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 1 | As specified in clause TS 38.133 [6] 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 4 | |
| MUSIM Gap Pattern Id | | Config 1,2,3 | 0 | As specified in clause TS 38.133 [6] 9.1.10-1 |
| MUSIM gap offset | | Config 1,2,3 | 39 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

#### 6.6.2.14.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.2.14.4.1-3 and Table 6.6.2.14.5-1, respectively. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

Measurement gap pattern configuration defined in Table 6.6.2.14.4.1-3 is provided for a UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap. In test 1 measurement gap pattern configuration # 1 as defined in Table 6.6.2.14.4.1-3 is provided for a UE that does not support per-FR gap and in test 2 without measurement gap pattern configuration as defined in Table 6.6.2.14.4.1-3 is provided for UE that support per-FR gap.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.14.5-1.

3. SS shall transmit an *RRCReconfiguration* message with *measConfig* and *musim-GapConfig-r17*.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.14.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1282 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

- transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

OR

- switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   Or
   - if the device has been switched off, switche on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.2.14.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.2.14.4.3-1: Common Exception messages SA inter-frequency event triggered reporting using MUSIM gap with shorter MGRP**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |
| Specific message contents exceptions for Test Configuration 6.6.2.14-1 | Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.7 |
| Specific message contents exceptions for Test Configuration 6.6.2.14-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.7 |
| Specific message contents exceptions for Test Configuration 6.6.2.14-3 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.7 |

**Table 6.6.2.14.4.3-2: RRCReconfiguration: NR measurement Configuration (Step 3, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT specified in Table H. 3.1-2 with Condition INTER-FREQ and GAP NEEDED | Measurement configuration | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| musim-GapConfig-r17 CHOICE { | | | |
| setup | MUSIM-GapConfig | MUSIM gap configuration Table 6.6.2.14.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.2.14.4.3-3: MeasGapConfig (Table 6.6.2.14.4.3-2)**

| Derivation Path: Table H.3.1-6 with condition gapUE | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | 1 entry | | |
| setup SEQUENCE { | | 1entry | test 1 |
| gapOffset | 4 | | |
| mgl | ms6 | Pattern#1 | |
| mgrp | ms80 | Pattern#1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.2.14.4.3-4: MUSIM-GapConfig (Table 6.6.2.14.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-82BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MUSIM-GapConfig-r17 ::= SEQUENCE { | | | |
| musim-GapToReleaseList-r17 | not present | | |
| musim-GapToAddModList-r17 SEQUENCE (SIZE (1..3)) OF MUSIM-Gap-r17 { | 1 entry | | |
| MUSIM-Gap-r17[1] SEQUENCE { | | entry 1 | |
| musim-GapId-r17 | 0 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #0 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | | |
| ms40 | 39 | Pattern #0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| musim-AperiodicGap-r17 | not present | | |
| } | | | |

### 6.6.2.14.5 Test requirement

Table 6.6.2.14.4.1-3 and Table 6.6.2.14.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 event-triggered reporting using MUSIM gap with shorter MGRP.

**Table 6.6.2.14.5-1: NR Cell specific test parameters for NR SA FR1-FR1 event-triggered reporting using MUSIM gap with shorter MGRP**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |

| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
|---|---|---|---|---|---|---|
| SMTC configuration defined in A.3.11 | | Config 1,2,3 | SMTC.7 | | SMTC.7 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap and in test 2 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2.

The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1282 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.2.15 NR SA FR1 event triggered reporting without SSB index detection in DRX mode for UE operating on a cell with less than 5MHz BW

### 6.6.2.15.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event without SSB time index in DRX mode when the inter-frequency target cell is less than 5MHz bandwidth. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3.4.

### 6.6.2.15.2 Test applicability

This test applies to all types of NR UE Release 18 supporting less than 5 MHz bandwidth.

### 6.6.2.15.3 Minimum conformance requirements

The minimum conformance requirements are specified in TS 38.133 [6] clause 9.3.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.15.

### 6.6.2.15.4 Test description

#### 6.6.2.15.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.15.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.2.4.1-2 with config 1 apply to this test. Test environment parameters are given in Table 6.6.2.15.4.1-2.

**Table 6.6.2.15.4.1-1: SA FR1 event triggered reporting tests in DRX supported test configuration**

| Test Case ID | Description |
|---|---|
| 6.6.2.15-1 | NR 15 kHz SSB SCS, 3 MHz bandwidth, FDD duplex mode |
| Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table 6.6.2.15.4.1-2: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.2.15.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 6.6.2.15.4.3.
2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2 and C.1.3.

### 6.6.2.15.4.2 Test procedure

The test procedures are same as 6.6.2.2.4.2 except these steps:

2. Set the parameters according to T1 in Table 6.6.2.2.4.1-2 config 1 and Table 6.6.2.2.5-1 config 1 with the exceptions specified in Table 6.6.2.15.5-1.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.2.5-1 config 1 with the exceptions specified in Table 6.6.2.15.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1082 ms for Test 1 or 10242 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 6.6.2.15.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6 and 7.3 with the following exceptions:

**Table 6.6.2.15.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.y FR1 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |

### 6.6.2.15.5 Test requirement

Table 6.6.2.2.5-1 config 1 with the exceptions specified in Table 6.6.2.15.5-1 defines the primary level settings for all tests.

**Table 6.6.2.15.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Duplex mode | | Config 1 | FDD | | | |
| $BW_{channel}$ | MHz | Config 1 | 3: $N_{RB,c}$ = 15 | | | |
| BWP BW | MHz | Config 1 | 3: $N_{RB,c}$ = 15 | | | |
| PDSCH Reference measurement channel | | Config 1 | SR.1.2 FDD | | NA | |
| RMSI CORESET Reference Channel | | Config 1 | CR.1.3 FDD | | NA | |
| Dedicated CORESET Reference Channel | | Config 1 | CCR.1.7 FDD | | NA | |
| SSB parameters | | Config 1 | SSB.13 FR1 | | SSB.13 FR1 | |
| $Io^{Note3}$ | dBm/3 MHz | Config 1 | -69.9 | -69.9 | -75.4 | -67.6 |

In test 1 and 2, UE is not required to report SSB time index.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured shall be less than a total of 1082 ms in test 1 and 10242 ms for test 2 (note: the total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.6.3 Inter-RAT Measurements

### 6.6.3.0 Minimum conformance requirements

#### 6.6.3.0.1 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN FDD

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

##### 6.6.3.0.1.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ according to the following expression:

$$T_{Identify,E-UTRAN\ FDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

$T_{Inter1}$ is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT} = CSSF_{within_gap_i}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ FDD}$ defined in Table 6.6.3.0.1.1-1.

**Table 6.6.3.0.1.1-1: Measurement period and measurement bandwidth**

| Configuration | Physical Layer Measurement period: $T_{Measure,\ E\text{-}UTRAN\ FDD}$ [ms] | Measurement bandwidth [RB] |
|---|---|---|
| 0 | 480 x $CSSF_{interRAT}$ | 6 |
| 1 (note 1) | 240 x $CSSF_{interRAT}$ | 50 |
| NOTE 1: This configuration is optional. | | |

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

#### 6.6.3.0.1.2 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ specified in Table 6.6.3.0.1.2-1. When RRM enhancement for high speed is configured the UE shall be able to identify a new detectable E-UTRAN FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ specified in Table 6.6.3.0.1.2-2.

**Table 6.6.3.0.1.2-1: Requirement to identify a newly detectable E-UTRAN FDD cell**

| DRX cycle length (s) | $T_{Identify,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) | |
|---|---|---|
| | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in Section 6.6.3.0.1.1 apply | Non-DRX requirements in Section 6.6.3.0.1.1 apply |
| 0.256 | 5.12*K (20*$CSSF_{interRAT}$) | 7.68*K (30*$CSSF_{interRAT}$) |
| 0.32 | 6.4*K (20*$CSSF_{interRAT}$) | 7.68*K (24*$CSSF_{interRAT}$) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20*$CSSF_{interRAT}$) | Note1 (20*$CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.1.1. | | |

**Table 6.6.3.0.1.2-2: Requirement to identify a newly detectable E-UTRAN FDD cell for UE configured with RRM enhancement for high speed**

| DRX cycle length (s) | $T_{Identify,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) | |
|---|---|---|
| | **Gap period = 40 ms, 20 ms** | **Gap period = 80 ms** |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 | Note 1(15*$CSSF_{interRAT}$) | |
| 0.32<DRx cycle <= 0.64 | Note 1(10*$CSSF_{interRAT}$) | |
| DRx cycle = 1.024 | Note 1(10*$CSSF_{interRAT}$) | Note 1(10*$CSSF_{interRAT}$) |
| DRx cycle = 1.28 | Note 1(8*$CSSF_{interRAT}$) | Note 1(8*$CSSF_{interRAT}$) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20*$CSSF_{interRAT}$) | Note1 (20*$CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in clause 9.4.2.2. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure,\ E\text{-}UTRAN\ FDD}$ specified in Table 6.6.3.0.1.2-3.

**Table 6.6.3.0.1.2-3: Requirement to measure E-UTRAN FDD cells**

| DRX cycle length (s) | $T_{measure,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) |
|---|---|
| ≤0.08 | Non-DRX requirements in Section 6.6.3.0.1.1 apply |
| 0< DRX-cycle ≤10.24 | Note1 (5* $CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.1.1. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in

TS 38.133 [6] Section 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.5.

#### 6.6.3.0.1.3 Measurement reporting requirements for Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$ where $TTI_{DCCH}$ is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify, E-UTRAN FDD}$ defined in clauses 6.6.3.0.1.1 and 6.6.3.0.1.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify, E-UTRAN FDD}$ becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure, E-UTRAN FDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.2.

### 6.6.3.0.2 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN TDD

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

#### 6.6.3.0.2.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within $T_{Identify, E-UTRAN TDD}$ according to the following expression:

- When configuration 0 or configuration 1 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms\ ,$$

- When configuration 2 or configuration 3 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = (T_{BasicIdentify} * \frac{480}{T_{Inter1}} + 240) * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

$T_{Inter1}$ is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT} = CSSF_{within_gap_i}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ TDD}$ defined in Table 6.6.3.0.2.1-1.

**Table 6.6.3.0.2.1-1: $T_{Measure,\ E\text{-}UTRAN\ TDD}$ for different configurations**

| Configuration | Measurement bandwidth [RB] | Number of UL/DL sub-frames per half frame (5 ms) | | DwPTS | | $T_{Measure,\ E\text{-}UTRAN\ TDD}$ [ms] |
|---|---|---|---|---|---|---|
| | | DL | UL | Normal CP | Extended CP | |
| 0 | 6 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 480 x $CSSF_{interRAT}$ |
| 1 (note 1) | 50 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 240 x $CSSF_{interRAT}$ |
| 2 | 6 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 720 x $CSSF_{interRAT}$ |
| 3 (Note 1) | 50 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 480 x $CSSF_{interRAT}$ |
| NOTE 1: This configuration is optional.<br>NOTE 2: Void | | | | | | |

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

### 6.6.3.0.2.1 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-1. When RRM enhancement for high speed is configured the UE shall be able to identify a new detectable E-UTRAN TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-2.

**Table 6.6.3.0.2.1-1: Requirement to identify a newly detectable E-UTRAN TDD cell**

| DRX cycle length (s) | $T_{Identify,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) | |
|---|---|---|
| | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in Section 6.6.3.0.2.1 apply | Non-DRX requirements in Section 6.6.3.0.2.1 apply |
| 0.256 | 5.12*K (20*$CSSF_{interRAT}$) | 7.68*K (30*$CSSF_{interRAT}$) |
| 0.32 | 6.4*K (20*$CSSF_{interRAT}$) | 7.68*K (24*$CSSF_{interRAT}$) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20*$CSSF_{interRAT}$) | Note1 (20*$CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.2.1. | | |

**Table 6.6.3.0.2.1-2: Requirement to identify a newly detectable E-UTRAN TDD cell for UE configured with RRM enhancement for high speed**

| DRX cycle length (s) | $T_{Identify,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) | |
|---|---|---|
| | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<=0.32 | Note 1(15*$CSSF_{interRAT}$) | |

| | | |
|---|---|---|
| 0.32<DRx cycle <= 0.64 | Note 1(10*$CSSF_{interRAT}$) | |
| DRx cycle = 1.024 | Note 1(10*$CSSF_{interRAT}$) | Note 1(10*$CSSF_{interRAT}$) |
| DRx cycle = 1.28 | Note 1(8*$CSSF_{interRAT}$) | Note 1(8*$CSSF_{interRAT}$) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20*$CSSF_{interRAT}$) | Note1 (20*$CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in clause 9.4.3.2. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure, E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-3.

**Table 6.6.3.0.2.1-3: Requirement to measure E-UTRAN TDD cells**

| DRX cycle length (s) | $T_{measure, E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) |
|---|---|
| ≤0.08 | Non-DRX Requirements in Section 6.6.3.0.2.1 apply |
| 0.128 | For configuration 2, non-DRX requirements in section 6.6.3.0.2.1 apply,<br>Otherwise: Note1 (5*$CSSF_{interRAT}$) |
| 0.128<DRX-cycle≤10.24 | Note1 (5*$CSSF_{interRAT}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.2.1. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.5.

### 6.6.3.0.2.3 Measurement reporting requirements for Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$ where $TTI_{DCCH}$ is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify, E\text{-}UTRAN\ TDD}$ defined in clauses 6.6.3.0.2.1 and 6.6.3.0.2.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify, E\text{-}UTRAN\ TDD}$ becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure, E\text{-}UTRAN\ TDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.3.

## 6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX

### 6.6.3.1.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 under the cell search and measurement requirements.

### 6.6.3.1.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 from Release 15 onwards.

### 6.6.3.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.1.

#### 6.6.3.1.3.1 NR – E-UTRAN FDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.1.

#### 6.6.3.1.3.2 NR – E-UTRAN TDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.2.

### 6.6.3.1.4 Test description

#### 6.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.1.4.1-1.

**Table 6.6.3.1.4.1-1: supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.3.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.3.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.1-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.1-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.3.1-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.3.1-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.1.4.1-2 and Table 6.6.3.1.4.1-3.

**Table 6.6.3.1.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.3.1.5-1 and Table 6.6.3.1.5-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 6.6.3.1.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | 1 LTE carrier frequency is used in the test |

| | | | |
|---|---|---|---|
| Channel Bandwidth | MHz | As specified in Tables 6.6.3.1.5-1 and 6.6.3.1.5-2. | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | As specified in Clause TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| NOTE 1: Values are defined in Table 6.6.3.1.5-1 | | | |

1. Message contents are defined in clause 6.6.3.1.4.3.

2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 6.6.3.1.4.2 Test procedure

The test consists of two successive time periods, with time durations of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Gap pattern configuration is configured before T2 begins to enable inter-frequency monitoring.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.1.5-1 and 6.6.3.1.5-2. Propagation conditions are set according to Annex C clause C.2.2.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.3.1.5-1 and 6.6.3.1.5-2.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord

with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5,
OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.3.1.4.3-1: Common Exception messages NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RAT |
| Specific message content exceptions for Test Configurations 6.6.3.1-1 and 6.6.3.1-4 | Table H.3.1-3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message content exceptions for Test Configurations 6.6.3.1-2, 6.6.3.1-3, 6.6.3.1-5 and 6.6.3.1-6 | Table H.3.1-3 with Condition Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

#### 6.6.3.1.5 Test requirement

Table 6.6.3.1.5-1 and Table 6.6.3.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.3.1.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |

| | | | | | |
|---|---|---|---|---|---|
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| CORESET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern note1 | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ note2 | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $N_{oc}$ note2 | | dBm/SCS | 1, 2, 4, 5 | -104 | |
| | | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| $\hat{E}_s/I_{ot}$ note3 | | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| SS-RSRP note3 | | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | | 3, 6 | -83.44 | -102.55 |
| SSB_RP note3 | | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | | 3, 6 | -83.44 | -102.55 |
| Io note3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -58.42 | -73.74 |
| | | dBm/38.16 MHz | 3, 6 | -52.32 | -67.64 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.3.1.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration note1 | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration note1 | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel note2 | | 1, 2, 3 | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD | |
| | | 4, 5, 6 | 5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel note2 | | 1, 2, 3 | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD | |
| | | 4, 5, 6 | 5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD | |
| OCNG Patterns note2 | | 1, 2, 3 | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA note3 | | | | |
| OCNG_RB note3 | | | | |
| $N_{oc}$ note4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$ note5 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| RSRP note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| SCH_RP note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| Io note5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21 | -54.60 |
| Propagation Condition not 6 | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix note6 | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3842ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The overall delays measured test requirement is expressed as:

$T_{identify,E\text{-}UTRAN\ FDD} = T_{BasicIdentify} * 480 / T_{Inter1} * CSSF_{interRAT}$ ms

Which:

$T_{BasicIdentify} = 480$,

$T_{Inter1} = 60$,

$CSSF_{interRAT} = 1$

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; 2x$TTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 3842 ms in this test case (note: this gives a total of 3840 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

### 6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX

#### 6.6.3.2.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used under the cell search and measurement requirements.

#### 6.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1, E-UTRAN and long DRX cycle.

#### 6.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 6.6.3.0.1 and 6.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.2.

#### 6.6.3.2.4 Test description

##### 6.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.2.4.1-1.

**Table 6.6.3.2.4.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Test Case ID | Description |
|---|---|
| 6.6.3.2-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.3.2-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.2-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.2-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.3.2-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.3.2-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.2.4.1-2 and Table 6.6.3.2.4.1-3.

**Table 6.6.3.2.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 6.6.3.2.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1 | | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 6.6.3.2.5-1 and 6.6.3.2.5-2. | | |
| Active cell | | Cell 1 | | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | | As specified in Clause TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | note 1 | | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| Hysteresis | dB | 0 | | |
| TimeToTrigger | s | 0 | | |
| Filter coefficient | | 0 | | L3 filtering is not used |
| DRX | | DRX.1 | DRX.7 | DRX cycle configurations DRX.1 and DRX.7 are defined in Table A.3.3.1-1 and Table A.3.3.2-1 respectively. |
| T1 | s | 5 | | |
| T2 | s | 5 | 15 | |
| NOTE 1: Values are defined in Table 6.6.3.2.5-1 | | | | |

1. Message contents are defined in clause 6.6.3.2.4.3.
2. There are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

### 6.6.3.2.4.2 Test procedure

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.2.5-1 and 6.6.3.2.5-2.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.3.2.5-1 and 6.6.3.2.5-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3.48 s for Test 1 or less than 12.8 s for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.3.2.4.3-1: Common Exception messages NR SA FR1 – E-UTRAN event-triggered reporting in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RAT<br>Table H.3.7-1 with Condition DRX.1 and Gap for Test 1<br>Table H.3.7-1 with Condition DRX.7 and OFFSET for Test 2 |

| | |
|---|---|
| Specific message content exceptions for Test Configurations 6.6.3.2-1 and 6.6.3.2-4 | Table H.3.1-3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message content exceptions for Test Configurations 6.6.3.2-2, 6.6.3.2-3, 6.6.3.2-5 and 6.6.3.2-6 | Table H.3.1-3 with Condition Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

### 6.6.3.2.5 Test requirement

Table 6.6.3.2.5-1 and Table 6.6.3.2.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.6.3.2.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 2, 3 | FDD | |
| | | | 4, 5, 6 | TDD | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -104 | |
| | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| $\hat{E}_s/I_{ot}$ Note3 | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | 3, 6 | -83.44 | -102.55 |
| SSB_RP Note3 | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | 3, 6 | -83.44 | -102.55 |
| Io Note3 | dBm/9.36 MHz | 1, 2, 4, 5 | -58.42 | -73.74 |
| | dBm/38.16 MHz | 3, 6 | -52.32 | -67.64 |
| Propagation condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.3.2.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration Note1 | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration Note1 | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note2 | | 1, 2, 3 | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD | |
| | | 4, 5, 6 | 5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | | 1, 2, 3 | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD | |
| | | 4, 5, 6 | 5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD | |
| OCNG Patterns Note2 | | 1, 2, 3 | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |

| | | | | |
|---|---|---|---|---|
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| RSRP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| SCH_RP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| Io Note5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21 | -54.60 |
| Propagation Condition Note6 | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

### 6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16

#### 6.6.3.3.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used under the cell search and measurement requirements for UE configured with RRM enhancement for high speed.

#### 6.6.3.3.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 configured with RRM enhancement for high speed from Release 15 onwards.

#### 6.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 6.6.3.0.1 and 6.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.3.

#### 6.6.3.3.4 Test description

##### 6.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.3.4.1-1.

**Table 6.6.3.3.4.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Test Case ID | Description |
|---|---|
| 6.6.3.3-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.3.3-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.3-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.3.3-4 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.3.3-5 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.3.3-6 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.3.4.1-2 and Table 6.6.3.3.4.1-3.

**Table 6.6.3.3.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 6.6.3.3.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables A.6.6.3.3.1-2 and A.6.6.3.3.1-3. | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | As specified in Clause Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -97 | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | DRX.6 | DRX cycle configurations DRX.6 is defined in Table A.3.3.1-6. |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in TS 38.133 [6] Table 6.6.3.3.5-1 | | | |

1. Message contents are defined in clause 6.6.3.3.4.3.

2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. UE is configured with highSpeedMeasFlag-r16

#### 6.6.3.3.4.2 Test procedure

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.3.5-1 and 6.6.3.3.5-2.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.3.3.5-1 and 6.6.3.3.5-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 4.8s then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.3.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks on condition of HighSpeedMeas with exceptions | Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT<br>Table H.3.1-3 with Condition SSB.1 FR1 for configuration 6.6.3.3-1, 6.6.3.3-2, 6.6.3.3-4, 6.6.3.3-5<br>Table H.3.1-3 with Condition SSB.2 FR1 for configuration 6.6.3.3-3, 6.6.3.3-6<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RAT<br>Table H.3.7-1 with Condition DRX.6 and Gap |

6.6.3.3.5 Test requirement

Table 6.6.3.3.5-1 and Table 6.6.3.3.5-2 defines the primary level settings including test tolerances for all tests.

**Table 6.6.3.3.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 2, 3 | FDD | |
| | | | 4, 5, 6 | TDD | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -98 | |
| | | | 3, 6 | -95 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH_DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$[Note2] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106 | |
| $N_{oc}$[Note2] | dBm/SCS | 1, 2, 4, 5 | -106 | |
| | | 3, 6 | -103 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 |
| $\hat{E}_s/I_{ot}$[Note3] | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 |
| SS-RSRP[Note3] | dBm/SCS | 1, 2, 4, 5 | -88 | -108 |
| | | 3, 6 | -85 | -105 |
| SSB_RP[Note3] | dBm/SCS | 1, 2, 4, 5 | -88 | -108 |
| | | 3, 6 | -85 | -105 |
| Io[Note3] | dBm/9.36 MHz | 1, 2, 4, 5 | -59.98 | -75.92 |
| | dBm/38.16 MHz | 3, 6 | -53.88 | -69.82 |
| Propagation condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.3.3.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD | |

| | | | | |
|---|---|---|---|---|
| | | | 10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -106 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 19 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 19 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87 |
| Io[Note5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -78.22+10log ($N_{RB,c}$ /50) | -59.16+10log ($N_{RB,c}$ /50) |
| Propagation Condition [Note6] | | 1, 2, 3, 4, 5, 6 | AWGN1944 | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 4.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.6.4 L1-RSRP measurement for beam reporting

### 6.6.4.0 Minimum conformance requirements

#### 6.6.4.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 4.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

#### 6.6.4.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 4.6.4.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

#### 6.6.4.0.3 Inter-cell SSB based L1-RSRP Reporting

If a cell with PCI different from serving cell is known according 9.13.2 of TS 38.133 [6], the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$. The requirements specified in this clause are only applicable when

- *highSpeedMeasFlag-r16* is not configured, and
- *highSpeedMeasFlagFR2-r17* is not configured, and
- highSpeedMeasCA-Scell-r17 is not configured, and
- SSBs of CDP outside SMTCs for L1-RSRP measurement are not overlapped with concurrent gaps.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ is defined in Table 6.6.4.0.3-1 for FR1,

For FR1,

- $P=\frac{1}{1-\frac{T_{SSB_CDP}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 cell with PCI different from serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 cell with PCI different from serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 6.6.4.0.3-1: Inter-cell L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ for known cells with different PCIs in FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB_CDP})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(K*M*P)*\max(T_{DRX},T_{SSB_CDP}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{SSB_CDP}$ is the periodicity of the SSB-Index configured for inter-cell L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: K = 1.5. | |

### 6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX

#### 6.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

#### 6.6.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

#### 6.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.1.

6.6.4.1.4 Test description

6.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.1.4.1-2. Test environment parameters are given in Table 6.6.4.1.4.1-3.

**Table 6.6.4.1.4.1-1: NR SA SSB based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.4.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.4.1.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| OCNG Patterns | 1~3 | | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~3 | | Off |
| reportConfigType | 1~3 | | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.4.1.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.4.1.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.1.4.1-2 and 6.6.4.1.5-1. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.6.4.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.
2. Set the parameters according to T1 in Table 6.6.4.1.5-1. T1 starts.
3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.
4. When T1 expires, the SS shall set the parameters according to T2 in 6.6.4.1.5-1. T2 starts.
5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 6.6.4.1.5-2 for test configurations 1, 2 and Table 6.6.4.1.5-3 for test configuration 3 and the relative L1-RSRP requirement for SSB#0 in Table 6.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

- R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.1.5-2 for test configurations 1, 2 and in Table 6.6.4.1.5-3 for test configuration 3 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.4.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10 |

**Table 6.6.4.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

6.6.4.1.5 Test requirement

Table 6.6.4.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.4.1.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.1.5-2 for for test configuration 1, 2 and the corresponding absolute accuracy requirements in Table 4.6.4.1.5-3 for test configuration 3 and the corresponding relative accuracy requirements in Table 4.6.4.1.5-4 for all test configurations.

**Table 6.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 6.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 6.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.NOTE:
The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX

### 6.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 6.6.4.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.2.

### 6.6.4.2.4 Test description

#### 6.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.2.4.1-2. Test environment parameters are given in Table 6.6.4.2.4.1-3.

**Table 6.6.4.2.4.1-1: SA SSB based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.4.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.4.2.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| OCNG Patterns | 1~3 | | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |

| | | | |
|---|---|---|---|
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~3 | | DRX.3 |
| reportConfigType | 1~3 | | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.4.2.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.4.2.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.2.4.1-2 and 6.6.4.2.5-1. UE is configured to perform RLM and BFD based on the SSBs. DRX is configured as specified in Table 6.6.4.2.4.1-2.

### 6.6.4.2.4.2 Test procedure

Same test procedure as in subclause 6.6.4.1.4.2 with tables 6.6.4.1.4.1-2 and 6.6.4.1.5-1 replaced by tables 6.6.4.2.4.1-2 and 6.6.4.2.5-1.

### 6.6.4.2.4.3 Message contents

Same message content as in subclause 6.6.4.1.4.3 with the following exception:

**Table 6.6.4.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

6.6.4.2.5 Test requirement

Table 6.6.4.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.4.2.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.2.5-2 for for test configurations 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.4.2.5-3 for test configuration 3 and the corresponding relative accuracy requirements in Table 6.6.4.2.5-4 for all test configurations.

**Table 6.6.4.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 6.6.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 6.6.4.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |

| | | |
|---|---|---|
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX

### 6.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 6.6.4.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

### 6.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.3.

### 6.6.4.3.4 Test description

#### 6.6.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.3.4.1-2. Test environment parameters are given in Table 6.6.4.3.4.1-3.

**Table 6.6.4.3.4.1-1:NR SA CSI-RS based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.4.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.4.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.4.3-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.4.3.4.1-2: General test parameters for NR SA CSI-RS based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |

| | | | |
|---|---|---|---|
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| CSI-RS configuration | 1 | | CSI-RS 1.3 FDD |
| | 2 | | CSI-RS 1.3 TDD |
| | 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 | | OP.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| DRX configuration | 1~3 | | Off |
| reportConfigType | 1~3 | | aperiodic |
| reportQuantity | 1~3 | | cri-RSRP |
| Number of reported RS | 1~3 | | 2 |
| qcl-Info | 1~3 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.4.3.4.1-3: Test Environment parameters for NR SA CSI-RS based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.4.3.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.3.4.1-2 and 6.6.4.3.5-1. UE is configured to perform RLM and BFD based on the SSBs.

#### 6.6.4.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 6.6.4.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.4.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 2 for configuration 1, slot 4 for configuration 2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 0 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 6.6.4.3.5-2 for test configurations 1, 2 and in Table 6.6.4.3.5-3 for test configuration 3 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 6.6.4.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. Void.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.4.3.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS<br>TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC |

**Table 6.6.4.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

**Table 6.6.4.3.4.3-3: Physical layer parameters for DCI format 1_1**

| Derivation Path: TS 38.508-1 [14], Table 7.2.2.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| PDSCH-to-HARQ_feedback timing indicator | K1 = 3 if mod(i,10) = 8<br><br>where i is slot index per frame; i = {0,…,9} | - | Config1 (NR FDD) |
| PDSCH-to-HARQ_feedback timing indicator | K1 = 6 if mod(i,20) = 11<br><br>where i is slot index per frame; i = {0,…,19} | - | Config3 (NR TDD30kHz) |

### 6.6.4.3.5 Test requirement

Table 6.6.4.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.4.3.5-1: SSB specific test parameters for NR SA CSI-RS based L1-RSRP measurement**

| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~3 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| | 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.15 |
| | 3 | | -91.65 | -88.14 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.59 |
| | 3 | dBm/38.16 MHz | -57.59 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 3.5 |
| Note 1: Void<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.3.5-2 for for test configurations 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.4.3.5-3 for test configuration 3 and the corresponding relative accuracy requirements in Table 6.6.4.3.5-4 for all test configurations.

**Table 6.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

**Table 6.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

**Table 6.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX

### 6.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 6.6.4.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

### 6.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.4.

### 6.6.4.4.4 Test description

#### 6.6.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.4.4.1-2. Test environment parameters are given in Table 6.6.4.4.4.1-3.

**Table 6.6.4.4.4.1-1: NR SA CSI-RS based L1-RSRP measurement supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.4.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.4.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.4.4-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

| Note: | The UE is only required to be tested in one of the supported test configurations |
|---|---|

**Table 6.6.4.4.4.1-2: General test parameters for NR SA CSI-RS based L1-RSRP measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| CSI-RS configuration | 1 | | CSI-RS 1.3 FDD |
| | 2 | | CSI-RS 1.3 TDD |
| | 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 | | OP.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| DRX configuration | 1~3 | | DRX.3 |
| reportConfigType | 1~3 | | aperiodic |
| reportQuantity | 1~3 | | cri-RSRP |
| Number of reported RS | 1~3 | | 2 |
| qcl-Info | 1~3 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |

| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
|---|---|

**Table 6.6.4.4.4.1-3: Test Environment parameters for NR SA CSI-RS based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.4.4.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.4.4.1-2 and 6.6.4.4.5-1. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.4.4.4.2 Test procedure

Same test procedure as in subclause 6.6.4.3.4.2 with tables 6.6.4.3.4.1-2 and 6.6.4.3.5-1 replaced by tables 6.6.4.4.4.1-2 and 6.6.4.4.5-1.

### 6.6.4.4.4.3 Message contents

Same message content as in subclause 6.6.4.3.4.3 with the following exception:

**Table 6.6.4.4.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 and Offset |

### 6.6.4.4.5 Test requirement

Table 6.6.4.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.4.4.5-1: SSB specific test parameters for NR SA CSI-RS based L1-RSRP measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~3 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| | 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.15 |
| | 3 | | -91.65 | -88.14 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.59 |
| | 3 | dBm/38.16 MHz | -57.59 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 3.5 |
| Note 1: Void | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.4.5-2 for for test configurations 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.4.4.5-3 for test configurations3 and the corresponding relative accuracy requirements in Table 6.6.4.4.5-4 for all test configurations.

**Table 6.6.4.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 75 |

**Table 6.6.4.4.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 78 |

**Table 6.6.4.4.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feasibility of configuring different channel models to different SSBs needs further study.

- The TT analysis may need to be redone after concluding if the new test configuration is testable.

### 6.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in TS 38.133 [6] clause 9.5.4.1

### 6.6.4.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, measurement enhancements in high speed scenario and long DRX cycle

### 6.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.5.

6.6.4.5.4 Test description

6.6.4.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.5.4.1-2. Test environment parameters are given in Table 6.6.4.5.4.1-3.

**Table 6.6.4.5.4.1-1: SA SSB based L1-RSRP measurement supported test configurations for UE configured with highSpeedMeasFlag-r16**

| Test Case ID | Description |
|---|---|
| 6.6.4.5-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.4.5-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.4.5-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.4.5.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement for UE configured with highSpeedMeasFlag-r16**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| OCNG Patterns | 1~3 | | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~3 | | DRX.3 |
| reportConfigType | 1~3 | | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 2 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.4.5.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.4.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n=1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 with n=1 for TE Part | | |

1. Message contents are defined in clause 6.6.4.5.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in Table 6.6.4.5.4.1-2 and 6.6.4.5.5-1. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 6.6.4.5.4.1-2.

### 6.6.4.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.6.4.5.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 6.6.4.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 6.6.4.1.5-1. T2 starts.

5. If the UE sends L1-RSRP reports meeting the corresponding absolute accuracy requirements in Table 6.6.4.5.5-2 for test configurations 1 and 2 the corresponding absolute accuracy requirements in Table 6.6.4.5.5-3 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.4.5.5-4 for all test configurations every 80 slots from no later than 640 ms plus 80 slots for all configurations from the beginning of time period T2 until the end of time period T2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.4.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.4.5.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB<br>Table H.3.6-10<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.6.4.5.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.6.4.5.5 Test requirement

**Table 6.6.4.5.5-1: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16***

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.6 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.53 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 3 | | -91.65 | -91.65 | -Infinity | -88.14 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 0 | -Infinity | 3.5 |
| Propagation conditions | 1,2 | | AWGN | | AWGN 1944 Hz Note4 | |
| | 3 | | AWGN | | AWGN 3334 Hz Note5 | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.
Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.5.5-2 for for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 6.6.4.5.5-3 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.4.5.5-4 for all test configurations.

**Table 6.6.4.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 55 |
| Highest reported value (SSB#1) | - | 75 |

**Table 6.6.4.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 6.6.4.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.4.6 NR SA FR1 Inter-cell SSB based L1-RSRP measurements on PCell in DRX

### 6.6.4.6.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements for SSB of a cell with additional PCI.

#### 6.6.4.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting 5GS NR SA FR1, measurement Inter-cell SSB based L1-RSRP measurements on PCell in DRX.

#### 6.6.4.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.6.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.6.

#### 6.6.4.6.4 Test description

##### 6.6.4.6.4.1 Initial conditions

This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1 of TS 38.133 [6] , with the testing configurations for NR cells in Table 6.6.4.6.1-1.

**Table 6.6.4.6.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.4.6.2-1: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| Active cell | 1~3 | | Cell 1 |
| A cell with additional PCI | 1~3 | | Cell 2 |
| RF Channel Number | 1~3 | | 1: Cell 1 and Cell 2 |
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 for Cell 1 and Cell 2 |
| | 2 | | SSB.3 FR1 for Cell 1 and Cell 2 |
| | 3 | | SSB.4 FR1 for Cell 1 and Cell 2 |
| OCNG Patterns | 1~3 | | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1 ULBWP.1.1 |

| | | | |
|---|---|---|---|
| SMTC configuration | 1~3 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~3 | | DRX.3 |
| reportConfigType | 1~3 | | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| CP length | 1~3 | | Normal |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Time offset between serving and a cell with additional PCI | 1 | | < CP |
| | 2 | | < CP |
| | 3 | | < CP |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.4.6.2-2: Test Environment parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.4.6.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.4.6.4.3.

2. There are two cells in the test, the FR1 PCell (Cell 1) and a cell with additional PCI (Cell 2). The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.6.4.1-2 and 6.6.4.6.5-1. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.4.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.6.4.6.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.6.4.1-2.

2. Set the parameters according to T1 in Table 6.6.4.6.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 6.6.4.6.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 6.6.4.6.5-2 for test configurations 1, 2 and Table 6.6.4.6.5-3 for test configuration 3 and the relative L1-RSRP requirement for SSB#0 in Table 6.6.4.6.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.6.5-2 for test configurations 1, 2 and in Table 6.6.4.6.5-3 for test configuration 3 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.6.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.4.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.4.6.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10 |

**Table 6.6.4.6.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.4.6.4.3-3: CSI-SSB-ResourceSetConfig**

| Derivation Path: TS 38.133 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-SSB-ResourceSet ::= SEQUENCE { | | | |
| csi-SSB-ResourceSetId | 0 | | |
| csi-SSB-ResourceList | 0 | | |
| servingAdditionalPCIList-r17 | 1 | | |
| } | | | |

### 6.6.4.6.5 Test requirement

Table 6.6.4.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.4.6.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement**

| Parameter | Config | Unit | SSB#0 of Cell 1 | | SSB#1 of Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| | 3 | | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| | 3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 0 | -Infinity | 3 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than X ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of SSB#1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2, where X is

- 680 for Config 1&2
- 660 for Config 3

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.5 Inter-RAT UTRAN measurements

### 6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX

#### 6.6.5.1.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 under the cell search and measurement requirements.

#### 6.6.5.1.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 from Release 16 onwards and support UTRA FDD.

#### 6.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.5.1.

#### 6.6.5.1.4 Test description

##### 6.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.5.1.4.1-1.

**Table 6.6.5.1.4.1-1: supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.5.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD |
| 6.6.5.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD |
| 6.6.5.1-3 | NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.5.1.4.1-2 and Table 6.6.5.1.4.1-3.

**Table 6.6.5.1.4.1-2: Initial conditions for SA inter-RAT UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | UE Part | A.3.2.3.2 | |
| Exceptions to connection diagram | SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA<br>LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX | | |

**Table 6.6.5.1.4.1-3: General test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| UTRA RF Channel Number | | 2 | 1 UTRA carrier frequency is used in the test |

| | | | |
|---|---|---|---|
| Channel Bandwidth | MHz | As specified in Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2 | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | As specified in Clause Table FFS Per-UE gap pattern. |
| Inter-RAT UTRA measurement quantity | | CPICH Ec/Io | Measurement quantity for Cell 2 |
| b1-ThresholdUTRA-FDD | dB | -16.5 | CPICH Ec/Io threshold for SS-RSRP measurement on Cell 1 for event B1 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in Table A.6.6.5.1.1-3 | | | |

1. Message contents are defined in clause 6.6.5.1.4.3.

2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN inter-RAT neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.0 and C.1.

### 6.6.5.1.4.2 Test procedure

The test consists of two successive time periods, with time durations of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Gap pattern configuration is configured before T2 begins to enable inter-frequency monitoring.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.5.1.5-1 and 6.6.5.1.5-2. Propagation conditions are set according to Annex C clause C.2.2.T1 starts.

3. SS shall transmit an *RRCReconfiguration* message to confogure Event B1 measurement reporting.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.5.1.5-1 and 6.6.5.1.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 primary scrambling code = ((current Cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*

according to TS 38.508-1 [14] clause 4.5,
OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10.Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.5.1.4.3 Message contents

**Table 6.6.5.1.4.3-1: RRCReconfiguration (Step 3)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 6.6.5.1.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.5.1.4.3-2: MeasConfig (Table 6.6.5.1.4.3-1)**

| Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO | | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectUTRA-FDD-r16 | MeasObjectUTRA-FDD | Table 6.6.5.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT(*16*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1_UTRA | Actual value of UTRA threshold = (16-49)/2 = -16.5dB | |
| } | | | |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 | | |

| | | | |
|---|---|---|---|
| | with condition gapUE and Pattern #0 | | |
| } | | | |

**Table 6.6.5.1.4.3-3: MeasObjectUTRA-FDD (Table 6.6.5.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectUTRA-FDD-r16 ::= SEQUENCE { | | | |
| carrierFreq-r16 | ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2 | | |
| } | | | |

**Table 6.6.5.1.4.3-4: MeasurementReport (Step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | Table 6.6.5.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.5.1.4.3-5: MeasResults (Table 6.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B1_UTRA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 { | 1 entry | | |
| MeasResultUTRA-FDD-r16[1] SEQUENCE { | | entry 1 | |
| physCellId-r16 | PhysCellIdUTRA-FDD-r16 of UTRA Cell 2 | | |
| measResult-r16 SEQUENCE { | | | |
| utra-FDD-EcN0-r16 | INTEGER (0..49) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.5.1.5 Test requirement

Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.5.1.5-1: PCell specific test parameters for SA inter-RAT UTRA FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3 | 1 | |
| Duplex mode | | | 1, 2, 3 | FDD | |
| TDD Configuration | SCS=15 kHz | | 2 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3 | TDDConf.1.2 | |
| $BW_{channel}$ | | MHz | 1 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3 | 40: $N_{RB,c}$ = 106 (TDD) | |

| | | | | | |
|---|---|---|---|---|---|
| PDSCH reference measurement channel | | | 1 | SR.1.1 FDD | |
| | | | 2 | SR.1.1 TDD | |
| | | | 3 | SR.2.1 TDD | |
| CORSET reference channel | | | 1 | CR.1.1 FDD | |
| | | | 2 | CR.1.1 TDD | |
| | | | 3 | CR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3 | OP.1 | |
| SMTC configuration | | | 1, 2, 3 | SMTC.1 | |
| SSB configuration | | | 1, 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1 | TRS.1.1 FDD | |
| | | | 2 | TRS.1.1 TDD | |
| | | | 3 | TRS.1.2 TDD | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3 | -106 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2 | -106 | |
| | | | 3 | -103 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3 | 18 | -2 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3 | 18 | -2 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2 | -88 | -108 |
| | | | 3 | -85 | -105 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2 | -88 | -108 |
| | | | 3 | -85 | -105 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2 | -59.98 | -75.92 |
| | | dBm/38.16 MHz | 3 | -53.88 | -69.82 |
| Propagation condition | | | 1, 2, 3 | ETDLA30 | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3 | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.5.1.5-2: UTRAN neighbour cell specific test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| UTRA RF Channel Number | | 2 | |
| CPICH_Ec/Ior | dB | -10 | |
| PCCPCH_Ec/Ior | dB | -12 | |
| SCH_Ec/Ior | dB | -12 | |
| PICH_Ec/Ior | dB | -15 | |
| DPCH_Ec/Ior | dB | N/A | |

| | | | |
|---|---|---|---|
| OCNS | | -0.941 | |
| $\hat{I}_{or}/I_{oc}$ | dB | -Infinity | -1.8 |
| $I_{oc}$ | dBm/3.84 MHz | -70 | |
| CPICH_Ec/Io | dB | -Infinity | -14 |
| Propagation Condition | | AWGN | |
| Note 1: The DPCH level is controlled by the power control loop.<br>Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to $I_{or}$. | | | |

The UE shall send one Event B1 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 2.4s from the start of period T2, i.e. when Cell 2 becomes detectable. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.6.6 CLI Measurements

### 6.6.6.0 Minimum conformance requirements

#### 6.6.6.0.1 Minimum conformance requirements for SRS-RSRP measurement

Same as in clause 4.6.5.0.1.

#### 6.6.6.0.2 Minimum conformance requirements for CLI-RSSI measurement with non-DRX

Same as in clause 4.6.5.0.2.

### 6.6.6.1 NR SA FR1 SRS-RSRP measurement in non-DRX

#### 6.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 6.6.6.0.

#### 6.6.6.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR and CLI-based SRS-RSRP measurements.

#### 6.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.6.1.

#### 6.6.6.1.4 Test description

The test scenario comprises of one serving NR FR1 PCell (Cell 1) and one virtual intra-frequency UE transmitting SRS periodically, which are the target of the CLI measurement report evaluated in the test. The test parameters for PCell are given in Table 6.6.6.1.4.1-3 and Table 6.6.6.1.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with event I1 is used. No gap pattern is configured in the test.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 6.6.6.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 6.6.6.1.5-2. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

##### 6.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.6.1.4.1-1.

**Table 6.6.6.1.4.1-1: Supported test configurations for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Configuration | Description |
|---|---|
| 6.6.6.1-1 | NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.6.1-2 | NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.6.1.4.1-2.

**Table 6.6.6.1.4.1-2: Initial conditions for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 6.6.6.1.4.3.
2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.
3. The test parameters are given in Table 6.6.6.1.4.1-3.

**Table 6.6.6.1.4.1-3: General test parameters for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| RF Channel Number | | 1, 2 | 1: Cell 1 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.1 | |
| | | 2 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table 6.6.6.1.5-3 |
| | | 2 | SRSConf.2 | |
| CP length | | 1, 2 | Normal | |
| i1-Threshold | dBm | 1 | -97 | |
| | | 2 | -95 | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | DRX.7 | |
| Time offset between DL from serving cell and SRS from test system | µs | 1,2 | 17.67 | |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 6.6.6.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During T1 only the serving NR PCell is powered on, but at the start of T2 the virtual UE is powered on and starts transmitting on SRS resources, in addition to the serving NR cell which is kept powered on. The purpose of the test is to evaluate the event i1 reporting delay upon a newly powered up virtual UE, from the start of T2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.6.1.4.1-3, Table 6.6.6.1.5-1 and Table 6.6.6.1.5-2.

3. The SS shall transmit an *RRCReconfiguration* message configuring a CLI measurement object with a CLI event I1 trigger, as specified in section 6.6.6.1.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.6.1.4.1-3, Table 6.6.6.1.5-1 and Table 6.6.6.1.5-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by event I1, as specified in section 6.6.6.1.4.3. If the overall delay measured from the beginning of time period T2 is less than 1922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall requirement delay, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall power off the virtual UE and then transmit an *RRCRelease* message to release the RRC connection.

8. The SS shall:

   - switch off and then on the UE and go to step 9, or

   - transmit *Paging* message (including *PagingRecord* with *ue-Identity*) for the UE and go to step 9.

9. Repeat steps 1-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 6.6.6.1.4.3-1: Common Exception messages for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5 |

**Table 6.6.6.1.4.3-2: *MeasObjectToAddModList* for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectCLI-r16 | MeasObjectCLI-r16 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.6.1.4.3-3: *MeasObjectCLI-r16* for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectCLI-r16 ::= SEQUENCE { | | | |
| cli-ResourceConfig-r16 SEQUENCE { | | | |
| srs-ResourceConfig-r16 CHOICE { | | | |
| setup SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry | | |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1 |
| | SRSConf.2 | entry 1 | Config 2 |
| srs-SCS-r16 | kHz15 | | Config 1 |
| | kHz30 | | Config 2 |
| refServCellIndex-r16 | 0 | PCell | |
| refBWP-r16 | 0 | BWP-0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.6.1.4.3-4: *ReportConfigNR* for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| cli-EventTriggered-r16 SEQUENCE { | | | |
| eventId-r16 CHOICE { | | | |
| eventI1-r16 SEQUENCE { | | Event I1 | |
| i1-Threshold CHOICE { | | | |
| srs-RSRP-r16 | 43 | 43 = -97-(-140) | Config 1 |
| srs-RSRP-r16 | 45 | 45 = -95-(-140) | Config 2 |
| } | | | |
| reportOnLeave-r16 | False | | |
| hysteresis-16 | 0 | | |
| timeToTrigger-r16 | ms0 | | |
| } | | | |
| } | | | |
| reportInterval-r16 | ms120 | Not critical to the test | |
| reportAmount-r16 | r2 | Similar to other measurement tests | |
| maxReportCLI-r16 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.6.1.4.3-5: *MeasResultCLI-r16* for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultCLI-r16 ::= SEQUENCE { | | | |
| measResultsListSRS-r16 CHOICE { | | | |
| srs-ResourceId-r16 | SRS-ResourceId | | |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) | |
| } | | | |
| } | | | |

### 6.6.6.1.5 Test requirement

Table 6.6.6.1.5-1 and Table 6.6.6.1.5-2 define the primary level settings including test tolerances for NR SA FR1 SRS-RSRP measurement in non-DRX. Table 6.6.6.1.5-3 defines the SRS resource configurations.

**Table 6.6.6.1.5-1: NR Cell specific test parameters for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 | |
| | | 2 | TDDConf.2.1 | |

| | | | |
|---|---|---|---|
| PDSCH RMC configuration | | 1 | SR.1.1 TDD |
| | | 2 | SR.2.1 TDD |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 TDD |
| | | 2 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 TDD |
| | | 2 | CCR.2.1 TDD |
| OCNG Patterns | | 1, 2 | OP.1 |
| TRS Configuration | | 1 | TRS.1.1 TDD |
| | | 2 | TRS.1.2 TDD |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 |
| $N_{\mathrm{oc}}$ Note 2 | dBm/15 kHz | 1 | -98 |
| | | 2 | |
| $N_{\mathrm{oc}}$ Note 2 | dBm/SCS | 1 | -98 |
| | | 2 | -95 |
| Propagation Condition | | 1, 2 | AWGN |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled. | | | |

**Table 6.6.6.1.5-2: Neighbour UE specific test parameters for NR SA FR1 SRS-RSRP measurement in non-DRX**

| Parameter | Unit | Test configuration | Neighbour cell UE | |
|---|---|---|---|---|
| | | | T1 | T2 |
| $N_{\mathrm{oc}}$ Note 2 | dBm/15 kHz | 1 | -98 | |
| | | 2 | | |
| $N_{\mathrm{oc}}$ Note 2 | dBm/SCS | 1 | -98 | |
| | | 2 | -95 | |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | 1 | -infinity | 9.25 |
| | | 2 | | 8.75 |
| $\hat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | 1 | -infinity | 9.25 |
| | | 2 | | 8.75 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | -infinity | -88.75 |
| | | 2 | -infinity | -86.25 |
| Io | dBm/9.36 MHz | 1 | -70.05 | -60.62 |
| | dBm/38.16 MHz | 2 | -63.96 | -57.51 |
| Propagation Condition | | 1, 2 | AWGN | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled.<br>Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table 6.6.6.1.5-3:** SRS configuration**s for NR SA FR1 SRS-RSRP measurement in non-DRX**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | |
| | resourceType | Periodic | Periodic | |
| | Usage | Codebook | Codebook | |

| | | | | |
|---|---|---|---|---|
| SRS-Resource | SRS-ResourceId | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | |
| | freqDomainShift | 0 | 0 | |
| | freqHopping c-SRS | 12 | 12 | |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset | sl640, 4 | sl640, 9 | |
| | sequenceId | 0 | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 1920 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.7 NR measurements with autonomous gaps

### 6.6.7.0 Minimum conformance requirements

#### 6.6.7.0.1 Minimum conformance requirements for SA intra-frequency CGI identification of NR neighbour cell in FR1

[TS 38.133, Clause 9.11]

##### 6.6.7.0.1.1 Introduction

The requirements in this clause are applicable for CGI identification of an intra-frequency and inter-frequency NR target cell.

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC_CONNECTED state, and
- configured with SA or NR-DC or NE-DC operation mode, or with EN-DC operation mode for CGI identification requested by NR PSCell.

The overall CGI reporting delay is defined in clause 6.6.7.0.1.3.

The measurement reporting delay can be longer for the measurement reporting requirements in this clause when IDC autonomous denial is configured.

##### 6.6.7.0.1.2 CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of reportCGI. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may

make autonomous gaps in both downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3 in TS 38.331 [13]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of reportCGI, regardless of whether DRX is used or not, or whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of NR cell within:

$T_{identify_CGI} = (T_{MIB} + T_{SIB1})$ ms

Where:

$T_{MIB}$ is the time period used to acquire MIB message. $T_{MIB} = 6 * T_{SMTC}$ ms for target cell carrier frequency on FR1 and $T_{MIB} = 25 * T_{SMTC}$ ms for target cell carrier frequency on FR2.

$T_{SIB1}$ is the time period used to acquire SIB1 message. $T_{SIB1} = 6 * T_{RMSI\text{-}scheduling}$ ms.

Where $T_{SMTC}$ is the SMTC periodicity configured for the target cell measurement, and $T_{RMSI\text{-}scheduling}$ is

- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and 20ms when SSB and RMSI CORESET multiplexing pattern is 1
- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and $T_{SMTC}$ when SSB and RMSI CORESET multiplexing pattern is 2 or 3.

The requirement for identifying the CGI of an NR cell within $T_{identify_CGI}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

Within the time $T_{identify_CGI}$, over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in,

- Clause 8.2.1.2.16 in TS 38.133 [6] for NR serving cells and Clause 7.32.2.15 in TS 36.133 [23] for E-UTRA serving cells if the UE is configured with EN-DC operation mode,
- Clause 8.2.2.2.14 in TS 38.133 [6] if the UE is configured with SA operation mode,
- Clause 8.2.3.2.14 in TS 38.133 [6] for NR serving cells and Clause 7.36.2.14 in TS 36.133 [23] for E-UTRA serving cells if the UE is configured with NE-DC operation mode,
- Clause 8.2.4.2.11 in TS 38.133 [6] if the UE is configured with NR-DC operation mode.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and
- During MIB decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and
- During MIB decoding, the SSB for MIB decoding remains detectable with SNR $\geqslant$-3dB
- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with SNR $\geqslant$-3dB

#### 6.6.7.0.1.3 CGI reporting delay

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI}$ defined in clause 6.6.7.0.1.2 plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and additional 20ms margin if target cell is on FR2.

#### 6.6.7.0.2 Minimum conformance requirements for identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA

[TS 38.133, Clause 9.4.7]

##### 6.6.7.0.2.1 CGI identification of an E-UTRA cell with autonomous gaps

The requirements in this clause apply when the UE is configured with standalone NR, NE-DC or NR-DC. The UE shall identify and report the CGI when requested by an NR PCell for the purpose 'reportCGI'. The UE may make autonomous gaps in downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3.1 in TS 38.331 [13]. If autonomous gaps are used for measurement with the purpose of 'reportCGI', regardless of whether DRX is used or not, or regardless of whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of E-UTRA cell within $T_{identify_CGI,\ E\text{-}UTRAN}$ = 150 ms. This is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell, provided that the E-UTRA cell has been already identified by the UE.

A cell shall be considered identifiable following conditions are fulfilled:

- RSRP related side conditions given in Clause 9.1 in TS 36.133 [23] are fulfilled for a corresponding band,
- SCH_RP and SCH Ês/Iot according to Annex B.2.2 in TS 36.133 [23] for a corresponding band

The MIB of an E-UTRA cell whose CGI is identified shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [27].

The requirement for identifying a new CGI of an E-UTRA cell within $T_{identify_CGI,\ E\text{-}UTRAN}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

##### 6.6.7.0.2.2 CGI reporting delay

The E-UTRA CGI reporting delay is defined as the time between a command that will trigger an E-UTRA CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI,\ E\text{-}UTRAN}$ plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and an additional 30ms margin.

### 6.6.7.1 SA intra-frequency CGI identification of NR neighbour cell in FR1

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing

#### 6.6.7.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of intra-frequency CGI identification of an NR neighbour cell in FR1 with autonomous gaps. This test shall partly verify the measurement requirements in Clause 9.11 in TS 38.133 [6].

#### 6.6.7.1.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting with PCell in FR1 and supporting acquisition of CGI from neighbour NR cell using autonomous gap, which is controlled by PICS pc_nr_CGI_Reporting.

#### 6.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.7.1.

#### 6.6.7.1.4 Test description

The test scenario comprises of one NR FR1 carrier. Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) and NR FR1 neighbour cell (Cell 2) on NR RF channel 1.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report.

#### 6.6.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.7.1.4.1-1.

**Table 6.6.7.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.7.1.4.1-2.

**Table 6.6.7.1.4.1-2: Initial conditions for EN-DC PSCell FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for NR Cells are given in Table 6.6.7.1.4.1-3 below. The test parameters and applicability for the E-UTRAN PCell are defined in Table A.3.7.2.1-1 in TS 38.133 [6]. Cell-specific parameters of NR PSCell are specified in Table 6.6.7.1.5-1.

2. Message contents are defined in clause 6.6.7.1.4.3.

3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 6.6.7.1.4.1-3: General test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |

| | | | | |
|---|---|---|---|---|
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

#### 6.6.7.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on NR RF channel 1. NR Cell 2 is also on NR RF channel 1. Set the parameters according to Tables 6.6.7.1.4.1-3 and 6.6.7.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.

3. T1 starts. At this moment, the UE does not have any timing information of Cell 2.

4. After 5 seconds, T2 starts. A measurement object is configured for the frequency of the PCell and it is indicated to the UE that event-triggered reporting with Event A3 is used. The UE is expected to detect and send a measurement report with Event A3. A new RRC message triggering CGI identification shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to TRUE.

5. After 5 seconds, T3 starts. The start of T3 is the instant when the last TTI containing the RRC message implying CGI identification is sent to the UE.

6. If the UE transmits a measurement report containing the cell global identifier of Cell 2 within 252 ms from the start of T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If it is successful, continue to step 9. Otherwise continue to step 8.

8. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.7.1.4.3 Message contents

TBD

### 6.6.7.1.5 Test requirement

Table 6.6.7.1.5-1 defines the cell specific test parameters.

**Table 6.6.7.1.5-1: NR Cell specific test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | TN/A | | | TN/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | N/A | | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dedicated CORESET RMC configuration | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | | OP.1 | | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | | N/A | | |
| | | 2 | TRS.1.1 TDD | | | N/A | | |
| | | 3 | TRS.1.2 TDD | | | N/A | | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | | DLBWP.1.1 | | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | | ULBWP.1.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -1.46 | -Infinity | -1.46 | -1.46 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | 4 | -Infinity | 4 | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -94 | -Infinity | -94 | -94 |
| | | 2 | -94 | -94 | -94 | -Infinity | -94 | -94 |
| | | 3 | -91 | -91 | -91 | -Infinity | -91 | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -62.25 | -64.60 | -62.25 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -62.25 | -64.60 | -62.25 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -56.16 | --58.50 | -56.16 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send a measurement report containing the CGI of Cell 2 within 252 ms from the start of time period T3.

Test requirement = RRC Procedure delay + $T_{identify_CGI}$ + reporting delay

= 10 + 240 + 2ms from the start of T3

= 252 ms

The UE shall be scheduled continuously throughout the test. From the start of T3 until 252 ms, the interruption on PCell shall not be more than the values specified for SA in clause 8.2.2.2.14 in TS 38.133 [6].

The rate of correct events observed during repeated tests shall be at least 90%.

### 6.6.7.2 Identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing

#### 6.6.7.2.1 Test purpose

This test is to verify the requirement for identification of a new CGI of E-UTRA cell with autonomous gaps in NR SA in clause 9.4.7 in TS 38.133 [6].

#### 6.6.7.2.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting with PCell in FR1 and supporting acquisition of CGI from neighbour E-UTRA cell using autonomous gap, which is controlled by PICS pc_eutra_CGI_Reporting.

#### 6.6.7.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.7.2.

#### 6.6.7.2.4 Test description

The test scenario comprises of one NR FR1 carrier and one E-UTRA carrier. Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) and E-UTRA neighbour cell (Cell 2).

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report.

##### 6.6.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.7.2.4.1-1.

**Table 6.6.7.2.4.1-1: Supported test configurations of inter-RAT E-UTRAN cell using autonomous gap in SA**

| Configuration | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.7.2.4.1-2.

**Table 6.6.7.2.4.1-2: Initial conditions for EN-DC PSCell FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.7.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.1.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.2.3.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameters are given in Table 6.6.7.2.4.1-3 below. Cell-specific parameters of NR and E-UTRA are specified in Table 6.6.7.2.5-1, and 6.6.7.2.5-2, respectively.

2. Message contents are defined in clause 6.6.7.2.4.3.

3. There are one NR cell and one E-UTRAN cell specified in the test. NR Cell is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 6.6.7.2.4.1-3: General test parameters for identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Active cell | | Cell 1 | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| LTE Channel Bandwidth | MHz | 10 | |
| LTE PDSCH/PCFICH/PDCCH/PHICH parameters | | | As specified in clause A.3.7.2.1 in TS 38.133 [6] |
| CP length | | Normal | |
| Hysteresis | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | |
| *useAutonomousGaps* | | TRUE | As specified in clause 5.5.3.1 in TS 38.331 [13]. |
| Time offset between cells | ms | 3 | Asynchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤10 | |
| T3 | s | 5 | |

### 6.6.7.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on NR RF channel 1. E-UTRA Cell 2 is also on RF channel 1. Set the parameters according to Tables 6.6.7.2.4.1-3 and 6.6.7.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.

3. T1 starts. At this moment, the UE does not have any timing information of Cell 2.

4. After 5 seconds, T2 starts. A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event B2. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to TRUE.

5. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE.

6. If the UE transmits a measurement report containing the cell global identifier of Cell 2 within 200 ms from the start of T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If it is successful, continue to step 9. Otherwise continue to step 8.

8. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.6.7.2.4.3 Message contents

TBD

6.6.7.2.5 Test requirement

Table 6.6.7.2.5-1 and 6.6.7.2.5-2 define the cell specific test parameters.

**Table 6.6.7.2.5-1: PCell specific test parameters for identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR**

| Parameter | | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | | | 1, 2, 3 | FDD | | |
| | | | 4, 5, 6 | TDD | | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -98 | | |
| | | | 3, 6 | -95 | | |
| b2-Threshold2EUTRA | | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -109 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106 | | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -106 | | |
| | | | 3, 6 | -103 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88 | -108 | |
| | | | 3, 6 | -85 | -105 | |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88 | -108 | |
| | | | 3, 6 | -85 | -105 | |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.98 | -75.92 | |
| | | dBm/38.16 MHz | 3, 6 | -53.88 | -69.82 | |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Note 3: | $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
|---|---|

**Table 6.6.7.2.5-2: Cell specific test parameters for inter-RAT E-UTRAN cell for identification of a new CGI of E-UTRA cell using autonomous gaps**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode | | 1, 2, 3 | FDD | | |
| | | 4, 5, 6 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 10 MHz: $N_{RB,c}$ = 50 | | |
| PDSCH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.3 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.0 TDD | | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.6 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.6 TDD | | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 10 MHz: OP.10 FDD | | |
| | | 4, 5, 6 | 10 MHz: OP.1 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note3] | | | | | |
| OCNG_RB[Note3] | | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -106 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 | 7 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 | 7 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -99 | -99 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -99 | -99 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit a measurement report containing the cell global identifier of Cell 2 within 200 milliseconds from the start of T3.

Test requirement = RRC Procedure delay with additional margin + $T_{identify_CGI,E\text{-}UTRAN}$ + reporting delay

= 15 + 30 + 150 + 2ms from the start of T3

= 197 ms, allow 200 ms.

- The UE shall be scheduled continuously throughout the test, and from the start of T3 until 200 ms at least the number of ACK/NACK specified in NOTE 2 shall be detected as being transmitted by the UE.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE 1: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 2: The overall ACK/NACK number is caused by two parts. Firstly, at least X ACK/NACK shall be sent during identifying the cell global identifier of Cell 2, where X is defined in Table 8.2.2.2.15-1. Secondly, given that continuous DL data allocation, additional 43, 14 and 34 ACK/NACK shall be sent for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively, from the start of T3 until 200 ms excludes 150 ms for identifying the cell global identifier of Cell 2.

## 6.6.8 L1-SINR measurement for beam reporting

### 6.6.8.0 Minimum conformance requirements

#### 6.6.8.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 4.6.7.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.2.

#### 6.6.8.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 4.6.7.0.2

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

#### 6.6.8.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 4.6.7.0.3

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

### 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX

#### 6.6.8.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

#### 6.6.8.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement and long DRX cycle.

#### 6.6.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.1.

#### 6.6.8.1.4 Test description

##### 6.6.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.1.4.1-2. Test environment parameters are given in Table 6.6.8.1.4.1-3.

**Table 6.6.8.1.4.1-1: NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|

| | |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.8.1.4.1-2: General test parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| CSI-RS configuration | 1 | | CSI-RS 1.3 FDD |
| | 2 | | CSI-RS 1.3 TDD |
| | 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 | | OP.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| DRX configuration | 1~3 | | DRX.3 |
| reportConfigType | 1~3 | | aperiodic |
| reportQuantity-r16 | 1~3 | | cri-SINR-r16 |
| Number of reported RS | 1~3 | | 2 |
| qcl-Info | 1~3 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 26 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.8.1.4.1-3: Test Environment parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 6.6.8.1.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.1.4.1-2 and 6.6.8.1.5-1. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.8.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 6.6.8.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.8.1.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1, 2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 6.6.8.1.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 6.6.8.1.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. If after T1 expiry no report is received or received report did not contain L1-SINR of both CSI-RS#0 and CSI-RS#1 or UE sent the L1-SINR report at different slot than 26 from the reception of DCI trigger, the number of ‘failed’ iterations is increased by one, otherwise, the number of ‘passed’ iterations is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.8.1.4.3-1: Common Exception messages NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.7-1 with condition DRX.3 |

**Table 6.6.8.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 6.6.8.1.5 Test requirement

Table 6.6.8.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.8.1.5-1: CSI-RS specific test parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{\mathrm{oc}}$ Note1 | 1~3 | dBm/15kHz | -94.65 | |
| $N_{\mathrm{oc}}$ Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| | 3 | | -91.65 | |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | 1~3 | dB | 0 | 3 |
| | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |

| | | | | |
|---|---|---|---|---|
| CSI-RS RSRP Note3 | 3 | | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| | 3 | dBm/38.16 MHz | -57.59 | -55.84 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 3 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.1.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.1.5-4 for all test configurations.

**Table 6.6.8.1.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 41 |
| Highest reported value (CSI-RS#1) | 64 |

**Table 6.6.8.1.5-3: Void**

**Table 6.6.8.1.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS#0) | 0 |
| Highest DIFF SINR reported (CSI-RS#0) | 7 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX

### 6.6.8.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

### 6.6.8.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement.

### 6.6.8.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.2.

6.6.8.2.4 Test description

6.6.8.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.2.4.1-2. Test environment parameters are given in Table 6.6.8.2.4.1-3.

**Table 6.6.8.2.4.1-1: NR SA SSB based CMR and dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.8.2.4.1-2: General test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | c | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| CSI-RS configuration | 1 | | CSI-RS 1.1A FDD |
| | 2 | | CSI-RS 1.1A TDD |
| | 3 | | CSI-RS 2.1A TDD |
| OCNG Patterns | 1~3 | | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~3 | | off |
| reportConfigType | 1~3 | | periodic |
| reportQuantity-r16 | 1~3 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~3 | | 2 |
| L1-SINR reporting period | 1~3 | slot | 80 |
| T1 | 1~3 | s | 5 |
| T2 | 1~3 | s | 1 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.8.2.4.1-3: Test Environment parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.8.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 6.6.8.2.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.2.4.1-2, 6.6.8.2.5-1 and 6.6.8.2.5-2. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.8.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 6.6.8.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.8.2.4.1-2.

2. Set the parameters according to T1 in Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2. T1 starts. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2. T2 starts. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

5. If the UE sends L1-SINR reports meeting the corresponding absolute accuracy requirements in Table 6.6.8.2.5-3 for test configurations 1 and 2 the corresponding absolute accuracy requirements in Table 6.6.8.2.5-4 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.8.2.5-5 for all test configurations every 80 slots from no later than 720 ms for configuration 1 and 2 and no later than 680 ms for configuration 3 from the beginning of time period T2 until the end of time period T2, the number of passed

iterations is increased by one, otherwise the number of failed iterations is increased by one. The UE shall start sending valid L1-SINR reports. The SS shall check following requirements:

- R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1,2 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 (Table 6.6.8.2.5-3 for all configurations) and the relative L1-SINR requirement for SSB#0 in Table 6.6.8.2.5-5. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

- R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.8.2.5-3 for all configurations or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table6.6.8.2.5-5 for all configurations or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.8.2.4.3-1: Common Exception messages NR SA SSB based CMR and dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC |

**Table 6.6.8.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

6.6.8.2.5 Test requirement

Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.8.2.5-1: SSB specific test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0.5 | 0.5 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.15 | -94.15 | -Infinity | -91.65 |
| | 3 | | -91.14 | -91.14 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.43 | -63.43 | -66.70 | -61.93 |
| | 3 | dBm/38.16 MHz | -57.33 | -57.33 | -60.61 | -55.84 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0.5 | 0.5 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

**Table 6.6.8.2.5-2: CSI-RS specific test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | | CSI-RS#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/CSI-RS SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0.5 | 0.5 | -Infinity | 3 |
| CSI-RS RSRP Note3 | 1,2 | dBm/CSI-RS SCS | -94.15 | -94.15 | -Infinity | -91.65 |
| | 3 | | -91.14 | -91.14 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.43 | -63.43 | -66.70 | -61.93 |
| | 3 | dBm/38.16 MHz | -57.33 | -57.33 | -60.61 | -55.84 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0.5 | 0.5 | -Infinity | 3 |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.2.5-3 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.2.5-4 for all test configurations.

**Table 6.6.8.2.5-3: L1-SINR absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 44 |
| Highest reported value (SSB#1) | - | 61 |

**Table 6.6.8.2.5-4: Void**

**Table 6.6.8.2.5-5: L1-SINR relative accuracy requirements for the reported values for all test configurations**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF SINR reported (SSB#0) | - | 0 |
| Highest DIFF SINR reported (SSB#0) | - | 5 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX

### 6.6.8.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

### 6.6.8.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement.

### 6.6.8.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.3.

### 6.6.8.3.4 Test description

#### 6.6.8.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.3.4.1-2. Test environment parameters are given in Table 6.6.8.3.4.1-3.

**Table 6.6.8.3.4.1-1: NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 6.6.8.3.4.1-2: General test parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2 | | TDD |
| | 3 | | TDD |
| TDD Configuration | 1 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.3 FR1 |
| | 2 | | SSB.3 FR1 |
| | 3 | | SSB.4 FR1 |
| CSI-RS configuration | 1 | | CSI-RS 1.3 FDD |
| | 2 | | CSI-RS 1.3 TDD |
| | 3 | | CSI-RS 2.3 TDD |
| CSI-IM configuration | 1 | | CSI-IM.1.2 FDD |
| | 2 | | CSI-IM.1.2 TDD |
| | 3 | | CSI-IM.2.2 TDD |
| OCNG Patterns | 1~3 | | OP.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 |
| DRX configuration | 1~3 | | Off |
| reportConfigType | 1~3 | | aperiodic |
| reportQuantity-r16 | 1~3 | | cri-SINR-r16 |
| Number of reported RS | 1~3 | | 2 |
| qcl-Info | 1~3 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 26 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~3 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 6.6.8.3.4.1-3: Test Environment parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.8.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part | | |

1. Message contents are defined in clause 6.6.8.3.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.3.4.1-2 and 6.6.8.3.5-1. UE is configured to perform RLM and BFD based on the SSBs.

### 6.6.8.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 6.6.8.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.8.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1, 2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 6.6.8.3.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 6.6.8.3.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for

R3 is increased by one.5. If after T1 expiry no report is received or received report did not contain L1-SINR of both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR or UE sent the L1-SINR report at different slot than 26 from the reception of DCI trigger, the number of 'failed' iterations is increased by one, otherwise, the number of 'passed' iterations is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.8.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.8.3.4.3-1: Common Exception messages NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.6A-4 with condition APERIODIC |

**Table 6.6.8.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 6.6.8.3.5 Test requirement

Table 6.6.8.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.8.3.5-1: CSI-RS specific test parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~3 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2 | dBm/SSB SCS | -94.65 | |

| | | | | |
|---|---|---|---|---|
| | 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |
| | 3 | | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| | 3 | dBm/38.16 MHz | -57.59 | -55.84 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 3 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.3.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.3.5-4 for all test configurations.

**Table 6.6.8.3.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 43 |
| Highest reported value (CSI-RS#1) | 62 |

**Table 6.6.8.3.5-3: Void**

**Table 6.6.8.3.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS#0) | 0 |
| Highest DIFF SINR reported (CSI-RS#0) | 6 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 6.6.9 Idle Mode CA/DC Measurements

## 6.6.9.0 Minimum conformance requirements

### 6.6.9.0.1 Idle Mode CA/DC Measurements

For a UE which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* the UE shall support the idle mode CA measurements on the serving cell, and carriers configured for idle mode CA/DC measurement reporting provided T331 has not expired, the serving cell is supporting idle mode CA/DC measurement reporting and the serving cell is in the validity area.

This subclause defines the requirements for the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an NE-DC and NR carrier aggregation capable UE which has been configured with one or more of following, one or more SCells, one E-UTRAN PSCell or one or more downlink E-UTRAN SCells during the Connected mode and which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16.* The requirements are applicable for SCell(s) and E-UTRAN FDD and TDD PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
  - The UE is provided with a valid timer T331 by dedicated RRC signalling, and
  - The detected cell and SSBs remains detectable until UE reconnect to the network and transmits the early measurement report, and
  - The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-RAT E-UTRAN cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in TS 36.133 [23] Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-frequency cell is considered detectable according to the conditions in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding band. An SSB of an inter-frequency cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding Band.

While T331 is running, the UE shall perform measurement on the configured inter-frequency carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveNR-MeasReport-r16* shall support idle mode CA/DC measurements of:

- at least 7 inter-frequency carriers which are also configured for inter-frequency mobility measurements, and
- at least 7 inter-frequency carriers which are not configured for inter-frequency mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-frequency carriers for idle mode CA/DC measurements comprising of carriers configured for inter-frequency mobility measurements and carriers not configured for inter-frequency mobility measurements.

For inter-frequency carriers configured for idle mode CA/DC measurements, if Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ the inter-frequency measurement requirements in TS 38.133 [6] clause 4.2.2.4 shall apply, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ the UE shall search for inter-frequency layers configured for idle mode CA/DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2.2.7, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For UE supporting *idleInactiveNR-MeasBeamReport-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode CA/DC measurement, the UE shall be capable of performing SS-RSRP, SS-RSRQ for at least

- 7 SSBs with different SSB index and/or PCI on an inter-frequency layer in FR1,
- 10 SSBs with different SSB index and/or PCI on an inter-frequency layer in FR2.

For UE supporting *idleInactiveNR-MeasBeamReport-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode CA/DC measurement, the UE shall be able to acquire the SSB index for a newly detectable inter-RAT NR cell and perform RSRP/RSRQ measurement within the requirements defined in TS 38.133 [6] clause 4.2.2.4 plus

$T_{SSB_index,NR}$, where $T_{SSB_index,NR}$ is the additional time period used to acquire the index of the SSB being measured as defined in Table 6.6.9.0.1-1.

**Table 6.6.9.0.1-1: $T_{SSB_index,NR_Inter}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{SSB_index,NR_Inter}$ [s] (number of DRX cycles) |
|---|---|---|---|
| | FR1 | FR2[Note1] | |
| 0.32 | 1 | 8 | N2 x 1.28 x N1 x 1.5 (N2 x 4 x N1 x 1.5) |
| 0.64 | | 5 | N2 x 1.28 x N1 (N2 x 2 x N1) |
| 1.28 | | 4 | N2 x 1.28 x N1 (N2 x 1 x N1) |
| 2.56 | | 3 | N2 x 2.56 x N1 (N2 x 1 x N1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>NOTE 2: N2 = 3 if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR1, and N2 = 5 if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR2. | | | |

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode CA/DC measurement.

For inter-frequency carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4B, 10.1.5B, 10.1.9B and 10.1.10B, respectively.

The UE shall be able to report idle mode CA/DC measurements when idle mode CA/DC measurement reporting is requested by the network.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in TS 38.133 [6] clause 4.2.2.2 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.2B, 10.1.3B, 10.1.7B and 10.1.8B.

### 6.6.9.0.2 Measurement report for fast CA/DC setup

The requirements of measurement report for fast CA/DC setup apply in this clause for:

- UE supporting *measValidationReportEMR-r18* and configured with *measIdleCarrierListNR-r16* and/or *measIdleCarrierListEUTRA-r16* by higher layers.

- UE supporting *measValidationReportReselectionMeasurements-r18* and configured with *measReselectionCarrierListNR-r18* by higher layers.

A UE supporting *measValidationReportEMR-r18* and *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* shall report the results of the idle mode measurement which is specified in clause 6.6.9.0.1, and according to the measurement reporting requirements specified below**.**

A UE supporting *measValidationReportReselectionMeasurements-r18* shall report the results of the idle mode measurement specified in TS 38.133 [6] clause 4.2.2, and according to the measurement reporting requirements specified below.

UE is not required to report for fast CA/DC setup from any measurements during IDLE mode for carriers which are not configured by higher layers.

A UE shall perform validity check and report valid measurement results:

- if the UE supports *measValidationReportEMR-r18* and *measIdleValidityDuration-r18* is configured for carriers in *measIdleCarrierListNR-r16* or *measIdleCarrierListEUTRA-r16*,

- if the UEsupports *measValidationReportReselectionMeasurements-r18* and *measReselectionValidityDuration-r18* is configured for carriers in *measReselectionCarrierListNR-r18*

The measurement results are considered valid if the following conditions are met for the validity check:

- the measurements are performed before msg1 transmission for RRC resume/setup request within the last:
- measIdleValidityDuration-r18 seconds for carriers configured in measIdleCarrierListNR-r16 or measIdleCarrierListEUTRA-r16, and/or
- *measReselectionValidityDuration-r18* seconds for carriers configured in *measReselectionCarrierListNR-r18*,
- the measurement results satisfy measurement accuracy requirement at the measurement instance.

Otherwise, the measurement results are considered invalid. The UE shall not report invalid measurement results when *measIdleValidityDuration-r18* and/or *measReselectionValidityDuration-r18* is configured.

If the *measIdleValidityDuration-r18* is not configured, the UE is not required to perform validity check for carriers in *measIdleCarrierListNR-r16* and *measIdleCarrierListEUTRA-r16*, and the UE may report measurement results given the measurement results satisfy measurement accuracy requirement at the measurement instance.

If the *measReselectionValidityDuration-r18* is not configured, the UE is not required to perform validity check for carriers configured in *measReselectionCarrierListNR-r18*, and the UE may report measurement results given the measurement results satisfy measurement accuracy requirement at the measurement instance.

RSRP, RSRQ measurements contained in the measurement reports shall meet the corresponding accuracy requirements at the measurement instance specified in TS 38.133 [6] clauses 10.1.2B, 10.1.3B, 10.1.4B, 10.1.5B, 10.1.7B, 10.1.8B, 10.1.9B, 10.1.10B.

### 6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1

#### 6.6.9.1.1 Test purpose

The purpose of this test is to verify that the UE performs the required measurements on the serving cell and the configured inter-frequency carrier for idle mode measurement reporting after the UE has entered Idle mode. This test will partly verify the Idle mode CA/DC measurements requirements in TS 38.133 [6] clause 4.4.

#### 6.6.9.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, supporting 2DL CA and *idleInactiveNR-MeasReport-r16.*

#### 6.6.9.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 4.4and A.6.6.9.1

#### 6.6.9.1.4 Test description

##### 6.6.9.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.9.1.4.1-1.

**Table 6.6.9.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.9.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.9.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.9.1-3 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.6.9.1.4.1-2.

**Table 6.6.9.1.4.1-2: Initial conditions for SA Idle mode CA/DC measurement for FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.9.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 6.6.9.1.4.1-3.

2. Message contents are defined in clause 6.6.9.1.4.3.

3. The test scenario comprises of two NR Cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.9.1.4.1-3: General test parameters for SA Idle mode CA/DC measurement for FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.10.1 |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| PRACH configuration index | | Config 1,2,3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX in connected mode | | Config 1,2,3 | OFF | DRX is not used |
| DRX in idle mode | s | Config 1,2,3 | 0.32 | The value shall be used for all cells in the test. |
| T331 | s | | 300 | |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells |
| T1 | s | Config 1,2,3 | 10 | |
| T2 | s | Config 1,2,3 | 11.52 | |
| T3 | s | Config 1,2,3 | 10 | |

#### 6.6.9.1.4.2 Test procedure

Two cells are deployed in the test, one FR1 NR PCell (Cell 1) on RF channel 1 and an FR1 NR neighbour cell (Cell 2) on RF channel 2. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. During T1, UE is connected to Cell 1 and has not any timing information about Cell 2. UE is configured with early measurement reporting with channel 2. Beam level reporting for early measurements is not configured.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.9.1.5-1. T1 starts.

3. When T1 expires, the SS shall transmit an *RRCRelease* message including *measIdleCarrierListNR-r16* (Table 6.6.9.1.4.3-3) and switch the parameters according to T2 in Table 6.6.9.1.5-2. T2 starts.

4. Ensure the UE is in state RRC_IDLE until T2 expires. T3 starts.

6. The SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14]clause 4.5.

7. During the connection setup the UE is reports *idleMeasAvailable-r16* in the *RRCSetupComplete* message.

8. TE shall send the *UEInformationRequest* message, requesting UE to provide ide mode measurements results (Table 6.6.9.1.4.3-5).

9. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 6.6.9.1.5-3 for configuration 1 and 2 and Table 6.6.9.1.5-4 for configuration 3, and SS-RSRQ values within the limits in Table 6.6.9.1.5-5 for configuration 1, 2 and 3, the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.9.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.9.1.4.3-1: Common Exception messages for SA Idle mode CA/DC measurement for FR1**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 6.6.9.1.4.3-2: *SIB1* for SA Idle mode CA/DC measurement for FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| idleModeMeasurementsNR-r16 | TRUE | This field indicates that a UE that is configured for NR idle/inactive measurements shall perform the measurements while camping in this cell and report availability of these measurements when establishing or resuming a connection in this cell. If absent, a UE is not required to perform NR | |

| | | | |
|---|---|---|---|
| | | idle/inactive measurements. | |
| } | | | |
| } | | | |

**Table 6.6.9.1.4.3-3: *RRCRelease* for SA Idle mode CA/DC measurement for FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| MeasIdleConfigDedicated-r16 ::= SEQUENCE { | | | |
| measIdleCarrierListNR-r16 ::= SEQUENCE { | | Serving cell not included | |
| MeasIdleCarrierNR-r161 ::= SEQUENCE { | | | |
| carrierFreq-r16 | ARFCN value of NR channel 2 | | |
| ssbSubcarrierSpacing-r16 | kHz15 | Config 1,2 | |
| | kHz30 | Config 3 | |
| frequencyBandList | Not present | | |
| measCellListNR-r16 | Not present | | |
| reportQuantities-r16 | both | | |
| qualityThreshold-r16 | Not present | | |
| ssb-MeasConfig-r16 SEQUENCE { | | | |
| nrofSS-BlocksToAverage-r16 | Not present | | |
| absThreshSS-BlocksConsolidation-r16 | Not present | | |
| smtc-r16 | SSB-MTC | TS 38.508-1 [14], Table 7.3.1-3 | |
| ssb-ToMeasure-r16 | SSB-ToMeasure | TS 38.508-1 [14], Table 7.3.1-31 | |
| deriveSSB-IndexFromCell-r16 | false | | |
| | true | | FR1_TDD, FR2_TDD |
| ss-RSSI-Measurement-r16 | Not present | | |
| } | | | |
| beamMeasConfigIdle-r16 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| measIdleCarrierListEUTRA-r16 | Not present | | |
| measIdleDuration-r16 | sec300 | | |
| validityAreaList-r16 ::= SEQUENCE { | | | |
| ValidityArea-r16 ::= SEQUENCE { | | | |
| carrierFreq-r16 | ARFCN value of NR channel 1 | | |
| validityCellList-r16 ::= SEQUENCE { | | | |
| *PCI-Range* | PhysCellId of Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.9.1.4.3-4: *RRCSetupComplete* for SA Idle mode CA/DC measurement for FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-22: | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCSetupComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcSetupComplete SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| idleMeasAvailable-r16 | TRUE | Indication that the UE has idle/inactive measurement report available. | |
| | | | |
| | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.9.1.4.3-5: *UEInformationRequest***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-32A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationRequest-r16 ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| ueInformationRequest-r16 SEQUENCE { | | | |
| idleModeMeasurementReq-r16 | TRUE | UE shall report the idle/inactive measurement information, if available, to the network in the *UEInformationResponse* message. | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.9.1.4.3-6: *UEInformationResponse***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-32B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationResponse-r16 ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| ueInformationResponse-r16 SEQUENCE { | | | |
| measResultIdleNR-r16 ::= SEQUENCE { | | | |
| rsrp-Result-r16 | INTEGER(0..127) | Integer value for RSRP measurements is according to Table 10.1.6.1-1 in TS 38.133 [6] | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.9.1.5 Test requirements

Tables 6.6.9.1.5-1 and 6.6.9.1.5-2 define the primary level settings including test tolerances and tables 6.6.9.1.5-3, 6.6.9.1.5-4, 6.6.9.1.5-5 and 6.6.9.1.5-6 define accuracy requirements define for SA Idle mode CA/DC measurement for FR1.

**Table 6.6.9.1.5-1: Cell specific test parameters for connected mode for SA Idle mode CA/DC measurement for FR1**

| Parameter | Unit | Test configuration | Cell 1 | Cell 2 |
|---|---|---|---|---|

| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
|---|---|---|---|---|---|---|---|---|---|
| NR RF Channel Number | | | Config 1,2,3 | 1 | | | 2 | | |
| Duplex mode | | | Config 1 | FDD | | | | | |
| | | | Config 2,3 | TDD | | | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | | | |
| | | | Config 2 | TDDConf.1.1 | | | | | |
| | | | Config 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | | NA | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | NA | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | NA | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | NA | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | | NA | | |
| | | | Config 2 | TRS.1.1 TDD | | | NA | | |
| | | | Config 3 | TRS.1.2 TDD | | | NA | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | | Config 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | | Config 3 | SR2.1 TDD | | | SR2.1 TDD | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | | Config 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | | Config 3 | CR2.1 TDD | | | CR2.1 TDD | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | | SSB.5 FR1 | | |
| | | | Config 2 | SSB.1 FR1 | | | SSB.5 FR1 | | |
| | | | Config 3 | SSB.2 FR1 | | | SSB.6 FR1 | | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | | SMTC.5 | | |
| | | | Config 2, 3 | SMTC.1 | | | SMTC.4 | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | |
| | | | Config 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98 | | | -98 | | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | | -98 | | |
| | | | Config 3 | -95 | | | -95 | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91 | -91 | -91 | -infinity | -98 | -98 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Config 3 | -88 | -88 | -88 | -infinity | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 7 | 7 | 7 | -infinity | 0 | 0 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 7 | 7 | 7 | infinity | 0 | 0 |
| Io[Note3] | dBm/9.36MHz | Config 1,2 | -62.26 | -62.26 | -62.26 | -70.5 | -67.04 | -67.04 |
| | dBm/38.16MHz | Config 3 | -56.15 | -56.15 | -56.15 | -63.94 | -60.93 | -60.93 |
| Propagation Condition | | Config 1,2,3 | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 6.6.9.1.5-2: Cell specific test parameters for idle mode for SA Idle mode CA/DC measurement for FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | 1,2,3 | 1 | | | 2 | | |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 14 | 14 | 14 | -infinity | 12 | 12 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 1 | 7 | 7 | 7 | -infinity | 0 | 0 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -91 | -91 | -91 | -infinity | -98 | -98 |
| | | 2 | -91 | -91 | -91 | -infinity | -98 | -98 |
| | | 3 | -88 | -88 | -88 | -infinity | -95 | -95 |
| Io | dBm/9.36 MHz | 1 | -62.26 | -62.26 | -62.26 | -70.5 | -67.04 | -67.04 |
| | dBm/9.36 MHz | 2 | -62.26 | -62.26 | -62.26 | -70.5 | -67.04 | -67.04 |
| | dBm/38.16 MHz | 3 | -56.15 | -56.15 | -56.15 | -63.94 | -60.93 | -60.93 |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3 | Not sent | | | Not sent | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.9.1.5-3: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRP reported values for test configurations 1 and 2**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 1) | 54 |
| Highest reported value (Cell 1) | 77 |
| Lowest reported value (Cell 2) | 47 |
| Highest reported value (Cell 2) | 70 |

**Table 6.6.9.1.5-4: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRP reported values for test configurations 3**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 1) | 57 |
| Highest reported value (Cell 1) | 80 |
| Lowest reported value (Cell 2) | 50 |
| Highest reported value (Cell 2) | 73 |

**Table 6.6.9.1.5-5: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRQ reported values for test configurations 1, 2 and 3**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 1) | 55 |
| Highest reported value (Cell 1) | 72 |
| Lowest reported value (Cell 2) | 51 |
| Highest reported value (Cell 2) | 67 |

During the time period T2 the UE is in Idle mode and the signal level of Cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode CA measurement according to Section 4.4.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for Cell 2. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for Cell 2 meets the requirements in Section 10.1.4B for SS-RSRP and 10.1.8B for SS-RSRQ and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.6.9.2 NR SA FR1 Idle mode fast CA/DC eEMR measurement

Editor's Note: This test case is incomplete in following aspects:

Test procedure is missing

Message contents are FFS

Test case applicability is missing in 38.522

Test Tolerance is not applied

#### 6.6.9.2.1 Test purpose

To verify the UE supporting *measValidationReportEMR-r18* makes correct reporting. This test will partly verify the he fast CA/DC measurement reporting requirements in TS 38.133 [6] clause clause 4.7.

#### 6.6.9.2.2 Test applicability

This test applies to all types of NR UE supporting *measValidationReportEMR-r18* from release 18 and forward.

#### 6.6.9.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.9.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.9.2.

#### 6.6.9.2.4 Test description

##### 6.6.9.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.9.2.4.1-1

**Table 6.6.9.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.9.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.9.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.9.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.6.9.2.4.1-2.

**Table 6.6.9.2.4.1-2: Initial conditions for NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The test scenario comprises of two NR Cells. NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as inter-frequency neighbour cell in FR1 on NR RF channel 2. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 for this test.
2. The general test parameter settings are in Table 6.6.9.2.4.1-3.

**Table 6.6.9.2.4.1-3: General test parameters for TBD**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.10.1 |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| PRACH configuration index | | Config 1,2,3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX in connected mode | | Config 1,2,3 | OFF | DRX is not used |
| DRX in idle mode | s | Config 1,2,3 | 0.32 | The value shall be used for all cells in the test. |
| T331 | s | | 30 | |
| *measIdleValidityDuration* | s | | 10 | |
| Time offset between serving and neighbour cells | | Config 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 30 | |
| T3 | s | Config 1,2,3 | 10 | |
| T4 | s | Config 1,2,3 | 1 | |

6.6.9.2.4.2 Test procedure

TBD

6.6.9.2.4.3 Message contents

TBD

6.6.9.2.5 Test requirements

Table 6.6.9.2.5-1 defines the primary level settings for all tests.

**Table 6.6.9.2.5-1: NR Cell specific test parameters for TBD**

| Parameter | | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | | | 2 | | | |
| Duplex mode | | | Config 1 | FDD | | | | | | | |
| | | | Config 2,3 | TDD | | | | | | | |
| TDD configuration | | | N.A | N.A | | | | | | | |
| | | | TDDConf.1.1 | TDDConf.1.1 | | | | | | | |
| | | | TDDConf.2.1 | TDDConf.2.1 | | | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | | | NA | | | |

| Parameter | | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| | Initial UL BWP | | | ULBWP.0.1 | | | | NA | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | NA | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | NA | | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | | | NA | | | |
| | | | Config 2 | TRS.1.1 TDD | | | | NA | | | |
| | | | Config 3 | TRS.1.2 TDD | | | | NA | | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | | | OP.1 | | | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | | SR2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | | CR2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | | | SSB.5 FR1 | | | |
| | | | Config 2 | SSB.1 FR1 | | | | SSB.5 FR1 | | | |
| | | | Config 3 | SSB.2 FR1 | | | | SSB.6 FR1 | | | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | | | SMTC.5 | | | |
| | | | Config 2, 3 | SMTC.1 | | | | SMTC.4 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | | | |
| | | | Config 3 | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98+TT | | | | -98+TT | | | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98+TT | | | | -98+TT | | | |
| | | | Config 3 | -95+TT | | | | -95+TT | | | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91+TT | | | | -infinity | -98+TT | infinity | infinity |
| | | | Config 3 | -88+TT | | | | -infinity | -95+TT | infinity | infinity |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3 | 7+TT | | | | - infinity | 0+TT | infinity | infinity |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 7+TT | | | | infinity | 0+TT | infinity | infinity |
| IoNote3 | | dBm/9.36 MHz | Config 1,2 | -62.26+TT | | | | -70.05+TT | -67.04+TT | -70.05+TT | -70.05+TT |

| Parameter | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| | dBm/3.84 MHz | Config 3 | -56.15+TT | | | | -63.96+TT | -60.9+T T 3 | -63.96+TT | -63.96+TT |
| Propagation Condition | | Config 1,2,3 | AWGN | | | | AWGN | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | | | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | | |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | | | |

During the period T2 and T3, the UE shall not perform reselection.

At the start of T4 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for Cell 2.

The UE shall NOT send early measurement report to the PCell in this test.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 6.6.9.3 NR SA FR1 Idle mode fast CA/DC cell reselection measurement without valid reporting

Editor's Note: This test case is incomplete in following aspects:

Test procedure is missing

Message contents are FFS

Test case applicability is missing in 38.522

Test Tolerance is not applied

### 6.6.9.3.1 Test purpose

To verify the UE supporting *measValidationReportReselectionMeasurements-r18* makes correct reporting. This test will partly verify the he fast CA/DC measurement reporting requirements in TS 38.133 [6] clause clause 4.7.

### 6.6.9.3.2 Test applicability

This test applies to all types of NR UE supporting *measValidationReportReselectionMeasurements-r18* from release 18 and forward.

### 6.6.9.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.9.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.9.3.

### 6.6.9.3.4 Test description

#### 6.6.9.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.9.3.4.1-1

**Table 6.6.9.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.9.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.9.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.9.3-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

| Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell |
|---|

Test environment parameters are given in Table 6.6.9.3.4.1-2.

**Table 6.6.9.3.4.1-2: Initial conditions for TBD**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The test scenario comprises of two NR Cells. NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as inter-frequency neighbour cell in FR1 on NR RF channel 2. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 for this test.
2. The general test parameter settings are in Table 6.6.9.3.4.1-3.

**Table 6.6.9.3.4.1-3: General test parameters for TBD**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.10.1 |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| PRACH configuration index | | Config 1,2,3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX in connected mode | | Config 1,2,3 | OFF | DRX is not used |
| DRX in idle mode | s | Config 1,2,3 | 0.32 | The value shall be used for all cells in the test. |
| *measReselectionValidity Duration-r18* | s | | 5 | |
| Time offset between serving and neighbour cells | | Config 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 30 | |
| T3 | s | Config 1,2,3 | 5 | |
| T4 | s | Config 1,2,3 | 1 | |

6.6.9.3.4.2 Test procedure

TBD

6.6.9.3.4.3 Message contents

TBD

6.6.9.3.5 Test requirements

Table 6.6.9.3.5-1 defines the primary level settings for all tests.

**Table 6.6.9.3.5-1: NR Cell specific test parameters for TBD**

| Parameter | | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | | | 2 | | | |
| Duplex mode | | | Config 1 | FDD | | | | | | | |
| | | | Config 2,3 | TDD | | | | | | | |
| TDD configuration | | | N.A | N.A | | | | | | | |
| | | | TDDConf.1.1 | TDDConf.1.1 | | | | | | | |
| | | | TDDConf.2.1 | TDDConf.2.1 | | | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | | | NA | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | NA | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | NA | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | NA | | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | | | NA | | | |
| | | | Config 2 | TRS.1.1 TDD | | | | NA | | | |
| | | | Config 3 | TRS.1.2 TDD | | | | NA | | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | | | OP.1 | | | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | | SR2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | | CR2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | | | SSB.5 FR1 | | | |
| | | | Config 2 | SSB.1 FR1 | | | | SSB.5 FR1 | | | |
| | | | Config 3 | SSB.2 FR1 | | | | SSB.6 FR1 | | | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | | | SMTC.5 | | | |
| | | | Config 2, 3 | SMTC.1 | | | | SMTC.4 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | | | |
| | | | Config 3 | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | | |

| Parameter | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98+TT | | | | -98+TT | | | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98+TT | | | | -98+TT | | | |
| | | Config 3 | -95+TT | | | | -95+TT | | | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -91+TT | | | | -infinity | -98+TT | infinity | infinity |
| | | Config 3 | -88+TT | | | | -infinity | -95+TT | infinity | infinity |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 7+TT | | | | - infinity | 0+TT | infinity | infinity |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 7+TT | | | | infinity | 0+TT | infinity | infinity |
| IoNote3 | dBm/9.36 MHz | Config 1,2 | -62.26+TT | | | | -70.05+TT | -67.04+TT | -70.05+TT | -70.05+TT |
| | dBm/38.16 MHz | Config 3 | -56.15 | | | | -63.96+TT | -60.93+TT | -63.96+TT | -63.96+TT |
| Propagation Condition | | Config 1,2,3 | AWGN | | | | AWGN | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

During the period T2, the UE shall not perform reselection.

At the start of T4 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for Cell 2.

The UE shall NOT send early measurement report to the PCell in this test.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 6.6.9.4 NR SA FR1 Idle mode fast CA/DC cell reselection measurement with valid reporting

Editor's Note: This test case is incomplete in following aspects:

Test procedure is missing

Message contents are FFS

Test case applicability is missing in 38.522

Test Tolerance is not applied

#### 6.6.9.4.1 Test purpose

To verify the UE supporting *measValidationReportReselectionMeasurements-r18* makes correct reporting. This test will partly verify the he fast CA/DC measurement reporting requirements in TS 38.133 [6] clause clause 4.7.

#### 6.6.9.4.2 Test applicability

This test applies to all types of NR UE supporting *measValidationReportReselectionMeasurements-r18* from release 18 and forward.

#### 6.6.9.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.9.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.9.4.

#### 6.6.9.4.4 Test description

##### 6.6.9.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.9.4.4.1-1

**Table 6.6.9.4.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.9.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.9.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.9.4-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.6.9.4.4.1-2.

**Table 6.6.9.4.4.1-2: Initial conditions for TBD**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The test scenario comprises of two NR Cells. NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as inter-frequency neighbour cell in FR1 on NR RF channel 2. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 for this test.
2. The general test parameter settings are in Table 6.6.9.4.4.1-3.

**Table 6.6.9.4.4.1-3: General test parameters for TBD**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2 |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | As specified in clause A.3.10.1 |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.2 FR1 | As specified in clause A.3.10.1 |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| PRACH configuration index | | Config 1,2,3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX in connected mode | | Config 1,2,3 | OFF | DRX is not used |
| DRX in idle mode | s | Config 1,2,3 | 0.32 | The value shall be used for all cells in the test. |
| *measReselectionValidityDuration-r18* | s | | 5 | |
| Time offset between serving and neighbour cells | | Config 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells |
| T1 | s | Config 1,2,3 | 10 | |
| T2 | s | Config 1,2,3 | 30 | |
| T3 | s | Config 1,2,3 | 5 | |
| T4 | s | Config 1,2,3 | 1 | |

6.6.9.4.4.2 Test procedure

TBD

6.6.9.4.4.3 Message contents

TBD

6.6.9.4.5 Test requirements

Table 6.6.9.4.5-1 defines the primary level settings for all tests.

**Table 6.6.9.4.5-1: NR Cell specific test parameters for TBD**

| Parameter | | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | | | 2 | | | |
| Duplex mode | | | Config 1 | FDD | | | | | | | |
| | | | Config 2,3 | TDD | | | | | | | |
| TDD configuration | | | N.A | N.A | | | | | | | |
| | | | TDDConf.1.1 | TDDConf.1.1 | | | | | | | |
| | | | TDDConf.2.1 | TDDConf.2.1 | | | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | | | |
| | | | Config 3 | 40: NRB,c = 106 | | | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | | | NA | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | NA | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | NA | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | NA | | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | | | NA | | | |
| | | | Config 2 | TRS.1.1 TDD | | | | NA | | | |
| | | | Config 3 | TRS.1.2 TDD | | | | NA | | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | | | OP.1 | | | |

| Parameter | Unit | Test configuration | Cell 1 | Cell 2 | | | |
|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | Config 1 | SR.1.1 FDD | SR.1.1 FDD | | | |
| | | Config 2 | SR.1.1 TDD | SR.1.1 TDD | | | |
| | | Config 3 | SR2.1 TDD | SR2.1 TDD | | | |
| CORESET Reference Channel | | Config 1 | CR.1.1 FDD | CR.1.1 FDD | | | |
| | | Config 2 | CR.1.1 TDD | CR.1.1 TDD | | | |
| | | Config 3 | CR2.1 TDD | CR2.1 TDD | | | |
| SSB parameters | | Config 1 | SSB.1 FR1 | SSB.5 FR1 | | | |
| | | Config 2 | SSB.1 FR1 | SSB.5 FR1 | | | |
| | | Config 3 | SSB.2 FR1 | SSB.6 FR1 | | | |
| SMTC configuration defined in A.3.11 | | Config 1 | SMTC.2 | SMTC.5 | | | |
| | | Config 2, 3 | SMTC.1 | SMTC.4 | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | | |
| | | Config 3 | 30 | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98+TT | -98+TT | | | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98+TT | -98+TT | | | |
| | | Config 3 | -95+TT | -95+TT | | | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -88+TT | -infinity | -91+TT | -100+TT | -100+TT |
| | | Config 3 | -85+TT | -infinity | -88+TT | -97+TT | -97+TT |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4, | 10+TT | - infinity | 7+TT | -2+TT | -2+TT |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 10+TT | -infinity | 7+TT | -2+TT | -2+TT |
| IoNote3 | dBm/9.36 MHz | Config 1,2 | -59.63+TT | -70.5+TT | -62.26+TT | -67.92+TT | -67.92+TT |
| | dBm/38.16 MHz | Config 3 | -53.54+TT | -63.96+TT | -56.17+TT | -61.83+TT | -61.83+TT |
| Propagation Condition | | Config 1,2,3 | AWGN | AWGN | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

During the period T2 and T3 the UE shall not perform reselection.

At the start of T4 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for Cell 2.

The UE shall send early measurement report to the PCell with valid measurement results.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for Cell 2 meets the requirements in section 10.1.4B for SS-RSRP and in section 10.1.8B for SS-RSRQ and test ends. In the test case, the reported measurements are considered valid if they fulfil measurement accuracy requirements according to Cell 2 signal level during T3.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

# 6.6.10 to 6.6.14

# 6.6.15 Idle Mode inter-RAT CA/DC Measurements

## 6.6.15.0 Minimum conformance requirements

For a UE which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* the UE shall support the idle mode CA measurements on the serving cell, and carriers configured for idle mode CA/DC measurement reporting provided T331 has not expired, the serving cell is supporting idle mode CA/DC measurement reporting and the serving cell is in the validity area.

This subclause defines the requirements for the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an NE-DC and NR carrier aggregation capable UE which has been configured with one or more of following, one or more SCells, one E-UTRAN PSCell or one or more downlink E-UTRAN SCells during the Connected mode and which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16.* The requirements are applicable for SCell(s) and E-UTRAN FDD and TDD PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
  - The UE is provided with a valid timer T331 by dedicated RRC signalling, and
  - The detected cell and SSBs remains detectable until UE reconnect to the network and transmits the early measurement report, and
  - The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-RAT E-UTRAN cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in TS 36.133 [23] Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-frequency cell is considered detectable according to the conditions in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding band. An SSB of an inter-frequency cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding Band.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in clause 4.2.2.2 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.2B, 10.1.3B, 10.1.7B and 10.1.8B.

While T331 is running, the UE shall perform measurement on the configured inter-RAT carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveEUTRA-MeasReport-r16* shall support idle mode DC measurements of:

- at least 7 E-UTRAN inter-RAT carriers which are also configured for E-UTRAN inter-RATmobility measurements, and
- at least 1 E-UTRAN inter-RAT carrier which is not configured for E-UTRAN inter-RAT mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-RAT carriers for idle mode CA/DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For inter-RAT carriers configured for idle mode CA/DC measurements, if Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ the inter-RAT measurement requirements in TS 38.133 [6] clause 4.2.2.5 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ the UE shall search for inter-RAT layers configured for idle mode CA/DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2.2, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For overlapping inter-RAT carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing RSRP and RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in TS 36.133 [23] clauses in 9.1.3B.3 and 9.1.6B.2, respectively.

The UE shall be able to report idle mode CA measurements when idle mode CA measurement reporting is requested by the network.

## 6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting

### 6.6.15.1.1 Test purpose

The purpose of this test is to verify that the UE properly retains the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode, when the UE has entered Idle mode. Additionally, test that the UE performs the required measurements on the serving cell and the configured inter-RAT carrier for idle mode measurement reporting. This test will partly verify the Idle mode CA measurements in TS 38.133 [6] clause 4.4. In the test, connected mode DRX configuration is not configured in either PCell or PSCell.

Additionally, the purpose of this test is to verify that the SS-RSRP, SS-RSRQ, RSRP and RSRQ measurement accuracy is within the specified limits. This test will verify the accuracy requirements in TS 38.133 [6] clauses 10.1.2B and 10.1.7B for intra-frequency measurements and clause 10.2.4 and 10.2.5 for the inter-RAT measurements.

### 6.6.15.1.2 Test applicability

This test applies to all types of NR UE release 16, supporting NE-DC and *idleInactiveEUTRA-MeasReport-r16.*

### 6.6.15.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.15.0.

The normative reference for this requirement is TS 38.133 [6] clauses 4.4, 10.1.2B, 10.1.7B, 10.2.4 and 10.2.5 and A.6.6.15

### 6.6.15.1.4 Test description

#### 6.6.15.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.15.1.4.1-1.

**Table 6.6.15.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.15.1-1 | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE FDD 10MHz |
| 6.6.15.1-2 | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE TDD 10MHz |
| 6.6.15.1-3 | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE FDD 10MHz |
| 6.6.15.1-4 | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE TDD 10MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.15.1.4.1-2.

**Table 6.6.15.1.4.1-2: Initial conditions for Idle Mode measurements of inter-RAT DC candidate cells for early reporting**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.15.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 6.6.15.1.4.1-3 and Table 6.6.15.1.4.1-4.
2. Message contents are defined in clause 6.6.15.1.4.3.
3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 6.6.15.1.4.1-3: General test parameters for Idle Mode measurements of inter-RAT DC candidate cells for early reporting**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1 in FR1 |
| PSCell | | Cell 2 | PSCell on RF channel number 2 in LTE. Cell 2 is of higher priority. |
| DRX | | OFF | For both PCell and PSCell once configured |
| PRACH configuration in Cell 2 | | PRACH_2CE | PRACH configuration as specified in Clause A.3.16 in TS 36.133 [23] |
| T331 | s | 300 | |
| CSI reporting periodicity and offset configuration for Cell 2 | ms | 2 | |
| T1 | s | 0.5 | During this time the PCell is known and PSCell is configured. |
| T2 | s | 0.5 | PSCell access. |
| T3 + T4 | s | 66 | During this time the UE is configured to perform inter-RAT measurements in idle mode on the PSCell carrier. |
| T5 | s | 0.5 | UE is paged and connection is setup. Network requests measurement report from the UE. |

**Table 6.6.15.1.4.1-4: General idle mode test parameters for Idle Mode measurements of inter-RAT DC candidate cells for early reporting**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Serving cell | | 1, 2, 3, 4 | Cell 1 | The UE camps on Cell 1 which is the former PCell. |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | The UE shall perform inter-RAT measurements on Cell 2 which is the former PSCell. |
| RF Channel Number | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | 1, 2, 3, 4 | 3 μs | Synchronous cells |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | - | 1, 2, 3,4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1, 2 | SSB.1 FR1 | Serving cell |
| | | 3, 4 | SSB.2 FR1 | Serving cell |
| SMTC configuration Serving cell | | 1, 2, 3, 4 | SMTC.2 | |
| DRX cycle length | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3, 4 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3, 4 | Not configured | |
| T3 | s | 1, 2, 3, 4 | 0.5 | T3 needs to be defined so that cell measurement time is taken into account. |
| T4 | s | 1, 2, 3, 4 | 65 | T4 needs to be defined so that cell measurement time is taken into account. |

#### 6.6.15.1.4.2 Test procedure

Two cells are deployed in the test, Cell 1, which is the PCell in connected, and serving cell in idle mode, on radio channel 1 in FR1, and Cell 2, which is the PSCell in connected, and measured LTE inter-RAT cell in idle mode, on radio channel 2 in LTE. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. During T1 Cell 2, the PSCell, shall be configured.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall set the parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T1 starts.
3. The SS then shall transmit *RRCReconfiguration* message with condition NE-DC according to TS 38.508-1 [14] Table 4.6.1-13 to add E-UTRA cell (PSCell).
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall send a PRACH to PSCell during T1.
6. After the UE has transmitted the random-access preamble on the PSCell, the SS shall set T2 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T2 starts.
7. After T2, the SS shall set T3 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate and send the RRCRelease. T3 starts.
8. During the time periods T3 and T4 the UE is in Idle mode configured to perform inter-RAT idle mode CA/DC measurements on Cell 2. The UE shall not perform reselection.
9. After T3 is expired, the SS shall set T4 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T4 starts.
10. After T4 expires the SS shall set T5 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate, T5 starts.
11. The SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity). During the connection setup the UE is reports *idleMeasAvailable-r16* in the *RRCSetupComplete* message.
12. The SS shall send the *UEInformationRequest* message, requesting UE to report idle mode CA/DC measurements.
13. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 6.6.15.1.5-3 for configuration 1 and 2 and Table 6.6.15.1.5-4 for configuration 3, and SS-RSRQ values within the limits in Table 6.6.15.1.5-5 for configuration 1, 2 and 3, the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.
14. If paging in step 11 succeeds, go to step 15, otherwise switch off the UE.

15. Switch on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.

16. Repeat step 2-15 until a test verdict has been achieved.

#### 6.6.15.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.6.15.1.4.3-1: Common Exception messages for**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 6.6.15.1.4.3-2: *SIB1* for NR SA FR1 Idle mode CA/DC measurement of inter-RAT DC candidate cells for early reporting**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| idleModeMeasurementsEUTRA-r16 | TRUE | This field indicates that a UE that is configured for EUTRA idle/inactive measurements shall perform the measurements while camping in this cell and report availability of these measurements when establishing or resuming a connection in this cell. If absent, a UE is not required to perform EUTRA idle/inactive measurements. | |
| } | | | |
| } | | | |

**Table 6.6.15.1.4.3-3: *RRCRelease* for SA Idle mode CA/DC measurement for FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| MeasIdleConfigDedicated-r16 ::= SEQUENCE { | | | |
| measIdleCarrierListNR-r16 ::= SEQUENCE { | Not present | | |
| measIdleCarrierListEUTRA-r16 ::= SEQUENCE { | | | |
| MeasIdleCarrierEUTRA-r16 ::= SEQUENCE { | | | |
| carrierFreqEUTRA-r16 | ARFCN value of Cell 2 | | |
| EUTRA-AllowedMeasBandwidth | mbw6 | | |
| measCellListEUTRA-r16 | Not present | | |
| reportQuantitiesEUTRA-r16 | both | | |
| qualityThresholdEUTRA-r16 | Not present | | |
| } | | | |
| } | | | |
| measIdleDuration-r16 | sec300 | | |

| | | | |
|---|---|---|---|
| validityAreaList-r16 ::= SEQUENCE { | | | |
| ValidityArea-r16 ::= SEQUENCE { | | | |
| carrierFreq-r16 | ARFCN value of NR channel 1 | | |
| validityCellList-r16 ::= SEQUENCE { | | | |
| PCI-Range | PhysCellId of Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.15.1.4.3-4: *RRCSetupComplete* for SA Idle mode CA/DC measurement for FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-22: | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCSetupComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcSetupComplete SEQUENCE { | | | |
| idleMeasAvailable-r16 | TRUE | Indication that the UE has idle/inactive measurement report available. | |
| | | | |
| | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.15.1.4.3-5: *UEInformationRequest***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-32A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationRequest-r16 ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| ueInformationRequest-r16 SEQUENCE { | | | |
| idleModeMeasurementReq-r16 | TRUE | UE shall report the idle/inactive measurement information, if available, to the network in the *UEInformationResponse* message. | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.15.1.4.3-6: *UEInformationResponse***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-32B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationResponse-r16 ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| ueInformationResponse-r16 SEQUENCE { | | | |
| measResultIdleEUTRA-r16 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| measResultsPerCarrierListIdleEUTRA-r16 SEQUENCE | | | |
| carrierFreqEUTRA-r16 | ARFCN of Cell 2 | | |
| measResultsPerCellListIdleEUTRA-r16 SEQUENCE | | | |
| rsrp-ResultEUTRA-r16 | INTEGER (0..97) | | |
| rsrq-ResultEUTRA-r16 | INTEGER (-30..46) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.15.1.5 Test requirements

Tables 6.6.15.1.5-1 and 6.6.15.1.5-2 define the primary level settings including test tolerances and tables 6.6.15.1.5-3, 6.6. 15.1.5-4, 6.6. 15.1.5-5 and 6.6.15.1.5-6 define accuracy requirements define for Idle mode CA/DC measurement.

**Table 6.6.15.1.5-1: Cell specific test parameters for NR cell for Idle Mode measurements of inter-RAT DC candidate cells for early reporting**

| Parameter | Unit | Config | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | | | |
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | 1,2,3,4 | N/A | | | | |
| Assumption for UE beams Note 5<br>R: Rough | | 1,2,3,4 | N/A | N/A | R | R | N/A |
| Frequency Range | | 1,2,3,4 | FR1 | | | | |
| Duplex mode | | 1, 2 | FDD | | | | |
| | | 3, 4 | TDD | | | | |
| TDD Configuration<br>1: TDDConf.1.1<br>2: TDDConf.2.1 | | 1,2 | - | | | | |
| | | 3,4 | 1 | 1 | 2 | 2 | 1 |
| $BW_{channel}$<br>1: 10: $N_{RB,c}$ = 52<br>2: 40: $N_{RB,c}$ = 106 | MHz | 1, 2 | 1 | 1 | - | - | 1 |
| | | 3, 4 | 2 | 2 | - | - | 2 |
| Initial Downlink BWP configuration | | 1,2,3,4 | DLBWP.0.1 | | | | |
| Initial Uplink BWP configuration | | 1,2,3,4 | ULBWP.0.1 | | | | |
| Dedicated Downlink BWP configuration<br>1: DLBWP.1.1 | | 1,2,3,4 | 1 | 1 | - | - | 1 |
| Dedicated Uplink BWP configuration<br>1: ULBWP.1.1 | | 1,2,3,4 | 1 | 1 | - | - | 1 |
| PDSCH Reference Measurement Channel<br>1: SR.1.1 FDD<br>2: SR.2.1 TDD | FDD | 1,2 | 1 | 1 | 1 | 1 | 1 |
| | TDD | 3,4 | 2 | 2 | 2 | 2 | 2 |
| TRS configuration | | 1,2,3,4 | - | | | | |
| TCI state | | 1,2,3,4 | - | | | | |
| RMSI CORESET parameters | FDD | 1,2 | CR.1.1 FDD | | | | |
| | TDD | 3,4 | CR.2.1 TDD | | | | |
| Dedicated CORESET parameters | FDD | 1,2 | CCR.1.1 FDD | | | | |
| | TDD | 3,4 | CCR.2.1 TDD | | | | |
| OCNG Patterns Note1 | | 1,2,3,4 | OP.1 defined in A.3.2.1 | | | | |
| SSB configuration<br>1: SSB.1 FR1<br>2: SSB.2 FR1 | | 1,2 | 1 | | | | |
| | | 3,4 | 2 | | | | |
| SMTC configuration | | 1,2,3,4 | SMTC.2 | | | | |
| Correlation Matrix and Antenna config | | 1,2,3,4 | 1x2 Low | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4 | 0 | 0 | - | - | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | 0 | 0 | - | - | 0 |
| EPRE ratio of PBCH to PBCH DMRS | | | 0 | 0 | - | - | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | 0 | 0 | - | - | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | | | 0 | 0 | - | - | 0 |
| EPRE ratio of PDSCH DMRS to SSS | | | 0 | 0 | - | - | 0 |
| EPRE ratio of PDSCH to PDSCH | | | 0 | 0 | - | - | 0 |
| EPRE ratio of OCNG DMRS to SSS | | | 0 | 0 | - | - | 0 |
| $N_{oc}$ Note2 | dBm/ 15kHz | 1,2 | -98 | -98 | -98 | -98 | -98 |
| | | 3,4 | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | -98 | -98 | -98 | -98 | -98 |
| | | 3,4 | -95 | -95 | -95 | -95 | -95 |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3,4 | 5 | 5 | 5 | 5 | 5 |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3,4 | 5 | 5 | 5 | 5 | 5 |
| SS-RSRP Note3,4 | dBm/SCS | 1,2 | -93 | -93 | -93 | -93 | -93 |
| | | 3,4 | -90 | -90 | -90 | -90 | -90 |
| Io Note3,4 | dBm/ 9.36 MHz | 1,2 | -63.85 | -63.85 | -63.85 | -63.85 | -63.85 |
| | dBm/ 38.16 MHz | 3,4 | -57.76 | -57.76 | -57.76 | -57.76 | -57.76 |
| Qrxlevmin | dBm/SCS | 1, 2 | - | - | -140 | | - |
| | dBm/SCS | 3, 4 | - | - | -137 | | - |
| Pcompensation | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| $Qhyst_s$ | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| $Qoffset_{s,n}$ | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Cell_selection_and_ reselection_quality_measurement | | 1,2,3,4 | SS-RSRP | | | | |
| Treselection | s | 1,2,3,4 | - | | 0 | | - |
| SnonintrasearchP | dB | 1,2,3,4 | - | | Not sent | | - |
| SnonintrasearchQ | dB | 1,2,3,4 | - | | Not sent | | - |
| $Thresh_{x,high}$ | dB | 1,2,3,4 | - | | 52 | | - |
| Propagation Condition | dB | 1,2,3,4 | - | | AWGN | | - |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 6.6.15.1.5-2: Cell specific test parameters for LTE cell for Idle Mode measurements of inter-RAT DC candidate cells for early reporting**

| Parameter | Unit | Config | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | Cell 2 | | | | |
| | | | T1 | T2 | T3 | T4 | T5 |
| Frequency Range | | 1,2,3,4 | LTE | | | | |
| Duplex mode | | 1, 3 | FDD | | | | |
| | | 2, 4 | TDD | | | | |
| $BW_{channel}$ | MHz | 1,2,3,4 | 10 | 10 | - | - | 10 |
| Measurement bandwidth | $n_{PRB}$ | 1,2,3,4 | - | - | 22-27 | 22-27 | - |
| PDSCH Reference Measurement Channel 1: R.1 FDD 2: R.1 TDD | FDD | 1,3 | 1 | 1 | - | - | 1 |
| | TDD | 2,4 | 2 | 2 | - | - | 2 |
| | | 1,3 | 1 | 1 | - | - | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 and A.3.1.2.2 in 36.133 [23]<br>1: R.6 FDD<br>2: R.6 TDD | | 2,4 | 2 | 2 | - | - | 2 |
| OCNG Patterns defined in A.3.2.1.1 (OP.2 FDD) and A.3.2.1.2 (OP.2 TDD) in 36.133 [23]<br>1: OP.2 FDD<br>2: OP.2 TDD | | 1,3 | 1 | | | | |
| | | 2,4 | 2 | | | | |
| Correlation Matrix and Antenna config | | 1,2,3,4 | 1x2 Low | | | | |
| PBCH_RA | dB | 1,2,3,4 | N/A | N/A | 0 | 0 | N/A |
| PBCH_RB | | | N/A | N/A | 0 | 0 | N/A |
| PSS_RA | | | N/A | N/A | 0 | 0 | N/A |
| SSS_RA | | | N/A | N/A | 0 | 0 | N/A |
| PCFICH_RB | | | N/A | N/A | 0 | 0 | N/A |
| PHICH_RA | | | N/A | N/A | 0 | 0 | N/A |
| PHICH_RB | | | N/A | N/A | 0 | 0 | N/A |
| PDCCH_RA | | | N/A | N/A | 0 | 0 | N/A |
| PDCCH_RB | | | N/A | N/A | 0 | 0 | N/A |
| PDSCH_RA | | | N/A | N/A | 0 | 0 | N/A |
| PDSCH_RB | | | N/A | N/A | 0 | 0 | N/A |
| OCNG_RA Note 1 | | | N/A | N/A | 0 | 0 | N/A |
| OCNG_RB Note 1 | | | N/A | N/A | 0 | 0 | N/A |
| $N_{oc}$ Note2 | dBm/ 15kHz | 1,2 | -98 | -98 | -98 | -98 | -98 |
| | | 3,4 | | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3,4 | 5 | 5 | -3 | 8 | 5 |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3,4 | 5 | 5 | -3 | 8 | 5 |
| RSRP Note3,4 | dBm/SCS | 1,2,3,4 | -93 | -93 | -101 | -90 | -93 |
| | | | | | | | |
| Io Note3,4 | dBm/ 9.36 MHz | 1,2, 3, 4 | -61.01 | -61.01 | -65.44 | -58.57 | -61.01 |
| Qrxlevmin | dBm/SCS | 1,2,3,4 | - | - | -140 | | - |
| Pcompensation | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| $Qhyst_s$ | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| $Qoffset_{s,n}$ | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Cell_selection_and_ reselection_quality_measurement | | 1,2,3,4 | RSRP and RSRQ | | | | |
| Treselection | s | 1,2,3,4 | - | | 0 | | - |
| SnonintrasearchP | dB | 1,2,3,4 | - | | Not sent | | - |
| SnonintrasearchQ | dB | 1,2,3,4 | - | | Not sent | | - |
| Propagation Condition | dB | 1,2,3,4 | - | | AWGN | | - |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 6.6.15.1.5-3: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRP reported values for test configurations 1 and 2**

| Normal Conditions | T5 |
|---|---|
| Lowest reported value (Cell 1) | 52 |
| Highest reported value (Cell 1) | 75 |
| Lowest reported value (Cell 2) | 39 |
| Highest reported value (Cell 2) | 62 |

**Table 6.6.15.1.5-4: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRP reported values for test configurations 3**

| Normal Conditions | T5 |
|---|---|
| Lowest reported value (Cell 1) | 55 |
| Highest reported value (Cell 1) | 78 |
| Lowest reported value (Cell 2) | 39 |
| Highest reported value (Cell 2) | 62 |

**Table 6.6.15.1.5-5: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRQ reported values for test configurations 1, 2 and 3.**

| Normal Conditions | T5 |
|---|---|
| Lowest reported value (Cell 1) | 54 |
| Highest reported value (Cell 1) | 71 |
| Lowest reported value (Cell 2) | 6 |
| Highest reported value (Cell 2) | 27 |

During time durations T1 the UE shall start transmitting preamble on PSCell. During T2 the UE perform intra-frequency measurements on the PCell and the PSCell.

During the time-period T3 the connection is released, and UE enters idle mode. During the time period T3 and T4 the UE is camped in Idle mode and at T4 the signal level of Cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode DC/CA measurement according to Section 4.4.

At the start of T5 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell including idle mode CA/DC measurement from Cell 2.

After receiving the requested early measurement report, the test equipment verifies that the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Sections 10.1.2B and 10.1.7B and Sections 10.2.4 and 10.2.5, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.6.16

# 6.6.17 NR SA FR1 event triggered reporting tests with Pre-MG

## 6.6.17.0 Minimum conformance requirements

### 6.6.17.0.1 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

When a measurement gap is provided or an activated Pre-MG is provided without any pre-MG status changed during the measurement period, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index.}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2 with SCS smaller or equal to 480 kHz.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 6.6.17.0.1-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.17.0.1-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps or not supporting [concurrent measurement gaps]. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

-- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

$N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3.

When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0.

The UE shall be able to identify a new detectable intra-frequency cell within the time period specified in TS 38.133 [6].

For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated.

The normative reference for this intra-frequency measurements with measurement gaps requirement is in TS 38.133 [6] clauses 9.2.2, 9.2.4.3 and 9.2.6.

**Table 6.6.17.0.1-1: Time period for PSS/SSS detection (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, 5 x $K_{gap}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil($M2^{Note\ 1}$x 5 x $K_{gap}$) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil( 5 x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |
| NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 3: For a UE supporting concurrent measurement gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer. | |
| NOTE 4: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to UE on measurements of secondary component carrier with active SCell. | |

**Table 6.6.17.0.1-2: Measurement period for intra-frequency measurements with gaps(FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, ceil(5 x $K_{gap}$ )x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_{gap}$) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(5 x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer. | |

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1 (RSRP for FR1), 10.1.7.1 (RSRQ for FR1), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ as defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ $T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

## 6.6.17.1 NR SA FR1 event triggered reporting tests with autonomous activation/deactivation Pre-MG

### 6.6.17.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct measurement and corresponding event reporting. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.6.2 and 9.2.6.3. And this test will also jointly verify pre-configured measurement gap activation/deactivation delay in TS 38.133 [6] clause 8.19.2.

### 6.6.17.1.2 Test applicability

This test applies to all types of NR UEs supporting 5GS NR SA FR1, BWP adaptation of at least 2 BWPs, BWP operation without bandwidth restriction, DCI and timer-based active BWP switching delay Type1 or Type2, CSI-RS-based RLM *and preconfiguredUE-AutonomousMeasGap-r17* capability from release 17 onwards.

### 6.6.17.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.17.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.17.1.

### 6.6.17.1.4 Test description

#### 6.6.17.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.17.1.4-1.

**Table 6.6.17.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 6.6.17.1.4.1-2.

**Table 6.6.17.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.17.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.17.1.4.1-3.

2. Message contents are defined in clause 6.6.17.1.4.3.

3. There are one NR carrier and two cells specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.17.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | |
| Measurement gap Repetition periodicity | ms | 1, 2, 3 | 40 | |
| Measurement gap length | ms | 1, 2, 3 | 6 | |
| Measurement gap offset | ms | 1, 2, 3 | 39 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |

| | | | | |
|---|---|---|---|---|
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 0.1 | |
| T2 | s | 1, 2, 3 | 0.2 | |
| T3 | s | 1,2, 3 | 5 | |
| *bwp-InactivityTimer* | ms | | 500 | |

#### 6.6.17.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

There are two BWPs configured in Cell 1, BWP-1 which contains the cell defining SSB, and BWP-2 which does not contain any SSB of Cell 1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.17.1.4.1-3 and Table 6.6.17.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. SS shall transmit an *RRCReconfiguration* message which include with Measurement configuration and 2 different UE-specific bandwidth parts for Cell 1 (PCell), BWP-1 and BWP-2.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

   - Pre-MG status is assumed to be ‘deactivated’ when the BWP is active.

   - BWP-1 includes bandwidth of the initial DL BWP and SSB.

   - BWP-2 does not include bandwidth of the initial DL BWP and SSB.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending for those PDSCHs scheduled in the slots overlapped with the pre-MG occasions in T1.

6. When T1 expires, at the start of time duration T2, the serving gNB trigger Pre-MG activation starts via the DCI format 1_1 command for PCell DL BWP switch, is received at the UE side in PCell’s slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2. And UE is expected to complete the Pre-MG activation within the beginning of PCell’s DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

7. At the start of time duration T3, the SS shall switch the power setting from T2 to T3 as specified in Table 6.6.17.1.5-1.

8. The UE shall NOT be able to receive PDSCH and report corresponding ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

9. The UE shall transmit a *MeasurementReport* message triggered by Event A3. With the overall delays measured from the beginning of time period T3 is less than 802 ms.

10. After the SS receive the *MeasurementReport* message in step 9 or when T3 expires, the SS shall:

    - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    Or
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.17.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.17.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-6 with conditions Pattern #0 and Pre-CFG<br>Table H.3.1-7 with condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.17.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | Entry 1: BWP-1 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP-Id2 | Entry 2: BWP-2 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWWP-1 | |
| defaultDownlinkBWP-Id | 0 | Initial BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | Entry 1: BWP-1 | |

| | | | |
|---|---|---|---|
| BWP-Uplink[2] | BWP-Uplink with condition BWP-Id2 | Entry 2: BWP-2 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

6.6.17.1.5 Test requirement

Table 6.6.17.1.4.1-3 and Table 6.6.17.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.17.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| Initial BWP configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| BWP-1 Configuration | | 1,2,3 | DLBWP.1.3 ULBWP.1.3 | | | N/A | | |
| BWP-2 Configuration | | 1,2,3 | DLBWP.1.2 ULBWP.1.2 | | | N/A | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | N/A | | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.2 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | N/A | | |
| | | 2 | TRS.1.1 TDD | | | N/A | | |
| | | 3 | TRS.1.2 TDD | | | N/A | | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | | DLBWP.1.1 | | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | | ULBWP.1.1 | | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | | SSB | | |
| $N_{\mathrm{oc}}$ Note 2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{\mathrm{oc}}$ Note 2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | 1 | 4 | | -1.46 | -Infinity | | -1.46 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | 1 | 4 | | 4 | -Infinity | | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | | -94 | -Infinity | | -94 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

During T1,

The UE shall report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

During T2,

The UE is expected to complete the Pre-MG activation within the beginning of PCell's DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

During T3,

The UE shall NOT be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

The UE shall send one Event A3 triggered measurement report, with a overall measurement reporting delay less than 802ms from the beginning of time period T3.

NOTE: this gives a total of 800 ms for measurement reporting delay plus 2 ms for $2xTTI_{DCCH}$ insertion uncertainty.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.17.2 NR SA FR1 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation

### 6.6.17.2.1 Test purpose

The purpose of this test is to verify that the UE correctly activates and deactivates the pre-MG and makes correct measurement and reporting of an event with activated and deactivated pre-MG. This test will partly verify the pre-MG activation and deactivation delay requirements in TS 38.133 [6] clause 8.19.2 and the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.6.2 and 9.3.4.

#### 6.6.17.2.2 Test applicability

This test applies to all types of NR UEs supporting 5GS NR SA FR1, BWP adaptation of at least 2 BWPs, BWP operation without bandwidth restriction, DCI and timer-based active BWP switching delay Type1 or Type2, CSI-RS-based RLM *an*d *preconfiguredNW-ControlledMeasGap-r17* capability from release 17 onwards.

#### 6.6.17.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.17.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.17.2.

#### 6.6.17.2.4 Test description

##### 6.6.17.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.17.2.4-1.

**Table 6.6.17.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 6.6.17.2.4.1-2.

**Table 6.6.17.2.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.17.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.17.2.4.1-3.
2. Message contents are defined in clause 6.6.17.2.4.3.
3. There are one NR carrier and two cells specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.17.2.4.1-3: General test parameters for SA intra-frequency event triggered reporting with pre-configured measurement gaps and network-controlled activation/deactivation**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2, 3 | 40 | |
| Measurement gap length | ms | 1, 2, 3 | 6 | |

| | | | | |
|---|---|---|---|---|
| Measurement gap offset | ms | 1, 2, 3 | 39 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| T1 | s | 1, 2, 3 | 0.1 | |
| T2 | s | 1, 2, 3 | 0.1 | |
| T3 | s | 1, 2, 3 | 5 | |

#### 6.6.17.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

There are two BWPs configured in Cell 1, BWP-1 which contains the cell defining SSB, and BWP-2 which does not contain any SSB of Cell 1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. A pre-MG is configured before the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.17.2.4.1-3 and Table 6.6.17.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. SS shall transmit an *RRCReconfiguration* message which include with Measurement configuration and 2 different UE-specific bandwidth parts for Cell 1 (PCell), BWP-1 and BWP-2.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

   - BWP-1 includes bandwidth of the initial DL BWP and SSB with preConfGapStatus for BWP-1 is set to ‘0’ as ‘deactivated’.

   - BWP-2 does not include bandwidth of the initial DL BWP and SSB with preConfGapStatus for BWP-2 is set to ‘1’ as ‘activated’.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending for those PDSCHs scheduled in the slots overlapped with the pre-MG occasions in T1.

6. When T1 expires, at the start of time duration T2, the serving gNB trigger Pre-MG activation starts via the DCI format 1_1 command for PCell DL BWP switch, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2. And UE is expected to complete the Pre-MG activation within the beginning of PCell's DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

7. At the start of time duration T3, the SS shall switch the power setting from T2 to T3 as specified in Table 6.6.17.2.5-1.

8. The UE shall NOT be able to receive PDSCH and report corresponding ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

9. The UE shall transmit a MeasurementReport message triggered by Event A3. With the overall delays measured from the beginning of time period T3 is less than 802 ms.

10. After the SS receive the MeasurementReport message in step 9 or when T3 expires, the SS shall:

- transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

OR

- switch the UE off.

11. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:

- if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
  Or
  - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.17.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.17.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-6 with conditions Pattern #0 and Pre-CFG<br>Table H.3.1-7 with condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.17.2.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | Entry 1: BWP-1 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP-Id2 | Entry 2: BWP-2 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 0 | Initial BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | Entry 1: BWP-1 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP-Id2 | Entry 2: BWP-2 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 6.6.17.2.4.3-3: *BWP-DownlinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-DownlinkDedicated ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] { | BWP-Downlink with condition BWP-Id0 | DLBWP.1.3 configuration | |
| EXTENSION { | | | |
| preConfGapStatus-r17 | 00000000 | DLBWP.1.3 configuration | |
| } | | | |
| } | | | |
| BWP-Downlink[1] { | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| EXTENSION { | | | |
| preConfGapStatus-r17 | 10000000 | DLBWP.1.2 configuration | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.17.2.5 Test requirement

Table 6.6.17.2.4.1-3 and Table 6.6.17.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.17.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | N/A | | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | N/A | | |
| | | 2 | CR.1.1 TDD | | | N/A | | |
| | | 3 | CR.2.1 TDD | | | N/A | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | | N/A | | |
| | | 2 | CCR.1.2 TDD | | | N/A | | |
| | | 3 | CCR.2.1 TDD | | | N/A | | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | N/A | | |
| | | 2 | TRS.1.1 TDD | | | N/A | | |
| | | 3 | TRS.1.2 TDD | | | N/A | | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | | N/A | | |
| Active DL BWP configuration for BWP-1 | | 1, 2, 3 | DLBWP.1.3 | | | N/A | | |
| Active UL BWP configuration for BWP-1 | | 1, 2, 3 | ULBWP.1.3 | | | N/A | | |
| Active DL BWP configuration for BWP-2 | | 1, 2, 3 | DLBWP.1.2 | | | N/A | | |
| Active UL BWP configuration for BWP-2 | | 1, 2, 3 | ULBWP.1.2 | | | N/A | | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | | N/A | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3 | 4 | 4 | -1.46 | -Infinity | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3 | 4 | 4 | 4 | -Infinity | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1,2 | -94 | -94 | -94 | -Infinity | -Infinity | -94 |
| | | 3 | -91 | -91 | -91 | -Infinity | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 | -64.60 | -62.25 | -64.60 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -58.50 | -56.16 | -58.50 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2 and T4.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1,

The UE shall report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

During T2,

The UE is expected to complete the Pre-MG activation within the beginning of PCell's DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

During T3,

The UE shall NOT be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

The UE shall send one Event A3 triggered measurement report, with an overall measurement reporting delay less than 802ms from the beginning of time period T3.

NOTE: this gives a total of 800 ms for measurement reporting delay plus 2 ms for $2xTTI_{DCCH}$ insertion uncertainty.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

$T_{PSS/SSS_sync_intra}$ = 600 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.18 SA event triggered reporting tests with concurrent gaps

### 6.6.18.0 Minimum conformance requirements

#### 6.6.18.0.1 Minimum conformance requirements for intra-frequency measurement

The UE shall be able to identify a new detectable intra-frequency cell within the time period specified in TS 38.133 [6].

Intra-frequency measurements without measurement gaps:

When UE supports *concurrentMeasGap-r17* and is configured with concurrent measurement gaps,

$K_p$ is the scaling factor for an SSB frequency layer to be measured without measurement gaps. $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and/or per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:
  - $N_{total}$ is the total number of SMTC occasions within the window, including those overlapped with measurement gap occasions within the window, and
  - $N_{available}$ is the number of SMTC occasions that are not overlapped with any non-dropped MG occasion within the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

    $K_p$ = 1 when $N_{available}$ = 0.
- Otherwise, when UE is not configured with or UE does not support concurrent measurement gaps:

  When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, $K_p$ =1

  When intra-frequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When intra-frequency SMTC is partially overlapping with the ML of NCSG, $K_p$ = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP. For calculation of $K_p$, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

If the higher layer signalling in TS38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, time period requirements are not specified to identify a new detectable intra-frequency cell.

Intra-frequency measurements with measurement gaps:

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps or not supporting [concurrent measurement gaps]. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

When concurrent measurement gaps are configured, requirements in this clause do not apply if$N_{available}$ =0.

If the higher layer signalling in TS 38.331 [13] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, time period requirements are not specified for identify a new detectable intra-frequency cell.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.3, 9.2.5 and 9.2.6.

#### 6.6.18.0.2 Minimum conformance requirements for Inter-frequency measurement

The UE shall be able to identify a new detectable inter-frequency cell within the time period specified in TS 38.133 [6].

Inter-frequency measurements without measurement gaps:

When UE supports *concurrentMeasGap-r17* and is configured with concurrent measurement gaps,

$K_p$ is a scaling factor for an SSB frequency layer to be measured without measurement gaps. $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG and per-FR MG within the same FR as the SSB frequency layer, and starting at the beginning of any SMTC occasion:

$N_{total}$ is the total number of SMTC occasions within the window, including those overlapped with MG occasions within the window, and

$N_{available}$ is the number of SMTC occasions that are not overlapped with any MG occasion within the window W, after accounting for MG collisions by applying the selected gap collision rule provided that concurrent measurement gaps are configured.

$K_p$ = 1 when $N_{available}$ = 0.

Otherwise, when UE is not configured with or UE does not support concurrent measurement gaps:

When inter-frequency SMTC is fully non overlapping with measurement gaps or inter-frequency SMTC is fully overlapping with MGs, $K_p$ =1.

When inter-frequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When inter-frequency SMTC is partially overlapping with the VIL of NCSG, $K_p$ = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP.

Inter-frequency measurements with measurement gaps:

$K_{gap}$ is a scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gap(s) and per-FR measurement gap(s) within the same FR, and starting from the beginning of any SMTC occasion:

  - $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

  - $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W, after accounting for collisions between the measurement gaps by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

$K_{gap}$ is only applicable for UE supporting *concurrentMeasGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3, 9.3.9.

#### 6.6.18.0.3 Minimum conformance requirements for Inter-RAT measurement

The requirements are application for NR−E-UTRAN FDD and NR−E-UTRAN TDD when DRX is used or not.

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD or TDD cell within the time period specified in TS 38.133 [6].

For a UE supporting and configured with concurrent measurement gaps, $K_{gap_EUTRA}$: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps. Otherwise, $K_{gap_EUTRA} = N_{total} / N_{available}$ for UE configured with concurrent measurement gaps.

For a window W of duration MGRP_max, where MGRP_max is the maximum MGRP across all configured per-UE measurement gap(s) and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

$N_{total}$ is the total number of associated gap occasions within the window, including those overlapped with other MG occasions within the window, and

$N_{available}$ is the number of non-dropped associated measurement gap occasions after accounting for collisions between the measurement gaps by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

Requirements do not apply for UE configured with concurrent measurement gaps, if $N_{available}$=0

The normative reference for this requirement is TS 38.133 [6] clause 9.4.2, 9.4.3.

#### 6.6.18.0.4 Minimum conformance requirements for PRS measurement

When physical layer receives last of *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message from LMF via LPP specified in TS 37.355 [38], the UE shall be able to measure multiple (up to the UE capability specified in TS 38.133 [6] Clause 9.9.2.3) DL RSTD measurements, defined in TS 38.215 [10], during the measurement period defined in TS 38.133 [6] Clause 9.9.2.5

$K_{p,PRS,i}$ is a scaling factor for a positioning frequency layer to be measured within the associated measurement gap pattern, which is defined as $K_{p,PRS,i} = N_{total} / N_{available}$ for UE configured with concurrent measurement gap, and $K_{p,PRS,i}$ = 1 for UE not configured with concurrent measurement gap.

- For a window W of duration max($T_{PRS,i}$, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG and per-FR MG within the same FR as the positioning frequency layer, and starting at the beginning of any associated gap occasions covering the PRS occasion:

- $N_{total}$ is the total number of associated gap occasions covering PRS occasions within the window, including those overlapped with other MG occasions within the window, and
- $N_{available}$ is the number of non-dropped associated gap occasions covering PRS occasions within the window W, after further accounting for MG collisions by applying the selected gap collision rule
- Requirements do not apply if $N_{available}$ =0.

The normative reference for this requirement is TS 38.133 [6] clause 9.9.2.

## 6.6.18.1 NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers

### 6.6.18.1.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for concurrent gaps non-overlap with SSB-based measurement in both inter-frequency layers within inter-frequency cell search requirements in TS 38.133 [6] clause 9.3.4.

### 6.6.18.1.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

### 6.6.18.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.1.

### 6.6.18.1.4 Test description

#### 6.6.18.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.1.4.1-1.

**Table 6.6.18.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.18.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.18.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.18.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Test environment parameters are given in Table 6.6.18.1.4.1-2.

**Table 6.6.18.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.18.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.18.1.4.1-3.

2. Message contents are defined in clause 6.6.18.1.4.3.

3. There are three NR carriers and three cells specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.18.1.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gaps with fully non-overlapping scenario for SSB-based measurements in both inter-frequency layers**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | | Three FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR cells 2 and 3 | | NR Cell 2 is on NR RF channel number 2. NR Cell 3 is on NR RF channel number 3. |
| Gap Pattern Id | | Config 1,2,3 | 0 for MeasGapId #1<br>1 for MeasGapId #2 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 39 for MeasGapId #1<br>19 for MeasGapId #2 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour Cell 1 | | Config 1, 2, 3 | 3μs | | Synchronous. |
| Time offset between serving and neighbour Cell 2 | | Config 1, 2, 3 | 5ms | | Asynchronous.<br>The timing of Cell 3 is 5ms later than the timing of Cell 1. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 1.5 | 1.5 | |

### 6.6.18.1.4.2 Test procedure

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 (Cell 2) as neighbour Cell 1 in FR1 on NR RF channel 2, and NR Cell 3 (Cell 3) as neighbour Cell 2 in FR1 on NR RF channel 3. The test parameters are given in Table 6.6.18.1.4.1-3 and Table 6.6.18.1.5-1 respectively.

Two measurement gap patterns (MeasGapId #1 and MeasGapId #2) are configured with the gap pattern ID #0 and #1 as defined in Table 6.6.18.1.4.1-3. MeasGapId #2 is configured with a higher priority than MeasGapId #1. MeasGapId #1 and MeasGapId #2 are associated with the MOs for RF channel numbers #2 and #3 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2 and NR Cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report. Two concurrent per-UE measurement gap patterns are configured. MeasGapId #2 for NR Cell 3 is configured with a higher priority than MeasGapId #1 for NR Cell 2.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell 2's overall delays measured from the beginning of time period T2 is less than 920 ms, and Cell 3's overall delays measured from the beginning of time period T2 is less than 1280 ms, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.18.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.18.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells and MGe with MeasGapId-r17=1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Cell 3 | Table H.3.1-3 with condition INTER-FREQ MO and MGe with MeasGapId-r17=2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 6.6.18.1.4.3-2: MeasConfig (Step3)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod SEQUENCE { | 3 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | Entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTRA-FREQ MO | NR Cell 1 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | Entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 2 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[3] SEQUENCE { | | Entry 3 | |
| measObjectId | 3 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod SEQUENCE { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | Entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT | | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod SEQUENCE { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | Entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | NR Cell 2 | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | Entry 2 | |
| measId | 2 | | |
| measObjectId | 3 | NR Cell 3 | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | MeasGapConfig-Concurrent | | |
| } | | | |

**Table 6.6.18.1.4.3-3: MeasGapConfig-Concurrent**

| |
|---|
| Derivation path: Table H.3.1-6 with condition MGe |

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| measGapId-r17 | 1 | NR Cell 2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | Entry 2 | |
| measGapId-r17 | 2 | NR Cell 3 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 19 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | Ms80 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.18.1.5 Test requirement

Table 6.6.18.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.18.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gaps with fully non-overlapping scenario for SSB-based measurements in both inter-frequency layers**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | FDD | | | | | |
| | | | Config 2,3 | TDD | | | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | | | |
| | | | Config 2 | TDDConf.1.1 | | | | | |
| | | | Config 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | | | |
| | | | Config 2 | SR.1.1 TDD | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Config 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET Reference Channel | | Config 1 | CR.1.1 FDD | | | | | |
| | | Config 2 | CR.1.1 TDD | | | | | |
| | | Config 3 | CR.2.1 TDD | | | | | |
| Dedicated CORESET Reference Channel | | Config 1 | CCR.1.1 FDD | | | | | |
| | | Config 2 | CCR.1.1 TDD | | | | | |
| | | Config 3 | CCR.2.1 TDD | | | | | |
| SSB parameters | | Config 1,2,3 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration defined in A.3.11 | | Config 1,2,3 | SMTC.2 | | SMTC.2 | | SMTC.2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | | | |
| | | Config 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighbouring cell, with a measurement reporting delay less than 920 ms for Cell 2 and 1280ms for Cell 3 from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.18.2 NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers

### 6.6.18.2.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for concurrent gaps partially-overlap with SSB-based measurement in both inter-frequency layers within inter-frequency cell search requirements in TS 38.133 [6] clause 9.3.4.

### 6.6.18.2.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

### 6.6.18.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.2.

### 6.6.18.2.4 Test description

#### 6.6.18.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.2.4.1-1.

**Table 6.6.18.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.18.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.18.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.18.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Test environment parameters are given in Table 6.6.18.2.4.1-2.

**Table 6.6.18.2.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.18.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.18.2.4.1-3.

2. Message contents are defined in clause 6.6.18.2.4.3.

3. There are three NR carriers and three cells specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.18.2.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gap with partial overlapping scenario for SSB-based measurements in both inter-frequency layers**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | | Three FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR cells 2 and 3 | | NR Cell 2 is on NR RF channel number 2. NR Cell 3 is on NR RF channel number 3. |
| Gap Pattern Id | | Config 1,2,3 | 0 for MeasGapId #1<br>1 for MeasGapId #2 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | ms | Config 1,2,3 | 39 for MeasGapId #1<br>4 for MeasGapId #2 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour Cell 1 | | Config 1, 2, 3 | 3μs | | Synchronous. |
| Time offset between serving and neighbour Cell 2 | | Config 1, 2, 3 | 5ms | | Asynchronous.<br>The timing of Cell 3 is 5ms later than the timing of Cell 1. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 1.5 | 1.5 | |

### 6.6.18.2.4.2 Test procedure

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 (Cell 2) as neighbour Cell 1 in FR1 on NR RF channel 2, and NR Cell 3 (Cell 3) as neighbour Cell 2 in FR1 on NR RF channel 3. The test parameters are given in Table 6.6.18.2.4.1-3, and Table 6.6.18.2.5-1 respectively. The TE schedules continuous DL data on PCell throughout the test.

Two measurement gap patterns (MeasGapId #1 and MeasGapId #2) are configured with the gap pattern ID #0 and #1 as defined in Table 6.6.18.2.4.1-3. MeasGapId #2 is configured with a higher priority than MeasGapId #1. MeasGapId #1 and MeasGapId #2 are associated with the MOs for RF channel numbers #2 and #3, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2 and NR Cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.2.5-1.

3. The SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report. Two concurrent per-UE measurement gap patterns are configured. MeasGapId #2 for NR Cell 3 is configured with a higher priority than MeasGapId #1 for NR Cell 2.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission in Cell 1.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.2.5-1. T2 starts.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for both Cell 2 and Cell 3, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

8. After the SS receives the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:

    - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with UE-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
    OR:
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.18.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.18.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells and MGe with MeasGapId-r17=1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Cell 3 | Table H.3.1-3 with condition INTER-FREQ MO and MGe with MeasGapId-r17=2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.7 |

**Table 6.6.18.2.4.3-2: MeasConfig (Step3)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod SEQUENCE { | 3 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | Entry 1 | |
| measObjectId | 1 | | |

| | | | |
|---|---|---|---|
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTRA-FREQ MO | NR Cell 1 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | Entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 2 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[3] SEQUENCE { | | Entry 3 | |
| measObjectId | 3 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod SEQUENCE { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | Entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT | | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod SEQUENCE { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | Entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | NR Cell 2 | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | Entry 2 | |
| measId | 2 | | |
| measObjectId | 3 | NR Cell 3 | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | MeasGapConfig-Concurrent | | |
| } | | | |

**Table 6.6.18.2.4.3-3: MeasGapConfig-Concurrent**

| Derivation path: Table H.3.1-6 with condition MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |

| | | | |
|---|---|---|---|
| measGapId-r17 | 1 | NR Cell 2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | Entry 2 | |
| measGapId-r17 | 2 | NR Cell 3 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 4 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | Ms80 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.18.2.5 Test requirement

Table 6.6.18.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.18.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gap with partial-overlapping scenario for SSB-based measurements in both inter-frequency layers**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | FDD | | | | | |
| | | | Config 2,3 | TDD | | | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | | | |
| | | | Config 2 | TDDConf.1.1 | | | | | |
| | | | Config 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | | | |
| | | | Config 2 | SR.1.1 TDD | | | | | |
| | | | Config 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | | | |
| | | | Config 2 | CR.1.1 TDD | | | | | |
| | | | Config 3 | CR.2.1 TDD | | | | | |
| | | | Config 1 | CCR.1.1 FDD | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | Config 2 | CCR.1.1 TDD | | | | | |
| | | Config 3 | CCR.2.1 TDD | | | | | |
| SSB parameters | | Config 1,2,3 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration defined in A.3.11 | | Config 1,2,3 | SMTC.2 | | SMTC.2 | | SMTC.7 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | | | |
| | | Config 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighbouring cell, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.18.3 NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1

### 6.6.18.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct event-triggered reporting of concurrent inter-RAT E-UTRAN and NR FR1 measurements when operating in standalone (SA) operation with PCell in FR1.

#### 6.6.18.3.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

#### 6.6.18.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2 and 6.6.18.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.3.

#### 6.6.18.3.4 Test description

##### 6.6.18.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.3.4.1-1.

**Table 6.6.18.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.18.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.18.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.18.3-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.18.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.18.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.18.3-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 6.6.18.3.4.1-2.

**Table 6.6.18.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-4 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.18.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.18.3.4.1-3.
2. Message contents are defined in clause 6.6.18.3.4.3.
3. There are two NR carriers and one E-UTRA cell specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.18.3.4.1-3: General test parameters for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1 - 6 | 1, 2 | 2 NR carrier frequency is used in the test. |
| LTE RF Channel Number | | | 3 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | 1 - 6 | As specified in Tables 6.6.18.3.5-1 and 6.6.18.3.5-2. | |

| | | | | |
|---|---|---|---|---|
| Active cell | | 1 - 6 | NR Cell 1 (PCell in FR1) | Cell 1 is on NR RF channel number 1 |
| Neighbour Cell 1 | | 1 - 6 | Cell 2 (NR FR1) | Cell 2 is on NR RF channel number 2 |
| Neighbour Cell 2 | | 1 - 6 | Cell 3 (LTE) | Cell 3 is on LTE RF channel number 3 |
| Gap Pattern Id | | 1 - 6 | 1 for MeasGapId #1<br>1 for MeasGapId #2 | As specified in TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| Measurement gap offset | | 1 - 6 | 19 for Gap pattern Id #1<br>39 for Gap pattern Id #2 | |
| NR measurement quantity | | | SS-RSRP | Measurement quantity for Cell 1 and Cell 2 |
| Inter-RAT E-UTRAN measurement quantity | | | RSRP | Measurement quantity for Cell 3 |
| b2-Threshold1 | dBm | | As specified in Table 6.6.18.3.5-1 | Absolute NR SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | | -101 | Absolute E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 3 for event B2 |
| Hysteresis | dB | 1 - 6 | 0 | |
| TimeToTrigger | s | 1 - 6 | 0 | |
| Filter coefficient | | 1 - 6 | 0 | L3 filtering is not used |
| *offsetMO* | dB | 1 - 6 | 6 | NR Cell 2 |
| *a4-Threshold* | dBm | 1 - 6 | -105 | NR Cell 2 |
| DRX | | | OFF | |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | Asynchronous cells NR cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3µs | Synchronous NR cells. |
| T1 | s | 1 - 6 | 5 | for LTE Cell 3 and NR FR1 Cell 2 |
| T2 | s | 1 - 6 | 5 | for LTE Cell 3 |
| | | | 10.3 for PC1 and PC5; 6.5 for other PC | for NR FR1 Cell 2 |

### 6.6.18.3.4.2 Test procedure

In this test, there are three cells: Cell 1 is the NR PCell, Cell 2 is an Inter-frequency NR FR1 neighbour cell on NR RF channel 2 and Cell 3 is an inter-RAT E-UTRAN neighbour cell on LTE RF channel 3. The test parameters are given in Table 6.6.18.3.4.1-3 and Tables 6.6.18.3.5-1/2 respectively.

In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is to be used for the E-UTRAN cell (Cell 3). In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used for the NR FR1 cell (Cell 2).

Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2 and Cell 3.

Two concurrent per-UE measurement gap pattern configurations # 0 as defined in Table 6.6.18.3.4.1-3 are provided for a UE. Two measurement gap patterns (MeasGapId #1 and MeasGapId #2) are configured with the gap pattern ID #1 as defined in Table 6.6.18.3.4.1-3. MeasGapId #2 is configured with a higher priority than MeasGapId #1. MeasGapId #1 and MeasGapId #2 are associated with the MOs for NR RF channel numbers #2 and LTE RF channel #3, respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.6.18.3.5-1/2.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A4 triggered measurement report for Cell 2, Event B2 triggered measurement report for Cell 3 to the PCell and two concurrent per-UE measurement gap patterns with MeasGapId #2 configured with a higher priority than MeasGapId #1.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.18.3.5-1/2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A4 and B2. If Cell 2's overall delays measured from the beginning of period T2 is less than 10240 ms for UE supporting power class 1, or 6400 ms for UE supporting other power class, and Cell 3's overall delays measured from the beginning of period T2 is less than 3.84 s, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.18.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.18.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ, INTER-RAT and GAP NEEDED<br>Table H.3.1-3A with conditions MGe with associatedMeasGap-r17 set to 1<br>Table H.3.1-4AA<br>Table H.3.1-4A<br>Table H.3.1-5 with condition INTER-RAT<br>Table H.3.1-6 with conditions MGe<br>Table H.3.1-7 with conditions INTER-FREQ and INTER-RAT |
| Specific message content exceptions for Test Configurations 6.6.18.3-1 and 6.6.18.3-4 | Table H.3.1-3 with conditions INTER- FREQ MO and MGe with associatedMeasGapSSB-r17 set to 1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message content exceptions for Test Configurations 6.6.18.3-2, 6.6.18.3-3, 6.6.18.3-5 and 6.6.18.3-6 | Table H.3.1-3 with conditions INTER- FREQ MO and Synchronous cells and MGe with associatedMeasGapSSB-r17 set to 1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.6.18.3.4.3-2: MeasConfig (Step 3)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ, INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod SEQUENCE { | 3 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | Entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTRA-FREQ MO | NR Cell 1 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | Entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 2 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[3] SEQUENCE { | | Entry 3 | |
| measObjectId | 3 | | |
| measObject CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-DEFAULT | E-UTRAN Cell 3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod SEQUENCE { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | Entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT with condition EVENT_A4 | NR Cell 2 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | Entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-DEFAULT with condition EVENT_B2 | E-UTRAN Cell 3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod SEQUENCE { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | Entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | Entry 2 | |
| measId | 2 | | |
| measObjectId | 3 | | |
| reportConfigId | 2 | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | | | GAP NEEDED |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 SEQUENCE{ | 2 entries | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| measGapId-r17 | 1 | | MeasGapId #1 |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 19 | | MeasGapId #1 |
| mgl-r17 | ms6 | | MeasGapId #1 |
| mgrp-r17 | ms80 | | MeasGapId #1 |
| mgta-r17 | ms0 | | MeasGapId #1 |
| refServCellIndicator-r17 | Not present | | |
| refFR2-ServCellAsyncCA-r17 | Not present | | |
| preConfigInd-r17 | Not present | | |
| ncsgInd-r17 | Not present | | |
| gapAssociationPRS-r17 | Not present | | |
| gapSharing-r17 | Not present | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | Entry 2 | |
| measGapId-r17 | 2 | | MeasGapId #2 |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | MeasGapId #2 |
| mgl-r17 | ms6 | | MeasGapId #2 |
| mgrp-r17 | ms80 | | MeasGapId #2 |
| mgta-r17 | ms0 | | |
| refServCellIndicator-r17 | Not present | | |
| refFR2-ServCellAsyncCA-r17 | Not present | | |
| preConfigInd-r17 | Not present | | |
| ncsgInd-r17 | Not present | | |
| gapAssociationPRS-r17 | Not present | | |
| gapSharing-r17 | Not present | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.18.3.5 Test requirement

Tables 6.6.18.3.5-1/2 define the primary level settings including test tolerances for all tests.

**Table 6.6.18.3.5-1: Cell specific test parameters of NR cells for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1 - 6 | 1 | | 2 | |
| Duplex mode | | 1, 4 | FDD | | | |
| | | 2, 3, 5, 6 | TDD | | | |
| TDD Configuration | | 1, 4 | NA | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2, 5 | TDDConf.1.1 | | | |
| | | | 3, 6 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | | | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | | | |
| BWP configuration | Initial DL BWP | | 1 - 6 | DLBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| CSI-RS for tracking parameters on NR RF Channel 1 | | | 1, 4 | TRS.1.1 FDD | | - | |
| | | | 2, 5 | TRS.1.1 TDD | | | |
| | | | 3, 6 | TRS.1.2 TDD | | | |
| OCNG Patterns | | | 1 - 6 | OP.1 | | | |
| PDSCH Reference measurement channel | | | 1, 4 | SR.1.1 FDD | | - | |
| | | | 2, 5 | SR.1.1 TDD | | | |
| | | | 3, 6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | 1, 4 | CR.1.1 FDD | | - | |
| | | | 2, 5 | CR.1.1 TDD | | | |
| | | | 3, 6 | CR.2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | 1, 4 | CCR.1.1 FDD | | - | |
| | | | 2, 5 | CCR.1.1 TDD | | | |
| | | | 3, 6 | CCR.2.1 TDD | | | |
| SMTC configuration | | | 1, 4 | SMTC.2 | | SMTC.2 | |
| | | | 2, 3, 5, 6 | SMTC.1 | | SMTC.1 | |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | 2, 5 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2, 4 ,5 | 15 | | | |
| | | | 3, 6 | 30 | | | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -81 | | - | |
| | | | 3, 6 | -78 | | - | |
| EPRE ratio of PSS to SSS | | dB | 1 - 6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ note2 | | dBm/15 kHz | 1-6 | -98 | | | |
| $N_{oc}$ note2 | | dBm/SCS | 1, 2, 4, 5 | -98 | | | |
| | | | 3, 6 | -95 | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1 - 6 | 4 | 4 | -Infinity | 4 |
| $\hat{E}_s/I_{ot}$ note3 | | dB | 1 - 6 | 4 | 4 | -Infinity | 4 |
| SSB_RP note3 | | dBm/SCS | 1, 2, 4, 5 | -94 | -94 | -Infinity | -94 |
| | | | 3, 6 | -91 | -91 | -Infinity | -91 |
| Io note3 | | dBm/9.36 MHz | 1, 2, 4, 5 | -64.59 | -64.59 | -70.05 | -64.59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | dBm/38.16 MHz | 3, 6 | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation condition | | 1 - 6 | AWGN | | | |
| Antenna Configuration and Correlation Matrix | | 1 - 6 | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Ês/Iot, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

**Table 6.6.18.3.5-2: Cell specific test parameters LTE cell for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1**

| Parameter | Unit | Configuration | Cell 3 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1 - 6 | 3 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1 - 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1 - 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1 - 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1 - 6 | -Infinity | 17 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1 - 6 | -Infinity | 17 |
| RSRP Note5 | dBm/15kHz | 1 - 6 | -Infinity | -87 |
| SCH_RP Note5 | dBm/15kHz | 1 - 6 | -Infinity | -87 |
| Io Note5 | dBm/9MHz | 1 - 6 | -76.22+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1 - 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1 - 6 | 1x2 Low | |
| NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].<br>NOTE 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.<br>NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27]. | | | | |

The UE shall send one Event A4 triggered measurement report for Cell 2, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1 and 5, or

6400 for UE supporting other power class.

The UE shall send one Event B2 triggered measurement report for Cell 3 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2.

The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.18.4 NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used

### 6.6.18.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event.

### 6.6.18.4.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap and independent measurement gap configurations for PRS measurement capability from release 17 onwards.

### 6.6.18.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2 and 6.6.18.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.4.

### 6.6.18.4.4 Test description

#### 6.6.18.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.4.4.1-1.

**Table 6.6.18.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.18.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

| | |
|---|---|
| 6.6.18.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.18.4-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in Table 6.6.18.4.4.1-2.

**Table 6.6.18.4.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.18.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.18.4.4.1-3.

2. Message contents are defined in clause 6.6.18.4.4.3.

3. There are three NR carriers specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.18.4.4.1-3: General test parameters for NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 3<br>2: Cell 2 | Two FR1 NR carrier frequencies are used for the NR cells. |
| Active cell | | 1, 2, 3 | NR Cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell | | 1, 2, 3 | NR Cell 2, NR Cell 3 | Cell 2 is an inter-frequency neighbour cell<br>Cell 3 is an intra-frequency neighbour cell in the positioning assistance data. |
| Gap Pattern Id | | 1, 2, 3 | 0 for MeasGapId #1<br>24 for MeasGapId #2 | |
| Measurement gap offset | ms | 1, 2, 3 | 7 for MeasGapId #1<br>11 for MeasGapId #2 | |
| A3-Offset | dB | 1, 2, 3 | -15 | Value to ensure TT requirement satisified |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| DRX | | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | µs | 1, 2, 3 | 3 | Synchronous cells. |
| Expected RSTD | µs | 1, 2, 3 | 3 | |
| Expected RSTD uncertainty | µs | 1, 2, 3 | 5 | |
| T1 | s | 1, 2, 3 | 2 | |
| T2 | s | 1, 2, 3 | 5 | |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

#### 6.6.18.4.4.2 Test procedure

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 as neighbour cell in FR1 on NR RF channel 2 and NR Cell 3 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Table 6.6.18.4.4.1-3 and Table 6.6.18.4.5-1 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2 and NR Cell 3. Cell 1 and Cell 3 transmit PRS during T2.

Two measurement gap patterns (MeasGapId #1 and MeasGapId #2) are configured with the gap pattern ID #0 and #24 as defined in Table 6.6.18.4.4.1-3. MeasGapId #2 is configured with a higher priority than MeasGapId #1. MeasGapId #1 and MeasGapId #2 are associated with the MOs for RF channel numbers #1 and #2, respectively.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 [38] shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance of MeasGapId #2 containing the PRS resources that is $\Delta T$ after slot #n, where $\Delta T$ = 50 ms is the maximum processing time of the assistance data and location information request.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report and two concurrent per-UE measurement gap patterns with MeasGapId #2 configured with a higher priority than MeasGapId #1. One of concurrent gaps used for PRS measurement in same frequency layer of serving cells while the other concurrent gap in the different frequency layer of serving cells.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell 2's overall delays measured from the beginning of period T2 is less than 1840 ms, and report the PRS RSRP measurements for Cell 3 with respect to the reference cell in the DL-AoD assistance data, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR

- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.18.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.18.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -15dB<br>Table H.3.1-5<br>Table H.3.1-6 with conditions MGeTable<br>H.3.1-7 with condition INTER-FREQ for Cell 2 and condition INTRA-FREQ for Cell 3 |
| Specific message contents exceptions for Test Configuration 6.6.1.8-1 | Table H.3.1-3 with conditions INTER-FREQ MO and MGe with associatedMeasGapSSB-r17 set to 1 for Cell 2 and condition INTRA-FREQ MO and MGe with associatedMeasGapSSB-r17 set to 2 for Cell 3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.6.1.8-2 and 6.6.1.8-3 | Table H.3.1-3 with conditions INTER-FREQ MO and MGe with associatedMeasGapSSB-r17 set to 1 for Cell 2 and conditions INTRA-FREQ MO and MGe with associatedMeasGapSSB-r17 set to 2 for Cell 3 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.6.18.4.4.3-2: MeasConfig (Step 3)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod SEQUENCE { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | Entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTRA-FREQ MO | NR Cell 1 and Cell 3 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | Entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 2 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod SEQUENCE { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | Entry 1 | |
| reportConfigId | 1 | | |

| | | | |
|---|---|---|---|
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT with condition EVENT_A3 | NR Cell 2 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod SEQUENCE { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | Entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | | | GAP NEEDED |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 SEQUENCE{ | 2 entries | | |
| GapConfig-r17[1] SEQUENCE{ | | Entry 1 | MeasGapId #1 |
| measGapId-r17 | 1 | | Pattern #0 |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 7 | | Pattern #0 |
| mgl-r17 | ms6 | | Pattern #0 |
| mgrp-r17 | ms40 | | Pattern #0 |
| mgta-r17 | ms0 | | Pattern #0 |
| refServCellIndicator-r17 | Not present | | |
| refFR2-ServCellAsyncCA-r17 | Not present | | |
| preConfigInd-r17 | Not present | | |
| ncsgInd-r17 | Not present | | |
| gapAssociationPRS-r17 | Not present | | |
| gapSharing-r17 | Not present | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE{ | | Entry 2 | MeasGapId #2 |
| measGapId-r17 | 2 | | Pattern #24 |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 11 | | Pattern #24 |
| mgl-r17 | ms10 | | Pattern #24 |
| mgrp-r17 | ms80 | | Pattern #24 |
| mgta-r17 | ms0 | | |
| refServCellIndicator-r17 | Not present | | |
| refFR2-ServCellAsyncCA-r17 | Not present | | |
| preConfigInd-r17 | Not present | | |
| ncsgInd-r17 | Not present | | |
| gapAssociationPRS-r17 | true | | |
| gapSharing-r17 | Not present | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.18.4.5 Test requirement

Tables 6.6.18.4.5-1 define the primary level settings including test tolerances for all tests.

**Table 6.6.18.4.5-1: Cell specific test parameters of NR cells for NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| TDD configuration | | | 1 | N/A | | N/A | | N/A | |
| | | | 2 | TDDConf.1.1 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | | | 3 | TDDConf.2.1 | | TDDConf.2.1 | | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 2 | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | | | 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | 1, 2 | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | | | 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | 1, 2, 3 | DLBWP.0.1 | | N/A | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | | N/A | |
| OCNG Patterns | | | 1, 2, 3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH RMC configuration | | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | | 2 | SR.1.1 TDD | | | | | |
| | | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC configuration | | | 1 | CR.1.1 FDD | | N/A | | N/A | |
| | | | 2 | CR.1.1 TDD | | N/A | | N/A | |
| | | | 3 | CR.2.1 TDD | | N/A | | N/A | |
| Dedicated CORESET RMC configuration | | | 1 | CCR.1.1 FDD | | N/A | | N/A | |
| | | | 2 | CCR.1.1 TDD | | N/A | | N/A | |
| | | | 3 | CCR.2.1 TDD | | N/A | | N/A | |
| SSB parameters | | | 1 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | | SSB.2 FR1 | | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC.2 | | SMTC.2 | | SMTC.2 | |
| | | | 2 | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| | | | 3 | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| TRS Configuration | | | 1 | TRS.1.1 FDD | | N/A | | N/A | |
| | | | 2 | TRS.1.1 TDD | | N/A | | N/A | |
| | | | 3 | TRS.1.2 TDD | | N/A | | N/A | |
| PRS configuration | | | 1 | PRS.1.4 FR1 | | N/A | | PRS.1.4 FR1 | |
| | | | 2 | PRS.1.4 FR1 | | N/A | | PRS.1.4 FR1 | |
| | | | 3 | PRS.2.4 FR1 | | N/A | | PRS.2.4 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 15 | | | | | |
| | | | 3 | 30 | | | | | |
| PRS muting configuration | | | 1, 2, 3 | '10' | | '01' | | '01' | |
| EPRE ratio of PSS to SSS | | | 1, 2, 3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | 1, 2, 3 | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | 1, 2, 3 | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | 1, 2, 3 | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | 1, 2, 3 | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 1, 2, 3 | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | 1, 2, 3 | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | 1, 2, 3 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | 1, 2, 3 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | 1, 2, 3 | -98 | | -98 | | -98 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | | -98 | | -98 | |
| | | 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS Note5 | 1, 2 | -94 | -94 | -Infinity | -94 | N/A | N/A |
| | | 3 | -91 | -91 | -Infinity | -91 | N/A | N/A |
| PRS-RSRP Note 3 | dBm/SCS Note5 | 1, 2 | -Infinity | -101 | N/A | N/A | -Infinity | -108 |
| | | 3 | -Infinity | -98 | N/A | N/A | -Infinity | -105 |
| PRS $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3 | -Infinity | -3 | N/A | N/A | -Infinity | -10 |
| PRS $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3 | -Infinity | -3 | N/A | N/A | -Infinity | -10 |
| Io Note3 | dBm/9.36 MHz | 1, 2 | -63.50 | | -70.05 | -64.59 | -63.50 | |
| | dBm/38.16 MHz | 3 | -57.40 | | -63.94 | -58.49 | -57.40 | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP/PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for Cell 2, with a measurement reporting delay less than 1840 ms from the beginning of period T2.

The PRS RSRP measurement time fulfils the requirements specified in TS 38.133 [6] Clause 9.9.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 3 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in TS 38.133 [6] section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90% with a confidence level of 95%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in TS 38.133 [6] Clause 10.1.24.3, i.e., between PRS RSRP_0 and PRS RSRP_126.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

IUE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.19 SA event triggered reporting tests with NCSG

### 6.6.19.0 Minimum conformance requirements

#### 6.6.19.0.1 Minimum conformance requirements for intra-frequency measurement

For the UE supporting NCSG, if NCSG is provided, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 6.6.19.0.1-1 and 6.6.19.0.1-2 (deactivated Scell).

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.19.0.1-3 and 6.6.19.0.1-4 (deactivated Scell).

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to CSSFwithin_ncsg,i in TS 38.133 [6] clause 9.1.5.3 for measurement conducted within NCSG.

**Table 6.6.19.0.1-1: Time period for PSS/SSS detection with NCSG (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, 5 x max(VIRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil($M2^{Note\ 1}$x 5) x max(VIRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(VIRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. | |
| NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |

**Table 6.6.19.0.1-2: Time period for PSS/SSS detection with NCSG (deactivated SCell) (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | 5 x max(measCycleSCell, VIRP) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, VIRP, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, VIRP, DRX cycle) x $CSSF_{intra}$ |

**Table 6.6.19.0.1-3: Measurement period for intra-frequency measurements with NCSG (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, 5 x max(VIRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x max(VIRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x max(VIRP, DRX cycle) x $CSSF_{intra}$ |

**Table 6.6.19.0.1-4: Measurement period for intra-frequency measurements with NCSG (deactivated SCell) (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | 5 x max(measCycleSCell, VIRP) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, VIRP, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, VIRP, DRX cycle) x $CSSF_{intra}$ |

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses

10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.7.1. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.7.1, and 9.2.7.2.

### 6.6.19.0.2 Minimum conformance requirements for inter-frequency measurement

For the UE supporting NCSG, if NCSG is provided, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured. Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 6.6.19.0.2-1.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 6.6.19.0.2-2.

**Table 6.6.19.0.2-1: Time period for PSS/SSS detection with NCSG (FR1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | Max(600ms, 8 × Max(VIRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8*1.5) × Max(VIRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 6.6.19.0.2-2: Measurement period for inter-frequency measurements with NCSG (FR1)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | Max(200ms, 8 × Max(VIRP, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5) × Max(VIRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320ms | 8 × DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

When NCSG are provided for inter-frequency measurements, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 6.6.19.0.2-2.

For UE supporting *nr-NeedForGapNCSG-reporting-r17* and indicating *NeedForGapNCSG-InfoNR* for inter-frequency measurement,

- An inter-frequency SSB measurement is defined as measurement with NCSG if
  - the UE indicates 'ncsg' via *NeedForGapNCSG-InfoNR* for the inter-frequency measurement, and
  - the SSB is not completely contained in the active BWP of the UE

  When network configures NCSG, the delay requirements are specified in TS 38.133 [6] clause 9.3.10.
- For inter-frequency SSB based measurements with NCSG, UE may cause scheduling restriction as specified in TS 38.133 [6] clause 9.3.10.3.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.6.3, and 9.3.10.

#### 6.6.19.0.3 Minimum conformance requirements for inter-RAT measurement

The requirements are application for NR−E-UTRAN RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

For UE supporting *eutra-NeedForGapNCSG-reporting-r17* and indicating *NeedForGapNCSG-InfoEUTRA* for inter-RAT measurement,

- An inter-RAT measurement is defined as measurement with NCSG if
  - the UE indicates 'ncsg' via *NeedForGapNCSG-InfoEUTRA* for the inter-RAT measurement

  When network configures measurement gap or NCSG, the delay requirements are specified in TS 38.133 [6] clause 9.4.2 and 9.4.3.

Parameter $T_{Inter1}$ used in inter-RAT requirements in TS 38.133 [6] clause 9.4 is specified in Table 6.6.19.0.3-1 when NCSG is used.

**Table 6.6.19.0.3-1: Minimum available time for inter-RAT measurements when NCSG is configured**

| NCSG Pattern Id | Measurement Length (ML, ms) | Visible Interruption Repetition Period (VIRP, ms) | Minimum available time for inter-frequency and inter-RAT measurements during 480 ms period (Tinter1, ms) |
|---|---|---|---|
| 0 | 5 | 40 | 60 |
| 1 | 5 | 80 | 30 |
| 2 | 2 | 40 | 24 Note 1 |
| 3 | 2 | 80 | 12 Note 1 |
| 4 | 5 | 20 | 120 Note 1 |
| 6 | 3 | 20 | 72 Note 1,3 |
| 7 | 3 | 40 | 36 Note 1,3 |
| 8 | 3 | 80 | 18 Note 1,3 |
| 10 | 2 | 20 | 48 Note 1 |
| NOTE 1: When determining UE requirements using Tinter1 for NCSG pattern IDs 2, 3, 4, 6, 7, 8, 10, Tinter1 = 60 for NCSG pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for NCSG pattern IDs 3 and 8 shall be used.<br>NOTE 2: NCSG pattern configurations applicability is as specified in Table 9.1.2C-1.<br>NOTE 3: This NCSG pattern is applicable for E-UTRA inter-frequency measurements only if NCSG based NR measurements are also configured. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.4.2, 9.4.3.

### 6.6.19.0.4 Minimum conformance requirements for interruptions

It is up to UE implementation whether or not the UE is able to conduct transmission in the following slot(s),

- when *mgta* is not applied, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after the last each of the interrupted slots after VIL1 and VIL2.

where UL slot denotes that all the symbols in the slot are uplink symbols, and L=1 if $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ for the UL transmission is less than the length of one slot; L=2 otherwise.

Note: Network is supposed to take into account the possible difference between the estimated TA at network and actual TA at UE when scheduling UE in the above slot(s).

The interruptions of NCSG in number of slots are listed in Table 6.6.19.0.4-1 on all serving cells when per-UE NCSG is configured or on FR1 serving cells when per-FR FR1 NCSG is configured to *ncsg-MeasGapPerFR-r17* capable UE. There are two interruptions in each NCSG occasion, VIL1 before ML and VIL2 after ML, in NR standalone (with single carrier or NR CA). Each of them has number of interrupted slots captured in Table 6.6.19.0.4-1.

**Table 6.6.19.0.4-1: Number of interrupted slots on all serving cells for per-UE NCSG or FR1 serving cells for FR1 NCSG during each VIL in NR standalone operation (with single carrier, NR CA)**

| NR SCS (kHz) | Number of interrupted slots on serving cells<br>When MG timing advance of 0ms is applied<br>VIL=1ms |
|---|---|
| 15 | 1 |
| 30 | 2 |
| 60 | 4 |
| 120 | 8 |
| NOTE 1: NR SCS of 120 kHz is only applicable to the case with per-UE NCSG.<br>NOTE 2: Void | |

## 6.6.19.1 NR SA FR1 event-triggered reporting tests with NCSG under non-DRX in FR1

### 6.6.19.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2.7.1 and 9.2.7.2, and also verify the scheduling availability during intra-frequency measurement with NCSG in 38.133 [6] clause 9.2.7.3.

### 6.6.19.1.2 Test applicability

This test applies to all types of NR UE from release 17 onwards supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and NR NCSG capability. The UE is capable of NCSG and report '*ncsg*' through *NeedForGapNCSG-InfoNR* for PCell. Test 1 is applicable to UEs not supporting per-FR NCSG (ncsg-MeasGapPerFR-r17, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR NCSG.

### 6.6.19.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.19.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.19.1.

### 6.6.19.1.4 Test description

#### 6.6.19.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.19.1.4.1-1.

**Table 6.6.19.1.4.1-1: Supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 6.6.19.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.19.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.19.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Test environment parameters are given in Table 6.6.19.1.4.1-2.

**Table 6.6.19.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.19.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.19.1.4.1-3.

2. Message contents are defined in clause 6.6.19.1.4.3.

3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.19.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting for FR1 with NCSG**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | | |
| NCSG type | | 1, 2, 3 | Per-UE | Per-FR | Per-FR NCSG pattern is configured if UE support per-FR NCSG; otherwise, per-UE NCSG patter is configured. |
| NCSG pattern | | 1, 2, 3 | 0 | 2 | |
| Visible interruption repetition periodicity | ms | 1, 2, 3 | 40 | 40 | |
| Measurement length | ms | 1, 2, 3 | 5 | 2 | |
| NCSG offset | ms | 1, 2, 3 | 39 | 39 | |
| SSB configuration | | 1 | SSB.1 FR1 | | |
| | | 2 | SSB.1 FR1 | | |
| | | 3 | SSB.2 FR1 | | |
| SMTC configuration | | 1 | SMTC.2 | | |
| | | 2 | SMTC.1 | | |
| | | 3 | SMTC.1 | | |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3 | | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | | Synchronous cells |
| | | 3 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 1 | | |

### 6.6.19.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T2 until the UE has sent the measurement report during T2. The test parameters are given in Table 6.6.19.1.4.1-3 and Table 6.6.19.1.5-1 respectively.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.19.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.19.1.5-1. T2 start.

6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802ms and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.19.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.19.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 and MGe with associatedMeasGapSSB-r17=1 for configuration 6.6.19.1-1<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1, MGe with associatedMeasGapSSB-r17=1 and synchronous cells for configuration 6.6.1.19-2<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1, MGe with associatedMeasGapSSB-r17=1 and synchronous cells for configuration 6.6.1.19- 3<br>Table H.3.1-4 with A3-offset = -4.5dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTRA-FREQ<br><br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 6.6.19.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

**Table 6.6.19.1.4.3-3: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17 SEQUENCE { | | | |
| measGapId-r17 | 1 | | |
| gapType-r17 | perUE | | Test1 |
| | perFR1 | | Test2 |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms5 | | Test1 |
| | ms2 | | Test2 |
| mgrp-r17 | ms40 | | |

| | | | |
|---|---|---|---|
| mgta-r17 | ms0 | | |
| ncsgInd-r17 | true | | |
| } | | | |

6.6.19.1.5 Test requirement

Table 6.6.19.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.19.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting with NCSG for PCell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.2 FDD | | N/A | |
| | | 2 | CCR.1.2 TDD | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to NR Cell 2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 802ms in this test case (note: this gives a total of 800ms for measurement reporting delay plus 2ms for TTI insertion uncertainty)

The UE shall be scheduled on PCell continuously throughout the test. From the start of T2 until the measurement report is received during T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern

For a test to be considered successful requirements on both Event A3 detection and 100% of all expected ACK/NACKs have to be fulfilled simultaneously.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 6.6.19.2 NR SA FR1 event-triggered reporting tests for FR1 with NCSG for inter-frequency measurement

### 6.6.19.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.3.10.1 and 9.3.10.2, and also verify the scheduling availability during inter-frequency measurement with NCSG in 38.133 [6] clause 9.3.10.3.

### 6.6.19.2.2 Test applicability

This test applies to all types of NR UEs supporting NR NCSG capability from release 17 onwards. Test 1 is applicable to UEs not supporting per-FR NCSG (*ncsg-MeasGapPerFR-r17*, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR NCSG. The serving frequency and the target frequency should be selected such that UE reports 'ncsg' for the target frequency given the serving frequency.

### 6.6.19.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.19.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.19.2.

### 6.6.19.2.4 Test description

#### 6.6.19.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.19.2.4.1-1.

**Table 6.6.19.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.19.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.19.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.19.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Test environment parameters are given in Table 6.6.19.2.4.1-2.

**Table 6.6.19.2.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.19.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.19.2.4.1-3.

2. Message contents are defined in clause 6.6.19.2.4.3.

3. There are two NR cells on two carriers specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.19.2.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 with NCSG**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| NCSG Pattern Id | | Config 1,2,3 | 0 | 2 | |
| NCSG offset | | Config 1,2,3 | 9 | | |
| SMTC-SSB parameters | | Config 1 | SSB.1 FR1 | | |
| | | Config 2 | SSB.1 FR1 | | |
| | | Config 3 | SSB.2 FR1 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 1 | | |

#### 6.6.19.2.4.2 Test procedure

Two cells are deployed in the test: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. NR RF channel 1 and NR RF channel 2 should be selected such the UE reports 'ncsg' for the target frequency on NR RF channel 2. The test parameters are given in Table 6.6.19.2.4.1-3 and Table 6.6.19.2.5-1 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.19.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.19.2.5-1. T2 starts.

6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922ms and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.19.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.19.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with conditions INTER-FREQ<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1, SMTC.5 and MGe with associatedMeasGapSSB-r17=1 for configuration 6.6.19.2-1<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1, SMTC.4, MGe with associatedMeasGapSSB-r17=1 and synchronous cells for configuration 6.6.19.2-2<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1, SMTC.4, MGe with associatedMeasGapSSB-r17=1 and synchronous cells for configuration 6.6.19.2-3<br><br>Table H.3.1-4 with A3-offset = -6dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with condition INTER-FREQ |

**Table 6.6.19.2.4.3-2: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | | |
| gapType-r17 | perUE | | Test1 |
| | perFR1 | | Test2 |
| gapOffset-r17 | 9 | | |
| mgl-r17 | ms5 | | Test1 |
| | ms2 | | Test2 |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| ncsgInd-r17 | true | | |
| } | | | |

6.6.19.2.5 Test requirement

Table 6.6.19.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.19.2.5-1: Cell specific test parameters for SA event triggered reporting for FR1 with NCSG for inter-frequency measurement**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2,3 | TDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to NR Cell 2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 922ms in this test case (note: this gives a total of 920ms for measurement reporting delay plus 2ms for TTI insertion uncertainty)

The UE shall be scheduled on PCell continuously throughout the test. From the start of T2 until the measurement report is received during T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern

For a test to be considered successful requirements on both Event A3 detection and 100% of all expected ACK/NACKs have to be fulfilled simultaneously.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%

## 6.6.19.3 NR SA FR1 NR - E-UTRAN event-triggered reporting in non-DRX in FR1 with NCSG

### 6.6.19.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct event-triggered reporting of inter-RAT E-UTRAN measurements based on NCSG when operating in standalone (SA) operation with PCell in FR1.

### 6.6.19.3.2 Test applicability

This test applies to all types of NR Release 17 and forward supporting 5GS NR SA FR1, E-UTRAN and NCSG capability for E-UTRAN from release 17 onwards. The serving frequency and target frequency should be selected such that UE reports 'ncsg' for the target frequency given the serving frequency.

### 6.6.19.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.19.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.19.3.

### 6.6.19.3.4 Test description

#### 6.6.19.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.19.3.4.1-1.

**Table 6.6.19.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 6.6.19.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.19.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.19.3-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.19.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.19.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.19.3-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in Table 6.6.19.3.4.1-2.

**Table 6.6.19.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.19.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 6.6.19.3.4.1-3.

2. Message contents are defined in clause 6.6.19.3.4.3.

3. There are one NR carriers and one E-UTRAN cell specified in the test. Cell 1 (NR Cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.19.3.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 6.6.19.3.5-1 and 6.6.19.3.5-2. | |
| Active cell | | Cell 1 | Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on LTE RF channel number 2 |
| NCSG Pattern Id | | 0 | As specified in TS 38.133 [6] Table 9.1.9.3-1. |
| NCSG offset | ms | 39 | |
| NCSG mgta | ms | 0 | |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | As specified in Table 6.6.19.3-5-1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |

### 6.6.19.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The test parameters are given in Table 6.6.19.3.4.1-3, Table 6.6.19.3.5-1 and Table 6.6.19.3.5-2 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.19.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. T1 starts, SS continuously schedules on PCell with data in the DL starting from T1 and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.19.3.5-1. T2 starts.

7. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842ms and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

8. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.19.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.19.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with conditions INTER-RAT<br><br>Table H.3.1-3A with condition MGe with associatedMeasGap-r17=1<br><br>Table H.3.1-4A<br><br>Table H.3.1-3 with condition SMTC.1, SSB.1 FR1 for configuration 6.6.19.3-1 and 6.6.19.3-4<br>Table H.3.1-3 with condition SMTC.1, SSB.1 FR1 and synchronous cells for configuration 6.6.19.3-2 and 6.6.19.3-5<br>Table H.3.1-3 with condition SMTC.1, SSB.2 FR1 and synchronous cells for configuration 6.6.19.3-3 and 6.6.19.3-6<br><br>Table H.3.1-5 with conditions INTER-RAT<br><br>Table H.3.1-7 with condition INTER-RAT |

**Table 6.6.19.3.4.3-2: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | |
|---|---|---|
| **Information Element** | **Value/remark** | **Comment** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | |
| GapConfig-r17[1] SEQUENCE { | | |
| measGapId-r17 | 1 | |
| gapOffset-r17 | 39 | |
| mgl-r17 | ms5 | |
| mgrp-r17 | ms40 | |
| mgta-r17 | ms0 | |
| ncsgInd-r17 | true | |
| } | | |

## 6.6.19.3.5 Test requirement

Table 6.6.19.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.19.3.5-1: PCell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 2, 3 | FDD | |
| | | | 4, 5, 6 | TDD | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |

| | | | | | |
|---|---|---|---|---|---|
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -104 | |
| | | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | 17.55 | -1.55 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | | 3, 6 | -83.44 | -102.55 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -86.45 | -105.55 |
| | | | 3, 6 | -83.44 | -102.55 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -58.42 | -73.74 |
| | | dBm/38.16 MHz | 3, 6 | -52.32 | -67.64 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.19.3.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters: | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD | |

| | | | | |
|---|---|---|---|---|
| DL Reference Measurement Channel[Note2] | | | 20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 18.55 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -85.45 |
| Io[Note5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -76.21 | -57.6 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3842ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The overall delays measured shall be less than a total of 3842 ms in this test case (note: this gives a total of 3840 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall be scheduled on PCell continuously throughout the test. From the start of T1 until the measurement report is received during T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern.

For a test to be considered successful requirements on both Event B2 detection and 100% of all expected ACK/NACKs have to be fulfilled simultaneously.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%

## 6.6.19.4 NR SA FR1 Event triggered reporting on SCC with deactivated SCell test with per-UE NCSG under non-DRX

### 6.6.19.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for NCSG with SSB-based measurement with deactivated SCELL.

### 6.6.19.4.2 Test applicability

This test applies to all types of NR UEs supporting NR NCSG capability from release 17 onwards supporting 2DL CA.

### 6.6.19.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.19.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.19.4.

### 6.6.19.4.4 Test description

#### 6.6.19.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.6.19.4.4.1-1. Supported test configurations for NR SCell are shown in Table 6.6.19.4.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

**Table 6.6.19.4.4.1-1: Supported test configurations for NR PCell**

| Config | Description |
|---|---|
| 6.6.19.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.19.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.19.4-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

**Table 6.6.19.4.4.1-1A: Supported test configurations for NR SCell**

| $Config_{SCell}$ | Description |
|---|---|
| 6.6.19.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.19.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.19.4-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration, | |

Test environment parameters are given in Table 6.6.19.4.4.1-2.

**Table 6.6.19.4.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.19.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |

1. The general test parameter settings are set up according to Table 6.6.19.4.4.1-3.

2. Message contents are defined in clause 6.6.19.4.4.3.

3. Three cells are deployed in the test, which are FR1 PCell (Cell 1), FR1 SCell (Cell 2) and FR1 neighbour cell (Cell 3) on the same frequency as the SCell. Cell 1 and Cell 2 shall be configured according to Annex C.1.1 and C.1.2.

**Table 6.6.19.4.4.1-3: General test parameters for event triggered reporting on SCC with deactivated SCell with per-UE NCSG for FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Configured deactivated SCell | | 1, 2, 3 | Cell 2 | |
| Neighbour cell | | 1, 2, 3 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 | |
| RF Channel Number | | 1, 2, 3 | 2: Cell 2 and Cell 3 | |
| Measurement gap type | | 1, 2, 3 | Per-UE NCSG | |
| NCSG pattern | | 1, 2, 3 | ID # 0 | |
| MGTA | ms | 1, 2, 5 | 0 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A6-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| SCell measurement cycle (measCycleSCell) | ms | 1, 2, 3 | 160 | |
| Cell 2 timing offset to Cell 1 | µs | 1, 2, 3 | 0 | |
| Time alignment error between Cell 2 and Cell 1 | µs | 1, 2, 3 | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| Cell 3 timing offset to Cell 1 | µs | 1, 2, 3 | 3 | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

### 6.6.19.4.4.2 Test procedure

Three cells are deployed in the test, which are FR1 PCell(Cell 1), FR1 SCell(Cell 2) and FR1 neighbour cell(Cell 3) on the same frequency as the SCell. The SCell is deactivated during the test. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered with Event A6 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The PCell shall continuously scheduled with data in the DL starting from T1 until the UE has sent the measurement report during T2. The test parameters are given in Table 6.6.19.4.4.1-3 and Table 6.6.19.4.5-1 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.19.4.5-1.

3. SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

4. T1 starts, SS continuously schedules on PCell with data in the DL starting from T1 and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.19.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A6. If the overall delays measured from the beginning of time period T2 is less than 1602 ms and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.19.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.19.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with conditions Deactivated SCell<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with condition Deactivated SCell |

**Table 6.6.19.4.4.3-2: ServingCellConfig (Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 | |
| } | | | |

**Table 6.6.19.4.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | Configuration 6.6.19.4-2 and 6.6.19.4-3 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | Configuration 6.6.19.4-1 |
| measCycleSCell-v1530 | sf160 | | |
| associatedMeasGapSSB-r17 | 1 | | |
| } | | | |

**Table 6.6.19.4.4.3-4: ReportConfigNR(Step 3)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA6 SEQUENCE { | | | |
| a6-Offset CHOICE { | | | |
| rsrp | -9 | The actual value is field value * 0.5 dB. | |
| } | | | |
| hysteresis | 0 | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| | | | |

**Table 6.6.19.4.4.3-5: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | |
|---|---|---|
| **Information Element** | **Value/remark** | **Comment** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | |
| GapConfig-r17[1] SEQUENCE { | | |
| measGapId-r17 | 1 | |
| gapOffset-r17 | 39 | |
| mgl-r17 | ms5 | |
| mgrp-r17 | ms40 | |
| mgta-r17 | ms0 | |
| ncsgInd-r17 | true | |
| } | | |

### 6.6.19.4.5 Test requirement

Table 6.6.19.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.19.4.5-1: NR Cell specific test parameters for event triggered reporting on SCC with deactivated SCell with per-UE NCSG for FR1**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | N/A | | N/A | |
| | | 2 | CR.1.1 TDD | | N/A | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | N/A | | N/A | |
| | | 2 | CCR.1.1 TDD | | N/A | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | | N/A | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | TRS.1.1 FDD | | | |
| | | 2 | TRS.1.1 TDD | | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | | ULBWP.1.1 | | N/A | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3 | -98 | | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3 | 4 | 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3 | 4 | 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -64.60 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -64.60 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -58.50 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A6 triggered measurement report to NR Cell 3. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1602ms in this test case (note: this gives a total of 1600ms for measurement reporting delay plus 2ms for TTI insertion uncertainty)

The UE shall be scheduled on PCell continuously throughout the test. From the start of T1 until the measurement report is received during T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern.

For a test to be considered successful requirements on both Event A6 detection and 100% of all expected ACK/NACKs have to be fulfilled simultaneously.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 6.6.20 UE Rx-Tx time difference measurement for propagation delay compensation

### 6.6.20.0 Minimum conformance requirements

When UE is configured with *prs-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [13] and provided with PRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_PRS}$, where:

$$T_{UERxTx,PRS} = \left\lceil \frac{N_{PRS}^{slot}}{N'} \right\rceil * N_{sample} * K_{layer3} * LCM(T_{PRS}, T_{DRX})$$

Where:

$N_{PRS}^{slot}$ is the maximum number of DL PRS resources configured in a slot,

N′ is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumberPRS-ResourceProcessedPerSlot-r17* as specified in TS38.331 [13],

$N_{sample}$ is the number of UE Rx-Tx time difference measurement samples and $N_{sample}$ = 4,

$T_{PRS}$ is the PRS resource periodicity specific for RTT-based propagation delay compensation,

$T_{DRX}$ is the DRX cycle length when DRX is in use, 1ms otherwise.

$K_{layer3}$ is

$N_{total}$ / $N_{available}$, when $N_{available}$>0

Where,

- For a window W of duration LCM($T_{PRS}$, MGRP_max, $T_{SMTC}$) and starting at the beginning of any PRS resource occasion, where $T_{SMTC}$ is the periodicity of SMTC for intra-frequency measurement without gap, and MGRP_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as PCell for a UE supporting *concurrentMeasGap-r17* and is configured with concurrent measurement gaps, otherwise MGRP max is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as PCell:
  - $N_{total}$ is the total number of PRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of PRS resource occasions that are not overlapped with:
    - For FR1: any measurement gap occasions within window W. And for a UE supporting *concurrentMeasGap-r17* after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 within the window W

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on PRS within the active DL BWP.

When UE is configured to perform UE Rx-Tx time difference measurement based on PRS, the requirements apply provided that the SCS of the PRS is same as that of the active BWP on PCell.

If PRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the

measurement report mapping requirements specified below.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

**Table 6.6.20.0-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

| Reported Quantity Value | Measured Quantity Value | Unit |
|---|---|---|
| RX-TX_TIME_DIFFERENCE_0000 | $T_{UE\ Rx\text{-}Tx} < -985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001 | $-985024 \le T_{UE\ Rx\text{-}Tx} < -984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002 | $-984992 \le T_{UE\ Rx\text{-}Tx} < -984960$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_30782 | $-32 \le T_{UE\ Rx\text{-}Tx} < 0$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_30783 | $0 \le T_{UE\ Rx\text{-}Tx} < 32$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_61563 | $984960 \le T_{UE\ Rx\text{-}Tx} < 984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61564 | $984992 \le T_{UE\ Rx\text{-}Tx} < 985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565 | $985024 \le T_{UE\ Rx\text{-}Tx}$ | $T_c$ |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC DL PRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 6.6.20.0-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 6.6.20.0-2: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

| Accuracy | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| | PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition ($T_{rep}^{PRS} * L_{PRS}/K_{comb}^{PRS}$ Note 3 | NR operating band groups Note 2 | Io Note 4 range | |
| | | | | | | Minimum Io Note 1 | Maximum Io |
| Tc Note 5 | dB | RB | kHz | | | dBm / $SCS_{PRS}$ | dBm/BW |
| ± [78+δ+ε] | -3 | ≥[24] | 15 | ≥[4] | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -50 |
| | | | | | NR_FDD_FR1_B | -120.5 | |
| | | | | | NR_TDD_FR1_C | -120 | |
| | | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | |
| | | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | |
| | | | | | NR_FDD_FR1_F | -118.5 | |
| | | | | | NR_FDD_FR1_G | -118 | |
| | | | | | NR_FDD_FR1_H | -117.5 | |
| ± [59+δ+ε] | | ≥[52] | | ≥[1] | Note 6 | NOTE 6 | NOTE 6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ± [30+δ+ε] | | >[104] | | ≥[1] | Note 6 | NOTE 6 | NOTE 6 |
| ± [57+δ+ε] | | ≥[24] | 30 | ≥[4] | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -118 | -50 |
| | | | | | NR_FDD_FR1_B | -117.5 | |
| | | | | | NR_TDD_FR1_C | -117 | |
| | | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -116.5 | |
| | | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -116 | |
| | | | | | NR_FDD_FR1_F | -115.5 | |
| | | | | | NR_FDD_FR1_G | -115 | |
| | | | | | NR_FDD_FR1_H | -114.5 | |
| ± [30+δ+ε] | | ≥[48] | | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [15+δ+ε] | | ≥[132] | | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [29+δ+ε] | | ≥[24] | 60 | ≥[4] | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -115 | -50 |
| | | | | | NR_FDD_FR1_B | -114.5 | |
| | | | | | NR_TDD_FR1_C | -114 | |
| | | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -113.5 | |
| | | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -113 | |
| | | | | | NR_FDD_FR1_F | -113.5 | |
| | | | | | NR_FDD_FR1_G | -113 | |
| | | | | | NR_FDD_FR1_H | -111.5 | |
| ± [15+δ+ε] | | ≥[64] | | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [7+δ+ε] | | ≥[132] | | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: $T_{\text{rep}}^{\text{PRS}}$, $L_{\text{PRS}}$, $K_{\text{comb}}^{\text{PRS}}$ are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [38].
NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.
NOTE 5: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 7: δ is the margin determined from Table 10.1.39.2-3.
NOTE 8: ε is the margin for reporting quantization error and $\varepsilon = 16\ Tc$.

**Table 6.6.20.0-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1**

| Min(PRS BW, SRS BW) (RB) | | | Margin (Tc [Note 1]) |
|---|---|---|---|
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz | |
| ≥ 24 | N/A | N/A | 160 |
| ≥ 52 | ≥ 24 | N/A | 80 |
| ≥ 104 | ≥ 48 | ≥ 24 | 56 |
| N/A | ≥ 132 | ≥ 64 | 24 |
| N/A | N/A | ≥ 132 | 24 |

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

## 6.6.20.1 NR SA FR1 UE Rx-Tx time difference measurement with PRS for RTT-based PDC

### 6.6.20.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133 [6] clause 9.12.4.1 for measurement delay and clause 10.1.39.2 for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

#### 6.6.20.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-PRS-r17 or gNB-SideRTT-BasedPDC-r17*.

#### 6.6.20.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.20.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.1, 9.12.5, 10.1.39.2 and A.6.6.20.

#### 6.6.20.1.4 Test description

##### 6.6.20.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.20.1.4.1-1

**Table 6.6.20.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.20-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.20-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.20-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.20.1.4.1-2.

**Table 6.6.20.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.20.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 6.6.20.1.4.1-3.

2. Message contents are defined in clause 6.6.20.1.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.20.1.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value |
|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 |
| RF Channel Number | | 1, 2, 3 | 1 |
| $BW_{channel}$ | MHz | 1 | 10: $N_{RB,c}$ = 52 |
| | | 2 | 10: $N_{RB,c}$ = 52 |
| | | 3 | 40: $N_{RB,c}$ = 106 |
| SSB configuration | | 1 | SSB.1 FR1 |
| | | 2 | SSB.1 FR1 |
| | | 3 | SSB.2 FR1 |
| SMTC configuration | | 1 | SMTC.2 |
| | | 2 | SMTC.1 |

| | | | |
|---|---|---|---|
| | | 3 | SMTC.1 |
| CP length | | 1, 2, 3 | Normal |
| DRX | | 1, 2, 3 | OFF |
| T1 | s | 1, 2, 3 | 5 |
| T2 | s | 1, 2, 3 | 10 |

#### 6.6.20.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. The Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

*measObject* with *measObjectRxTxDiff-r17*, and *NR-DL-PRS-PDC-Info* is defined ~~in~~ as per 6.6.20.1.4.3 and shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE $\Delta T$ ms before the start of T2, where $\Delta T$ = 10 ms. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 6.6.20.1.4.1-3 and Table 6.6.20.1.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.20.1.5-1 as appropriate.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.20.1.5-1. T2 starts.
6. The UE shall transmit periodically MeasurementReport messages.
7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. If the *result-k5* value is outside the limits in Table 6.6.20.0-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 6.6.20.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

| **Default Message Contents** | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76B in 38.508-1 [14] with condition PRS_REF |
| Specific message contents exceptions for Test Configuration 6.6.20-1 and 6.6.20-2 | Table 4.6.3-84AC in 38.508-1 [14] with condition SCS15 |
| Specific message contents exceptions for Test Configuration 6.6.20-3 | Table 4.6.3-84AC in 38.508-1 [14] with condition SCS30 |

6.6.20.1.5 Test requirements

Table 6.6.20.1.4.1-3 and Table 6.6.20.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR1 SA.

**Table 6.6.20.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | N/A | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | |
| | | 2 | TRS.1.1 TDD | |
| | | 3 | TRS.1.2 TDD | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | |
| PRS configuration | | 1 | PRS.1.2 FR1 | |
| | | 2 | PRS.1.2 FR1 | |
| | | 3 | PRS.2.2 FR1 | |
| PRS muting info | | 1, 2, 3 | '10' | |
| SRS configuration | | 1 | PDC-SRS.1 | |
| | | 2 | PDC-SRS.1 | |
| | | 3 | PDC-SRS.2 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | |
| | | 2 | -98~~+TT~~ | |
| | | 3 | -95~~+TT~~ | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98~~+TT~~ | |
| | | 2 | -98~~+TT~~ | |
| | | 3 | -98~~+TT~~ | |
| PRS $\hat{E}_s/I_{ot}$ | dB | 1 | -Infinity | -2.41~~+TT~~ |
| | | 2 | | |
| | | 3 | | |
| PRS $\hat{E}_s/N_{oc}$ | dB | 1 | -Infinity | -2~~+TT~~ |
| | | 2 | | |
| | | 3 | | |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100~~+TT~~ |
| | | 2 | -Infinity | -100~~+TT~~ |
| | | 3 | -Infinity | -97~~+TT~~ |
| Io | dBm/9.36 MHz | 1 | N/A | -67.67~~+TT~~ |
| | dBm/9.36 MHz | 2 | | -67.67~~+TT~~ |
| | dBm/38.16 MHz | 3 | | -61.57~~+TT~~ |
| Propagation Condition | | 1, 2, 3 | AWGN | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: The noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.20.1.5-2: SRS Configuration for FR1 Propagation Delay Compensation**

| | PDC-SRS.1 | PDC-SRS.2 | |
|---|---|---|---|
| **Field** | | | **Comment** |
| c-SRS | Same as $N_{RB,c}$ in the test case | Same as NRB,c in the test case | |
| b-SRS | 0 | 0 | |
| b-hop | 0 | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 | usagePDC-r17 | |
| startPosition | 5 | 5 | resourceMapping setting |
| nrofSymbols | 4 | 4 | |
| repetitionFactor | n.a. | n.a. | without repetition. |
| transmissionComb | n4 | n4 | |
| combOffset-n2 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic | |
| periodicityAndOffset-p | sl160, 20 | Sl320, 40 | SRS transmission periodicity |

The UE Rx-Tx time difference measurement time shall fulfils the requirements specified in clause 6.6.20.0. The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 6.6.20.0

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 6.6.20.0 for Cell 1.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.21 UE Rx-Tx time difference measurement for propagation delay compensation with TRS

### 6.6.21.0 Minimum conformance requirements

[38.133 clause 9.12.4.2, 9.12.5 and 10.1.25.3.1] for measurement time

When UE is configured with *csi-RS-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [13] and provided with TRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_TRS}$, where:

$$T_{UERxTx,TRS} = N_{sample} * K_{layer3} * LCM(T_{TRS}, T_{DRX})$$

Where

$N_{sample}$ is the number of UE Rx-Tx time difference measurement samples and $N_{sample}$ is [4],

$T_{TRS}$ is the TRS resource periodicity specific for RTT-based propagation delay compensation,

$T_{DRX}$ is the DRX cycle length when DRX is in use, 1ms otherwise.

$K_{layer3}$ is

$N_{total}$ / $N_{available}$ when $N_{available}$>0

Where,

- For a window W of duration LCM($T_{TRS}$, MGRP_max, $T_{SMTC}$) and starting at the beginning of any TRS resource occasion, where $T_{SMTC}$ is the periodicity of SMTC for intra-frequency measurement without gap, and MGRP_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as PCell for a UE supporting *concurrentMeasGap-r17*and is configured with concurrent measurement gaps, otherwise MGRP_max is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as PCell:
  - $N_{total}$ is the total number of TRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of TRS resource occasions that are not overlapped with
    - For FR1: any measurement gap occasions within window W. And for a UE supporting *concurrentMeasGap-r17* after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 within the window W

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on TRS within the active DL BWP. When UE is configured to perform UE Rx-Tx time difference measurement based on TRS, the requirements apply provided that the SCS of the TRS is same as that of the active BWP on PCell.

If TRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the measurement report mapping requirements specified in below.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

**Table 6.6.21.0-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

| Reported Quantity Value | Measured Quantity Value | Unit |
|---|---|---|
| RX-TX_TIME_DIFFERENCE_0000 | $T_{UE\ Rx\text{-}Tx} < -985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001 | $-985024 \le T_{UE\ Rx\text{-}Tx} < -984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002 | $-984992 \le T_{UE\ Rx\text{-}Tx} < -984960$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_30782 | $-32 \le T_{UE\ Rx\text{-}Tx} < 0$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_30783 | $0 \le T_{UE\ Rx\text{-}Tx} < 32$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_61563 | $984960 \le T_{UE\ Rx\text{-}Tx} < 984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61564 | $984992 \le T_{UE\ Rx\text{-}Tx} < 985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565 | $985024 \le T_{UE\ Rx\text{-}Tx}$ | $T_c$ |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

- $N_{TA_offset}$ defined in Table 7.1.2-2 changes during the UE Rx-Tx measurement period or

- if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC TRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 6.6.21.0-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex B.2.13 for a corresponding Band.

AWGN propagation condition.

**Table 6.6.21.0-2: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

| Accuracy | Conditions | | | | | |
|---|---|---|---|---|---|---|
| | TRS Ês/Iot | Minimum TRS bandwidth | TRS SCS | NR operating band groups[Note 2] | Io[Note 3] range | |
| | | | | | Minimum Io[Note 1] | Maximum Io |
| Tc[Note 4] | dB | RB | kHz | | dBm / $SCS_{TRS}$ | dBm/BW |
| [116+δ+ε] | -3 | ≥[24] | 15 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -50 |
| | | | | NR_FDD_FR1_B | -120.5 | |
| | | | | NR_TDD_FR1_C | -120 | |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | |
| | | | | NR_FDD_FR1_F | -118.5 | |
| | | | | NR_FDD_FR1_G | -118 | |
| | | | | NR_FDD_FR1_H | -117.5 | |
| [60+δ+ε] | | ≥[52] | | Note 5 | NOTE 5 | NOTE 5 |
| [29+δ+ε] | | >[104] | | Note 5 | NOTE 5 | NOTE 5 |
| [56+δ+ε] | | ≥[24] | 30 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -118 | -50 |
| | | | | NR_FDD_FR1_B | -117.5 | |
| | | | | NR_TDD_FR1_C | -117 | |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -116.5 | |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -116 | |
| | | | | NR_FDD_FR1_F | -115.5 | |
| | | | | NR_FDD_FR1_G | -115 | |
| | | | | NR_FDD_FR1_H | -114.5 | |
| [29+δ+ε] | | ≥[48] | | NOTE 5 | NOTE 5 | NOTE 5 |
| [15+δ+ε] | | ≥[132] | | NOTE 5 | NOTE 5 | NOTE 5 |
| [29+δ+ε] | | ≥[24] | 60 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -115 | -50 |
| | | | | NR_FDD_FR1_B | -114.5 | |
| | | | | NR_TDD_FR1_C | -114 | |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -113.5 | |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -113 | |
| | | | | NR_FDD_FR1_F | -113.5 | |
| | | | | NR_FDD_FR1_G | -113 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | NR_FDD_FR1_H | -111.5 | |
| [14+δ+ε] | | ≥[64] | | NOTE 5 | NOTE 5 | NOTE 5 |
| [7+δ+ε] | | ≥[132] | | NOTE 5 | NOTE 5 | NOTE 5 |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: The Io is defined in TRS slots. The same Io range applies to TRS and non-TRS symbols. Io levels are different in TRS and non-TRS symbols within the same slot.
NOTE 4: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the TRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 6: δ is the margin determined from Table 10.1.39.3-3.
NOTE 7: ε is the margin for reporting quantitization error and $\varepsilon = 16\ Tc$.

**Table 6.6.21.0-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1**

| Min(TRS BW, SRS BW) (RB) | | | Margin (Tc [Note 1]) |
|---|---|---|---|
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz | |
| ≥ 24 | N/A | N/A | 160 |
| ≥ 52 | ≥ 24 | N/A | 80 |
| ≥ 104 | ≥ 48 | ≥ 24 | 56 |
| N/A | ≥ 132 | ≥ 64 | 24 |
| N/A | N/A | ≥ 132 | 24 |

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: If SRS and TRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

## 6.6.21.1 NR SA FR1 UE Rx-Tx time difference measurement with TRS for RTT-based PDC

### 6.6.21.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement with TRS for RTT-based PDC meets the requirements specified in clause 9.12.4.2 for measurement delay and clause 10.1.39.3 for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

### 6.6.21.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-CSI-RS-ForTracking-r17 or gNB-SideRTT-BasedPDC-r17*.

### 6.6.21.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.21.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.2, 9.12.5, 10.1.39.3 and A.6.6.21.

### 6.6.21.1.4 Test description

#### 6.6.21.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.21.1.4.1-1

**Table 6.6.21.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.21-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.21-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.21-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.21.1.4.1-2.

**Table 6.6.21.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.21.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 6.6.21.1.4.1-3.

2. Message contents are defined in clause 6.6.21.1.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.21.1.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value |
|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 |
| RF Channel Number | | 1, 2, 3 | 1 |
| $BW_{channel}$ | MHz | 1 | 10: $N_{RB,c}$ = 52 |
| | | 2 | 10: $N_{RB,c}$ = 52 |
| | | 3 | 40: $N_{RB,c}$ = 106 |
| SSB configuration | | 1 | SSB.1 FR1 |
| | | 2 | SSB.1 FR1 |
| | | 3 | SSB.2 FR1 |
| SMTC configuration | | 1 | SMTC.2 |
| | | 2 | SMTC.1 |
| | | 3 | SMTC.1 |
| CP length | | 1, 2, 3 | Normal |
| DRX | | 1, 2, 3 | OFF |
| T1 | s | 1, 2, 3 | 1 |
| T2 | s | 1, 2, 3 | 1 |

### 6.6.21.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 does not have TRS transmission during T1 and transmits TRS during T2.

The measurement control information with *MeasObjectRxTxDiff* set to ‘csi-RS-Ref’ as defined in table 6.6.21.1.4.3-1, shall be provided to the UE during T1. The last TTI containing the RRC message shall be provided to the UE $\Delta T$ ms before the start of T2, where $\Delta T$ = 10 ms is the maximum processing time of the measurement request. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 6.6.21.1.4.1-3 and Table 6.6.21.1.5-1, respectively. The test consists of two sub-tests with different TRS BW.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.21.1.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.21.1.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. If the *result-k5* value is outside the limits in Table 6.6.21.0-2 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 6.6.21.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76B in 38.508-1 [14] with condition CSI-RS_REF |
| Specific message contents exceptions for Test Configuration 6.6.21-1 and 6.6.21-2 | Table 4.6.3-84AC in 38.508-1 [14] with condition SCS15 |
| Specific message contents exceptions for Test Configuration 6.6.21-3 | Table 4.6.3-84AC in 38.508-1 [14] with condition SCS30 |

### 6.6.21.1.5 Test requirements

Table 6.6.21.1.4.1-3 and Table 6.6.21.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA.

**Table 6.6.21.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test configuration | Values | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | N/A | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | |
| | | 2 | TRS.1.1 TDD | |
| | | 3 | TRS.1.2 TDD | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | |
| SRS configuration | | 1 | PDC-SRS.1 | |
| | | 2 | PDC-SRS.1 | |
| | | 3 | PDC-SRS.2 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98~~+TT~~ | |
| | | 2 | -98~~+TT~~ | |

| | | | | |
|---|---|---|---|---|
| | | 3 | -95~~+TT~~ | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98~~+TT~~ | |
| | | 2 | | |
| | | 3 | | |
| TRS $\hat{E}_s/I_{ot}$ | dB | 1 | -Infinity | -3~~+TT~~ |
| | | 2 | | |
| | | 3 | | |
| TRS $\hat{E}_s/N_{oc}$ | dB | 1 | -Infinity | -3~~+TT~~ |
| | | 2 | | |
| | | 3 | | |
| TRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101~~+TT~~ |
| | | 2 | -Infinity | -101~~+TT~~ |
| | | 3 | -Infinity | -98~~+TT~~ |
| Io | dBm/9.36 MHz | 1 | N/A | -68.28~~+TT~~ |
| | dBm/9.36 MHz | 2 | | -68.28~~+TT~~ |
| | dBm/38.16 MHz | 3 | | -62.19~~+TT~~ |
| Propagation Condition | | 1, 2, 3 | AWGN | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: TRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.21.1.5-2: SRS Configuration for FR1 Propagation Delay Compensation**

| | **PDC-SRS.1** | **PDC-SRS.2** | |
|---|---|---|---|
| **Field** | | | **Comment** |
| c-SRS | Same as $N_{RB,c}$ in the test case | Same as NRB,c in the test case | |
| b-SRS | 0 | 0 | |
| b-hop | 0 | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 | usagePDC-r17 | |
| startPosition | 5 | 5 | resourceMapping setting |
| nrofSymbols | 4 | 4 | |
| repetitionFactor | n.a. | n.a. | without repetition. |
| transmissionComb | n4 | n4 | |
| combOffset-n2 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic | |
| periodicityAndOffset-p | sl160, 20 | Sl320, 40 | SRS transmission periodicity |

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 6.6.21.0.

The UE shall perform and report UE Rx-Tx time difference measurement for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of T2.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 6.6.21.0.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.22 SA event triggered reporting tests with concurrent gaps including Pre-MG

### 6.6.22.0 Minimum conformance requirements

Minimmum conformance requirements given in sub-clause 6.6.1.0.2 and 6.6.2.0.1. In addition, minimum conformance requirements listed below also apply.

When the UE supports *concurrentMeasGapsPreMG-r18* capability, network can provide multiple measurement gap patterns with at least one of the measurement gaps is pre-configured measurement gap (Pre-MG) pattern configured by RRC message(s) as specified in TS 38.331 [2]. Requirements in this clause apply when the UE is in SA operation mode.

If the UE requires measurement gaps and/or Pre-MGs to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports *concurrentMeasGapsPreMG-r18* but does not support independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3[4], in order for the requirements in the following clauses to apply, the network can provide the UE with no more than two per-UE measurement gap patterns for monitoring all the frequency layers.

When the UE supports *concurrentMeasGapsPreMG-r18*, the gap association for a frequency layer is configured by the network via *associatedMeasGapSSB-r17* or *associatedMeasGapCSIRS-r17* in the corresponding MO(s) or via *gapAssociationPRS-r17* in *GapConfig-r17*. In this case the gap association rules in TS 38.133 [6] clause 9.1.8.2 shall also apply to either measurement gap or Pre-MG.

When autonomous mechanism [13] is used for activation/deactivation of Pre-MG pattern, the UE shall autonomously determine the Pre-MG status only based on the measurement objects associated with the concerned Pre-MG. The related Pre-MG autonomous activation/deactivation mechanism is specified in TS 38.133 [6] clause 9.1.7.3.1.

When network-controlled mechanism [13] is used for activation/deactivation, the requirements specified in TS 38.133 [6] clause 9.1.7.3.2 apply.

When UE supports *concurrentMeasGapsPreMG-r18*, where at least one of the concurrent gaps is Pre-MG, applicable measurement gap patterns are listed in TS 38.133 [6] Table 9.1.2-1, and their applicability based on measurement and serving cell configurations is specified in TS 38.133 [6] Table 9.1.2-3.

The requirements in TS 38.133 [6] clause 9.1.2 are applicable for the UE, capable of *concurrentMeasGapsPreMG-r18* and configured with multiple concurrent measurement gap patterns, within each activated Pre-MG occasion.

A collision between occasions of two measurement gaps where the higher priority gap is a Pre-MG and the lower priority gap may or may not be a Pre-MG is called as dynamic collision.

For a UE that supports *dynamicCollision-r18*:

- Collisions between a Pre-MG and a measurement gap may occur only when the Pre-MG is activated.
- Collisions between two Pre-MGs may occur only when both Pre-MGs are activated.

When the collision between a Pre-MG and a measurement gap or two Pre-MGs satisfy the colliding rule defined in TS 38.133 [6] clause 9.1.8.3, the UE shall perform measurements in the occasion of the non-dropped gap except the scenario specified in 38.133 [6] clause 9.1.12.5.

For a UE that does not support *dynamicCollision-r18*:

- Collisions between a Pre-MG and a measurement gap or two Pre-MGs may occur when the collision rule defined in 38.133 [6] clause 9.1.8.3 is satisfied, regardless of the Pre-MG activation status.

When the collision between a Pre-MG and a measurement gap or two Pre-MGs satisfy the colliding rule defined in 38.133 [6] clause 9.1.8.3, the UE shall perform measurements in the occasion of the non-dropped gap regardless of whether it collides with the Pre-MG activation or deactivation procedure.

The requirements for the UE capable of *concurrentMeasGapsPreMG-r18* apply provided that the two measurement gaps colliding with each other are configured with different priorities.

No collisions can occur between a per-FR Pre-MG and a per-FR measurement gap when they are configured in different FRs.

No collisions can occur between per-FR Pre-MGs when they are configured in different FRs.

The requirements in this clause apply for UE that supports *dynamicCollision-r18*.

A measurement gap occasion and a Pre-MG activation/deactivation procedure collide when the ending point of the Pre-MG activation/deactivation procedure occurs anywhere within a time period starting 4 ms before the starting point of the gap occasion and ending 4 ms after the ending point of the gap occasion. The ending point of the Pre-MG activation/deactivation procedure in this collision case is defined in TS 38.133 [6] clause 8.19.2, 8.19.3 and 8.19.4.

- When a collision occurs between a measurement gap occasion and a Pre-MG activation procedure, and the Pre-MG is configured with higher priority, the UE shall perform measurements during the measurement gap occasion and the activation of the Pre-MG is delayed until 5 ms after the ending point of the measurement gap occasion.

- When a collision occurs between a measurement gap occasion and a Pre-MG deactivation procedure, and the Pre-MG is configured with higher priority, the measurement gap occasion shall be dropped.

A slot is interrupted by a Pre-MG if it overlaps with any occasion of the configured Pre-MG, if the Pre-MG is activated and the Pre-MG occasion is not dropped.

The normative reference for this requirement is TS 38.133 [6] clause 9.1.12.

## 6.6.22.1 NR SA FR1 and FR1-FR1 event-triggered reporting with concurrent Type-2 measurement gap and Pre-MG

Editor's Notes: This test case is incomplete in following aspects:

- Test procedure is still TBD;
- Message contents are still TBD;
- TT analysis is still missing;

### 6.6.22.1.1 Test purpose

The purpose of this test is to verify that the concurrent gap with Pre-MG capable UE makes correct reporting of events. This test will partly verify the SA intra-frequency and inter-frequency NR cell search requirements in TS 38.133 [6] clauses 9.2.6, 9.3.4 and 9.3.5, respectively. Also, this test will also jointly verify pre-configured measurement gap autonomous activation/deactivation delay in TS 38.133 [6] clause 8.19.2.

### 6.6.22.1.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting *concurrentMeasGapsPreMG-r18*.

### 6.6.22.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.22.0.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.6.22.1.

### 6.6.22.1.4 Test description

#### 6.6.22.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.22.1.4.1-1.

**Table 6.6.22.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.22.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.22.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.22.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.22.1.4.1-2.

**Table 6.6.22.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.22.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.22.1.4.1-3.
2. Message contents are defined in clause 6.6.22.1.4.3.
3. The test scenario comprises of 2 NR carriers and 3 cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.22.1.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cells | | Config 1,2,3 | NR Cells 2 and 3 | NR Cell 2 is on NR RF channel number 1. NR Cell 3 is on the NR RF channel 2. |
| Gap Pattern Id | | Config 1,2,3 | 1 for *MeasGapId* #1 (80 ms MGRP)<br>0 for *MeasGapId* #2 (40 ms MGRP) | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | ms | Config 1,2,3 | 79 for *MeasGapId* #1<br>4 for *MeasGapId* #2 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cell | | Config 1,2,3 | 3 μs | The timing of Cell 3 is 3μs later than the timing of Cell 1. |
| | | Config 1,2,3 | 5 ms | The timing of Cell 3 is 5 ms later than the timing of Cell 1. |
| T1 | s | Config 1,2,3 | 2 | |
| T2 | s | Config 1,2,3 | 2 | |

6.6.22.1.4.2 Test procedure

TBD

6.6.22.1.4.3 Message contents

TBD

6.6.22.1.5 Test requirements

Table 6.6.22.1.4.1-3 and Table 6.6.22.1.5-1 define the primary level settings including test tolerances for the test.

**Table 6.6.22.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test Config. | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1,2,3 | 1 | | 1 | | 2 | |
| Duplex mode | | 1 | FDD | | | | | |
| | | 2,3 | TDD | | | | | |
| TDD configuration | | 1 | N/A | | | | | |
| | | 2 | TDDConf.1.1 | | | | | |
| | | 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| BWP BW | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | | N/A | | N/A | |
| BWP-1 Configuration | | 1,2,3 | DLBWP.1.3 ULBWP.1.3 | | N/A | | N/A | |
| BWP-2 Configuration | | 1,2,3 | DLBWP.1.2 ULBWP.1.2 | | N/A | | N/A | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | | N/A | |
| OCNG Patterns | | 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | 2 | SR.1.1 TDD | | N/A | | N/A | |
| | | 3 | SR.2.1 TDD | | N/A | | N/A | |
| RMSI CORESET RMC | | 1 | CR.1.1 FDD | | N/A | | N/A | |
| | | 2 | CR.1.1 TDD | | N/A | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | | N/A | |
| Dedicated CORESET RMC | | 1 | CCR.1.1 FDD | | N/A | | N/A | |
| | | 2 | CCR.1.1 TDD | | N/A | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | | N/A | |
| SSB parameters | | 1,2 | SSB.1 FR1 | | | | | |
| | | 3 | SSB.2 FR1 | | | | | |
| SMTC configuration | | 1,2,3 | SMTC.2 | | SMTC.2 | | SMTC.7 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 15 | | | | | |
| | | 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |

| Parameter | Unit | Test Config. | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15 kHz | | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | -98 | | -98 | | -98 | |
| | | 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1,2 | -94+TT | -94+TT | -Infinity | -94+TT | -91+TT | -Infinity |
| | | 3 | -91+TT | -91+TT | -Infinity | -91+TT | -88+TT | -Infinity |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3 | 4+TT | -1.46+TT | -Infinity | -1.46+TT | 7+TT | -Infinity |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3 | 4+TT | 4+TT | -Infinity | 4+TT | 7+TT | -Infinity |
| Io Note3 | dBm/9.36 MHz | 1,2 | -64.59 +TT | -62.25 +TT | -64.59 +TT | -62.26 +TT | -62.26 +TT | -70.05 +TT |
| | dBm/38.16 MHz | 3 | -58.49 +TT | -56.16 +TT | -58.49 +TT | -56.15 +TT | -56.15 +TT | -63.94 +TT |
| Propagation Condition | | 1,2,3 | AWGN | | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

During T1,

- If pc_dynamicCollision_r18 = true,
  - The UE shall report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the non-dropped *MeasGapId* #2 occasions;
  - The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 902 ms for NR Cell 3 from the beginning of time period T1.
- If pc_dynamicCollision_r18 = false
  - The UE shall report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the non-dropped *MeasGapId* #2 occasions.
  - The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1282 ms for NR Cell 3 from the beginning of time period T1.

During T2,

- The UE shall report ACK/NACK for PDSCHs scheduled in the slots that are not overlapped with the *MeasGapId* #1 occasions or non-dropped *MeasGapId* #2 occasions after *MeasGapId* #1 is activated, i.e. starting from the first complete *MeasGapId* #1 occasion after the beginning of PCell's DL slot $i + T_{\text{BWPswitchDelay}} + \frac{5}{\text{NR slot length}}$
- The UE shall send one Event A3 triggered measurement report for each neighboring cell, with a measurement reporting delay less than 1082 ms for Cell 2 from the beginning of time period T2. The measurement reporting delay is derived based on the requirements for intra-frequency measurement in TS 38.133 [6] clause 9.2.6 plus 80 ms, considering that the frist MeasGapId #1 occasion in T2 may collide with the pre-configured gap activation delay.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. UE is not required to report SSB time index.

NOTE 1: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.22.2 NR SA FR1 event-triggered reporting with two concurrent Pre-MGs

Editor's Notes: This test case is incomplete in following aspects:

- Test procedure is still TBD;
- Message contents are still TBD;
- TT analysis is still missing;

### 6.6.22.2.1 Test purpose

The purpose of this test is to verify that the UE correctly activates and deactivates the pre-MGs and makes correct measurement and reporting of an event with activated and deactivated pre-MG. This test will partly verify the multiple Pre-MG activation/deactivation delay in TS38.133 [6] clause 8.19.5.2, the intra-frequency cell search requirements in TS38.133 [6] clause 9.2.6 and inter-frequency cell search requirements in TS38.133 [6] clause 9.3.4 and 9.3.5.

### 6.6.22.2.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting *concurrentMeasGapsPreMG-r18*.

### 6.6.22.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.22.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.22.2.

### 6.6.22.2.4 Test description

#### 6.6.22.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.22.2.4.1-1.

**Table 6.6.22.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.22.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.22.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.22.2-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.22.2.4.1-2.

**Table 6.6.22.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.22.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.22.2.4.1-3.

2. Message contents are defined in clause 6.6.22.2.4.3.

3. The test scenario comprises of 2 NR carriers and 3 cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.22.2.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2,3 | Cell 1 | |
| Neighbour cell | | 1,2,3 | Cell 2, Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2,3 | 1: Cell 1 and Cell 2, 2: Cell 3 | |
| Pre-MG Gap Pattern Id | | 1,2,3 | 0 for *MeasGapId* #1<br>1 for *MeasGapId* #2 | |
| Measurement gap offset | | 1,2,3 | 39 for *MeasGapId* #1<br>19 for *MeasGapId* #2 | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | Same configuration for MO1 and MO2 |
| | | 2,3 | SMTC.1 | Same configuration for MO1 and MO2 |
| CSI-RS parameters | | 1 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| A3-Offset | dB | 1,2,3 | -4.5 | |
| CP length | | 1,2,3 | Normal | |
| Hysteresis | dB | 1,2,3 | 0 | |
| Time To Trigger | s | 1,2,3 | 0 | |
| Filter coefficient | | 1,2,3 | 0 | L3 filtering is not used |
| DRX | | 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 and Cell 3 is 3 ms later than the timing of Cell 1. |
| | | 2,3 | 3 μs | Synchronous cells |
| T1 | s | 1,2,3 | 5 | |
| T2 | s | 1,2,3 | 0.1 | |
| T3 | s | 1,2,3 | 5 | |

6.6.22.2.4.2 Test procedure

TBD

6.6.22.2.4.3 Message contents

TBD

6.6.22.2.5 Test requirement

Table 6.6.22.2.4.1-3 and Table 6.6.22.2.5-1 define the primary level settings including test tolerances for the test.

**Table 6.6.22.2.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config. | Cell 1 | | | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | | N/A | | | N/A | | |
| | | 2 | SR.1.1 TDD | | | | | | | | |
| | | 3 | SR.2.1 TDD | | | | | | | | |
| RMSI CORESET RMC | | 1 | CR.1.1 FDD | | | N/A | | | N/A | | |
| | | 2 | CR.1.1 TDD | | | N/A | | | N/A | | |
| | | 3 | CR.2.1 TDD | | | N/A | | | N/A | | |
| Dedicated CORESET RMC | | 1 | CCR.1.2 FDD | | | N/A | | | N/A | | |
| | | 2 | CCR.1.2 TDD | | | N/A | | | N/A | | |

| Parameter | Unit | Test config. | Cell 1 | | | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| | | 3 | CCR.2.1 TDD | | | N/A | | | N/A | | |
| OCNG Patterns | | 1,2,3 | OP.1 | | | OP.1 | | | OP.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | N/A | | | N/A | | |
| | | 2 | TRS.1.1 TDD | | | N/A | | | N/A | | |
| | | 3 | TRS.1.2 TDD | | | N/A | | | N/A | | |
| Initial BWP configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | | | N/A | | | N/A | | |
| BWP-1 Configuration | | 1,2,3 | DLBWP.1.3 ULBWP.1.3 | | | N/A | | | N/A | | |
| BWP-2 Configuration | | 1,2,3 | DLBWP.1.2 ULBWP.1.2 | | | N/A | | | N/A | | |
| RLM-RS | | 1,2,3 | CSI-RS | | | N/A | | | N/A | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,2,3 | -98+TT | | | -98+TT | | | -98+TT | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98+TT | | | -98+TT | | | -98+TT | | |
| | | 2 | -98+TT | | | -98+TT | | | -98+TT | | |
| | | 3 | -95+TT | | | -95+TT | | | -95+TT | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3 | 4 +TT | 4 +TT | -1.46 +TT | -∞ | -∞ | -1.46 +TT | 4 +TT | -∞ | -∞ |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3 | 4 +TT | 4 +TT | 4 +TT | -∞ | -∞ | 4 +TT | 4 +TT | -∞ | -∞ |
| SS-RSRP Note 3 | dBm/SCS | 1,2 | -94 +TT | -94 +TT | -94 +TT | -∞ | -∞ | -94 +TT | -94 +TT | -∞ | -∞ |
| | | 3 | -91 +TT | -91 +TT | -91 +TT | -∞ | -∞ | -91 +TT | -91 +TT | -∞ | -∞ |
| Io | dBm/9.36 MHz | 1,2 | -64.60 +TT | -64.60 +TT | -62.25 +TT | -∞ | -∞ | -62.25 +TT | -64.60 +TT | -∞ | -∞ |
| | dBm/38.16 MHz | 3 | -58.50 +TT | -58.50 +TT | -56.16 +TT | -∞ | -∞ | -56.16 +TT | -58.50 +TT | -∞ | -∞ |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T1 and T3.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, UE shall report corresponding HARQ-ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the pre-MG occasions of *MeasGapId* #2; and

The UE shall send one Event A3 triggered measurement report of NR Cell 3 on RF channel 2, with a measurement reporting delay less than 1282 ms from the beginning of time period T1.

During T2 and starting from the first complete Pre-MG occasion after the beginning of PCell's DL slot $i + T_{\mathrm{BWPswitchDelay}} + \frac{7}{\mathrm{NR\ slot\ length}}$ as defined in clause 8.19.5.2, the UE shall report corresponding HARQ-ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the pre-MG occasions of *MeasGapId* #1.

The UE shall send one Event A3 triggered measurement report of NR Cell 2 on RF channel 1, with a measurement reporting delay less than 802 ms from the beginning of time period T3.

During T3, the UE shall report corresponding HARQ-ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the pre-MG occasions of *MeasGapId* #1.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.23 SA event triggered reporting tests with concurrent gaps including NCSG

### 6.6.23.0 Minimum conformance requirements

Minimmum conformance requirements given in sub-clause 6.6.1.0.2 and 6.6.2.0.1. In addition, minimum conformance requirements listed below also apply.

When UE supports *concurrentMeasGapsNCSG-r18* capability, network can provide multiple measurement gaps with at least one of the measurement gaps is NCSG configured by RRC message(s) as specified in TS 38.331 [13].

If the UE requires concurrent measurement gaps and/or NCSG to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports *concurrentMeasGapsNCSG-r18* but does not support *independentGapConfig* or *ncsg-MeasGapPerFR-r17* as specified in [11], in order for the requirements in the following clauses to apply, the network can provide one per-UE concurrent measurement gap and one per-UE NCSG or at most two per-UE NCSGs for monitoring of all frequency layers.

For UE configured in the SA operation mode, when monitoring of multiple inter-RAT E-UTRAN carrier frequency layers, intra-frequency NR carrier frequency layers and/or inter-frequency NR carrier frequency layers as configured by PCell using gaps, each monitored carrier frequency layer, including following measurement types:

- a measurement object with SSB based measurement,
- E-UTRA inter-RAT measurement object,

can be associated to either one concurrent measurement gap pattern or one NCSG pattern.

Requirements for UE capable of *concurrentMeasGapsNCSG-r18* apply provided that each frequency layer is only associated with one concurrent measurement gap or one NCSG, and at least one of the gaps is NCSG. There can be one or more frequency layers associated with each concurrent measurement gap or each NCSG.

When UE supports *concurrentMeasGapsNCSG-r18*, where at least one of the concurrent gaps is NCSG, supported concurrent measurement gap patterns are listed in 38.133[6] Table 9.1.2-1 based on the applicability specified in 38.133[6] Table 9.1.2-3, while supported NCSG patterns are listed in 38.133[6] Table 9.1.9.3-1 based on the applicability specified in 38.133[6] Table 9.1.9.3-2.

The requirements in 38.133[6] clause 9.1.2 are also applicable for the UE capable of *concurrentMeasGapsNCSG-r18* and configured with multiple measurement gap or NCSG patterns within each concurrent measurement gap pattern. The requirements in 38.133[6] clause 9.1.9 are also applicable for the UE capable of *concurrentMeasGapsNCSG-r18* and configured with multiple measurement gap or NCSG patterns within each NCSG pattern.

The normative reference for this requirement is TS 38.133 [6] clause 9.1.13.

### 6.6.23.1 NR SA FR1-FR1 event-triggered reporting with concurrent Type-2 measurement gap and NCSG

Editor's Notes: This test case is incomplete in following aspects:

- Test procedure is still TBD;
- Message contents are still TBD;
- TT analysis is still missing;
- Test requirements are still in brackets.

#### 6.6.23.1.1 Test purpose

The purpose of this test is to verify that the concurrent gaps with NCSG capable UE makes correct reporting of events. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.10.

#### 6.6.23.1.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting *concurrentMeasGapsNCSG-r18.*

#### 6.6.23.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.23.0.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.6.23.1.

#### 6.6.23.1.4 Test description

##### 6.6.23.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.23.1.4.1-1.

**Table 6.6.23.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.23.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.23.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.23.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations<br>NOTE 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.23.1.4.1-2.

**Table 6.6.23.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.23.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 6.6.23.1.4.1-3.

2. Message contents are defined in clause 6.6.23.1.4.3.

3. The test scenario comprises of 2 NR carriers and 3 cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.23.1.4.1-3: General test parameters**

| Parameter | Unit | Test config. | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1,2,3 | 1,2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | 1,2,3 | NR Cell 2 and 3 | NR Cell 2 is on NR RF channel number 2.<br>NR Cell 3 is on NR RF channel number 1. |
| Measurement Gap Pattern Id | | 1,2,3 | 0 | As specified in TS 38.133 [6] Table 9.1.2-1. |
| Measurement Gap offset | | 1,2,3 | 39 | |
| NCSG Pattern Id | | 1,2,3 | 1 | As specified in TS 38.133 [6] Table 9.1.9.3-1. |
| NCSG offset | | 1,2,3 | 4 | |
| A3-Offset | dB | 1,2,3 | -6 | |
| Hysteresis | dB | 1,2,3 | 0 | |
| CP length | | 1,2,3 | Normal | |
| TimeToTrigger | s | 1,2,3 | 0 | |
| Filter coefficient | | 1,2,3 | 0 | L3 filtering is not used |
| DRX | | 1,2,3 | OFF | DRX is not used |

| Parameter | Unit | Test config. | Value | Comment |
|---|---|---|---|---|
| Time offset between serving and neighbour Cell 1 | | 1,2,3 | 3μs | Synchronous. |
| Time offset between serving and neighbour Cell 2 | | 1,2,3 | 5 ms | Asynchronous.<br>The timing of Cell 3 is 5 ms later than the timing of Cell 1. |
| T1 | s | 1,2,3 | 5 | |
| T2 | s | 1,2,3 | 1.5 | |

6.6.23.1.4.2 Test procedure

TBD

6.6.23.1.4.3 Message contents

TBD

6.6.23.1.5 Test requirements

Table 6.6.23.1.4.1-3 and Table 6.6.23.1.5-1 define the primary level settings including test tolerances for the test.

**Table 6.6.23.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1,2,3 | 1 | | 2 | | 1 | |
| Duplex mode | | 1 | FDD | | | | | |
| | | 2,3 | TDD | | | | | |
| TDD configuration | | 1 | N/A | | | | | |
| | | 2 | TDDConf.1.1 | | | | | |
| | | 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| BWP BW | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| Initial BWP configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | N/A | | N/A | |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 | | | | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | | | |
| | | 2 | TRS.1.1 TDD | | | | | |
| | | 3 | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC | | 1 | CR.1.1 FDD | | | | | |
| | | 2 | CR.1.1 TDD | | | | | |
| | | 3 | CR.2.1 TDD | | | | | |
| Dedicated CORESET Reference Channel | | 1 | CCR.1.1 FDD | | | | | |
| | | 2 | CCR.1.1 TDD | | | | | |
| | | 3 | CCR.2.1 TDD | | | | | |
| SSB parameters | | 1,2,3 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | 1,2,3 | SMTC.2 | | SMTC.2 | | SMTC.2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 15 | | | | | |
| | | 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15 kHz | 1,2,3 | -98+TT | | -98+TT | | -98+TT | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | -98+TT | | -98+TT | | -98+TT | |
| | | 3 | -95+TT | | -95+TT | | -95+TT | |
| SS-RSRP Note 3 | dBm/SCS | 1,2 | -94+TT | -94+TT | -Infinity | -91+TT | -Infinity | -91+TT |
| | | 3 | -91+TT | -91+TT | -Infinity | -88+TT | -Infinity | -88+TT |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3 | 4 +TT | 4+TT | -Infinity | 7+TT | -Infinity | 7+TT |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3 | 4+TT | 4+TT | -Infinity | 7+TT | -Infinity | 7+TT |
| Io Note3 | dBm/ 9.36 MHz | 1,2 | -64.59 +TT | -64.59 +TT | -70.05 +TT | -62.26 +TT | -70.05 +TT | -62.26 +TT |
| | dBm/ 38.16 MHz | 3 | -58.49 +TT | -58.49 +TT | -63.94 +TT | -56.15 +TT | -63.94 +TT | -56.15 +TT |
| Propagation Condition | | 1,2,3 | AWGN | | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighboring cell, with a measurement reporting delay less than [1282] ms for Cell 2 and [1282 ms] for Cell 3 from the beginning of time period T2.

During T2, UE shall send HARQ-ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern after considering the collision between NCSGs.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.23.2 NR SA FR1-FR1 event-triggered reporting with two concurrent NCSGs

Editor's Notes: This test case is incomplete in following aspects:

- Test procedure is still TBD;
- Message contents are still TBD;
- TT analysis is still missing;
- Test requirements are still in brackets.

### 6.6.23.2.1 Test purpose

The purpose of this test is to verify that the concurrent gaps with NCSG capable UE makes correct reporting of events. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.10.

### 6.6.23.2.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting *concurrentMeasGapsNCSG-r18*.

#### 6.6.23.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.23.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.23.2.

#### 6.6.23.2.4 Test description

##### 6.6.23.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.23.2.4.1-1.

**Table 6.6.23.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.23.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.23.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.23.2-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.23.2.4.1-2.

**Table 6.6.23.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.23.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.23.2.4.1-3.
2. Message contents are defined in clause 6.6.23.2.4.3.
3. The test scenario comprises of 3 NR carriers and 3 cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.23.2.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1,2,3 | 1,2,3 | Three FR1 NR carrier frequencies are used. |
| Active cell | | 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | 1,2,3 | NR Cell 2 and 3 | NR Cell 2 is on NR RF channel number 2.<br>NR Cell 3 is on NR RF channel number 3. |
| NCSG Pattern Id | | 1,2,3 | 0 for *NCSGId* #0<br>1 for *NCSGId* #1 | As specified in TS 38.133 [6] Table 9.1.9.3-1. |
| NCSG offset | | 1,2,3 | 79 for *NCSGId* #0<br>19 for *NCSGpId* #1 | |
| A3-Offset | dB | 1,2,3 | -6 | |
| Hysteresis | dB | 1,2,3 | 0 | |
| CP length | | 1,2,3 | Normal | |
| TimeToTrigger | s | 1,2,3 | 0 | |
| Filter coefficient | | 1,2,3 | 0 | L3 filtering is not used |

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| DRX | | 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour Cell 1 | | 1,2,3 | 3 μs | Synchronous. |
| Time offset between serving and neighbour Cell 2 | | 1,2,3 | 5 ms | Asynchronous.<br>The timing of Cell 3 is 5 ms later than the timing of Cell 1. |
| T1 | s | 1,2,3 | 5 | |
| T2 | s | 1,2,3 | 1.5 | |

6.6.23.2.4.2 Test procedure

TBD

6.6.23.2.4.3 Message contents

TBD

6.6.23.2.5 Test requirement

Table 6.6.23.2.4.1-3 and Table 6.6.23.2.5-1 define the primary level settings including test tolerances for the test.

**Table 6.6.23.2.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | 1 | FDD | | | | | |
| | | 2,3 | TDD | | | | | |
| TDD configuration | | 1 | N/A | | | | | |
| | | 2 | TDDConf.1.1 | | | | | |
| | | 3 | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| BWP BW | MHz | 1,2 | 10: $N_{PRB,c}$ = 52 | | | | | |
| | | 3 | 40: $N_{PRB,c}$ = 106 | | | | | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | | N/A | | N/A | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>ULBWP.1.1 | | | | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | | | |
| | | 2 | TRS.1.1 TDD | | | | | |
| | | 3 | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | 1,2,3 | OP.1 | | | | | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC | | 1 | CR.1.1 FDD | | | | | |
| | | 2 | CR.1.1 TDD | | | | | |
| | | 3 | CR.2.1 TDD | | | | | |
| Dedicated CORESET RMC | | 1 | CCR.1.1 FDD | | | | | |
| | | 2 | CCR.1.1 TDD | | | | | |
| | | 3 | CCR.2.1 TDD | | | | | |
| SSB parameters | | 1,2,3 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | 1,2,3 | SMTC.2 | | SMTC.2 | | SMTC.2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 15 | | | | | |
| | | 3 | 30 | | | | | |
| EPRE ratio of PSS to SSS | | 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15 kHz | 1,2,3 | -98 +TT | | -98 +TT | | -98 +TT | |
| $N_{oc}$ Note2 | dBm/ SCS | 1,2 | -98 +TT | | -98 +TT | | -98 +TT | |
| | | 3 | -95 +TT | | -95 +TT | | -95 +TT | |
| SS-RSRP Note 3 | dBm/ SCS | 1,2 | -94 +TT | -94 +TT | -Infinity | -91 +TT | -Infinity | -91 +TT |
| | | 3 | -91 +TT | -91 +TT | -Infinity | -88 +TT | -Infinity | -88 +TT |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3 | 4 +TT | 4 +TT | -Infinity | 7 +TT | -Infinity | 7 +TT |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3 | 4 +TT | 4 +TT | -Infinity | 7 +TT | -Infinity | 7 +TT |
| Io Note3 | dBm/9.36 MHz | 1,2 | -64.59 +TT | -64.59 +TT | -70.05 +TT | -62.26 +TT | -70.05 +TT | -62.26 +TT |
| | dBm/38.16 MHz | 3 | -58.49 +TT | -58.49 +TT | -63.94 +TT | -56.15 +TT | -63.94 +TT | -56.15 +TT |
| Propagation Condition | | 1,2,3 | AWGN | | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighboring cell, with a measurement reporting delay less than [1282] ms for Cell 2 and [1282 ms] for cell 3 from the beginning of time period T2.

During T2, UE shall send HARQ-ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern after considering the collision between NCSGs.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.23.3 NR SA FR1 and FR1-FR1 event triggered reporting with concurrent Type-2 measurement gap and NCSG

### 6.6.23.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the cell search requirements on SCC with deactivated SCell in TS 38.133 [6] clauses 9.2.7.1 and 9.2.7.2.

### 6.6.23.3.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting 2CC DL CA and *concurrentMeasGapsNCSG-r18*.

### 6.6.23.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.23.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.23.3.

6.6.23.3.4 Test description

6.6.23.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.23.3.4.1-1.

**Table 6.6.23.3.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.23.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.23.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.23.3-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 6.6.23.3.4.1-2.

**Table 6.6.23.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E (Note 1), Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.23.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |
| Note 1: For UE supporting intra-band contiguous CA, the test frequencies are selected according to E.1.4.2. For UE supporting intra-band non-contiguous CA, the test frequencies are selected according to E.1.4.3. For UE supporting inter-band CA, the the test frequencies are selected according to E.1.4.1 | | | |

1. The test parameters for PCell and neighbour cell are given in Table 6.6.23.3.4.1-3 below.
2. Message contents are defined in clause 6.6.23.3.4.3.
3. The test scenario comprises of 3 NR carriers and 3 cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 6.6.23.3.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2,3 | Cell 1 | |
| Configured deactivated SCell | | 1,2,3 | Cell 2 | |
| Neighbour cell | | 1,2,3 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2,3 | 1: Cell 1 | |
| RF Channel Number | | 1,2,3 | 2: Cell 2 and Cell 3 | |
| NCSG type | | 1,2,3 | Per-UE NCSG | |
| NCSG pattern Id | | 1,2,3 | ID # 1 | Defined in TS 38.133 [6] Table 9.1.9.3-1 |
| NCSG offset | | 1,2,3 | 39 | |
| Measurement gap type | | 1,2,3 | Per-UE MG | |
| MG pattern Id | | 1,2,3 | ID #1 | Defined in TS 38.133 [6] Table 9.1.2-1 |
| Measurement gap offset | | 1,2,3 | 19 | |
| MGTA | ms | 1,2,3 | 0 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| | | 3 | SMTC.1 | |
| A6-Offset | dB | 1,2,3 | -4.5 | |
| CP length | | 1,2,3 | Normal | |
| Hysteresis | dB | 1,2,3 | 0 | |
| Time To Trigger | s | 1,2,3 | 0 | |
| Filter coefficient | | 1,2,3 | 0 | L3 filtering is not used |
| DRX | | 1,2,3 | | OFF |
| SCell measurement cycle (measCycleSCell) | ms | 1,2,3 | 640 | |
| Cell 2 timing offset to Cell 1 | µs | 1,2,3 | 0 | |
| Time alignment error between Cell 2 and Cell 1 | µs | 1,2,3 | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| Cell 3 timing offset to Cell 1 | µs | 1,2,3 | 3 | Synchronous cells |
| T1 | s | 1,2,3 | 5 | |
| T2 | s | 1,2,3 | 5 | |

6.6.23.3.4.2 Test procedure

TBD

6.6.23.3.4.3 Message contents

TBD

6.6.23.3.5 Test requirement

Table 6.6.23.3.4.1-3 and Table 6.6.23.3.5-1 define the primary level settings including test tolerances for the test.

**Table 6.6.23.3.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | N/A | | | | | |
| | | 2 | TDDConf.1.1 | | | | | |
| | | 3 | TDDConf.2.1 | | | | | |
| PDSCH RMC | | 1 | SR.1.1 FDD | | N/A | | N/A | |
| | | 2 | SR.1.1 TDD | | | | | |
| | | 3 | SR.2.1 TDD | | | | | |
| RMSI CORESET RMC | | 1 | CR.1.1 FDD | | | | | |
| | | 2 | CR.1.1 TDD | | | | | |
| | | 3 | CR.2.1 TDD | | | | | |
| Dedicated CORESET RMC | | 1 | CCR.1.1 FDD | | | | | |
| | | 2 | CCR.1.1 TDD | | | | | |
| | | 3 | CCR.2.1 TDD | | | | | |
| OCNG Patterns | | 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1,2,3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | | | |
| Active BWP configuration | | 1,2,3 | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | | | |
| $N_{oc}$ Note2 | dBm/ SCS | 1,2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/ 15 kHz | 1,2,3 | -98 | | | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1,2,3 | 4 +TT | 4 +TT | 4 +TT | -1.46 +TT | -Infinity | -1.46 +TT |
| $\hat{E}_s / N_{oc}$ | dB | 1,2,3 | 4 +TT | 4 +TT | 4 +TT | 4 +TT | -Infinity | 4 +TT |
| SS-RSRP Note 3 | dBm/ SCS | 1,2 | -94 +TT | -94 +TT | -94 +TT | -94 +TT | -Infinity | -94 +TT |
| | | 3 | -91 +TT | -91 +TT | -91 +TT | -91 +TT | -Infinity | -91 +TT |

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| Io | dBm/9.36 MHz | 1,2 | -64.60 +TT | -64.60 +TT | -64.60 +TT | -62.25 +TT | -64.60 +TT | -62.25 +TT |
| | dBm/38.16 MHz | 3 | -58.50 +TT | -58.50 +TT | -58.50 +TT | -56.16 +TT | -58.50 +TT | -56.16 +TT |
| Propagation Condition | | 1,2,3 | AWGN | | | | | |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | | |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than [6402] ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall be scheduled on PCell continuously throughout the test. From the start of T1 until the measurement report is received during T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern and MGL of MG pattern.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For a test to be considered successful requirements on both Event A6 detection and percentage of transmitted ACK/NACKs have to be fulfilled simultaneously.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.24 SA event triggered reporting tests with NeedForGap

### 6.6.24.0 Minimum conformance requirements

#### 6.6.24.0.1 Minimum conformance requirements for intra-frequency event-triggered measurement without gap

[TS 38.133 [6], clause 9.2.5]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2 with SCS smaller or equal to 480 kHz.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection

- For UE indicating *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{PSS/SSS_sync_intra}$ is given in Table 6.6.24.0.1-1 for FR1. For UE indicating *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{PSS/SSS_sync_intra}$ is given in Table 6.6.24.0.1-3 for FR1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured.

- For UE indicatting *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_time_index_intra}$ is given in Table 6.6.24.0.1-2 for FR1. For UE indicating *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_time_index_intra}$ is given in Table 6.6.24.0.1-4 for FR1.

- $T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement

  - For UE indicating *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_measurement_period_intra}$ is given in Table 6.6.24.0.1-5 for FR1. For UE indicating *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_measurement_period_intra}$ is given in Table 6.6.24.0.1-6 for FR1.

- $CSSF_{intra}$: it is a carrier specific scaling factor and is determined

  - according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e.

    - when intra-frequency SMTC is fully non overlapping or partially overlapping with GAP, or

    - when intra-frequency SMTC is fully non overlapping with GAP for UE indicating no-gap-with-interruption, or

    - when intra-frequency SMTC is fully non overlapping or partially overlapping with GAP for UE indicating no-gap-no-interruption, or

  if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

  $K_p$ is the scaling factor for an SSB frequency layer to be measured without GAP. $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

- For a window W of duration max(SMTC period, xRP_max), where xRP_max is the maximum xRP across all configured per-UE GAPs, periodic MUSIM gaps, and/or per-FR GAPs within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

  - $N_{total}$ is the total number of SMTC occasions within the window, including those overlapped with GAP and MUSIM gap occasions within the window, and

  - $N_{available}$ is the number of SMTC occasions that are not overlapped with any non-dropped GAP or non-dropped MUSIM gap occasions within the window W, after accounting for measurement GAP and MUSIM gap collisions by applying the collision rules for GAP and MUSIM gap.

    $K_p = 1$ when $N_{available} = 0$.

  - xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

    Requirements in this clause do not apply when $N_{available} = 0$ due to fully overlapping between SMTC occasions and MUSIM gap occasions within the window W.

- When the target SSB is completely contained in active BWP of UE or the active downlink BWP is initial BWP, the intra-frequency measurement shall be conducted without gap and without interruption regardless of the NeedForGaps' status reporting.

**Table 6.6.24.0.1-1: Time period for PSS/SSS detection, (Frequency range 1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 [Note 2]x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra}$ |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified
NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.
NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.
NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.

**Table 6.6.24.0.1-2: Time period for time index detection (Frequency range 1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 [Note 2] x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1 | |
| NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 | |

**Table 6.6.24.0.1-3: Time period for PSS/SSS detection for UE indicating *no-gap-with-interruption*, (Frequency range 1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, 5 x max (80ms, SMTC period ))[Note 1] x $CSSF_{intra}$ |
| [DRX cycle≤ 320ms] | max( 600ms, ceil(M2 [Note 2]x 5) x [max(80ms, SMTC period,DRX cycle)]) x $CSSF_{intra}$ |
| [DRX cycle>320ms] | 5 x [DRX cycle x] $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. | |
| NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. | |
| NOTE 5: Requirements only apply when measurement gap is not configured, or measurement gap is fully non-overlapped with SMTC on any carrier on which UE indicates [no gap with interruption]. | |

**Table 6.6.24.0.1-4: Time period for time index detection for UE indicating *no-gap-with-interruption* (Frequency range 1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, 3 x max (80ms, SMTC period ))[Note 1] x $CSSF_{intra}$ |
| [DRX cycle≤ 320ms] | max(120ms, ceil (M2 [Note 2] x 3) x [max(80ms, SMTC period,DRX cycle)]) x $CSSF_{intra}$ |
| [DRX cycle>320ms] | 3 x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1 | |
| NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell. | |
| NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 | |
| NOTE 5: Requirements only apply when measurement gap is not configured, or measurement gap is fully non-overlapped with SMTC on any carrier on which UE indicates [no gap with interruption]. | |

**Table 6.6.24.0.1-5: Measurement period for intra-frequency measurements without gaps (Frequency range 1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 6.6.24.0.1-6: Measurement period for intra-frequency measurements without gaps for UE indicating *no-gap-with-interruption* (Frequency range 1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, 5 x (80ms, SMTC period ))[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x [max(80ms, SMTC period,DRX cycle)]) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: Requirements only apply when measurement gap is not configured, or measurement gap is fully non-overlapped with SMTC on any carrier on which UE indicates '*no-gap-with-interruption*' via *NeedForInterruptionInfoNR-r18*. | |

### 6.6.24.0.2 Minimum conformance requirements for inter-frequency event-triggered measurement without gap

[TS 38.133 [6], clause 9.3.9]

UE satisfying the applicability conditions specified in TS 38.133 [6] 9.3.1 on the requirement in this clause shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured for the FR1 and FR2-1 target frequency layers and and UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*. Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

- For inter-frequency SSB based measurements without measurement gaps in active BWP, it is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection

- For UE indicating no-gap-no-interurption, $T_{PSS/SSS_sync_inter}$ is given in Table 6.6.24.0.2-1 for FR1.
- For UE indicating no-gap-with-interruption, $T_{PSS/SSS_sync_inter}$ is given in Table 6.6.24.0.2-2 for FR1.

- $T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured
  - For UE indicating no-gap-no-interurption, $T_{SSB_time_index_inter}$ is given in Table 6.6.24.0.2-3 for FR1.
  - For UE indicating no-gap-with-interruption, $T_{SSB_time_index_inter}$ is given in Table 6.6.24.0.2-4 for FR1.
- $T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement
  - For UE indicating no-gap-no-interurption, $T_{SSB_measurement_period_inter}$ is given in Table 6.6.24.0.2-5 for FR1.

- For UE indicating no-gap-with-interruption, $T_{SSB_measurement_period_inter}$ is given in Table 6.6.24.0.2-6 for FR1.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside GAP, i.e. when interfrequency SMTC is fully non overlapping or partially overlapping with GAPs.

- when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps for UE indicating no-gap-no-interruption or

- when inter-frequency SMTC is fully non overlapping with measurement gaps for UE indicating n- gap-with-interruption,

If the UE indicates 'nogap-noncsg' via *NeedForGapNCSG-InfoNR* for the inter-frequency measurement or the UE indicates either *no-gap-with-interruption* or *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*,

$M_{pss/sss_sync_inter}$: For FR1, $M_{pss/sss_sync_inter} = 8$.

$M_{SSB_index_inter}$: For FR1, $M_{SSB_index_inter} = 3$.

$M_{meas_period_inter}$: For FR1, $M_{meas_period_inter} = 8$.

When UE is not configured with or UE does not support concurrent GAPs and the UE is not configured with MUSIM gaps:

When interfrequency SMTC is fully non overlapping with measurement gaps or NCSG, or interfrequency SMTC is fully overlapping with MGs or NCSG, $K_p = 1$.

When interfrequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When inter-frequency SMTC is partially overlapping with NCSG, $K_p$ = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP.

For calculation of $K_p$, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

**Table 6.6.24.0.2-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max( 600ms, ceil($M_{pss/sss_sync_inter}$ x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2x $M_{pss/sss_sync_inter}$ x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil($M_{pss/sss_sync_inter}$ x $K_p$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void<br>NOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 | |

**Table 6.6.24.0.2-2: Time period for PSS/SSS detection, when UE indicate *no-gap-with-interruption* (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max( 600ms, $M_{pss/sss_sync_inter}$ x max(80ms, SMTC period) )[Note 1] x $CSSF_{inter}$ |
| [DRX cycle≤ 320ms] | max( 600ms, ceil(M2 x $M_{pss/sss_sync_inter}$) x max(80ms, SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| [DRX cycle>320ms] | $M_{pss/sss_sync_inter}$ x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void<br>NOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 | |

**Table 6.6.24.0.2-3: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | max(120ms, ceil($M_{SSB_index_inter}$ x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x $M_{SSB_index_inter}$ x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | Ceil($M_{SSB_index_inter}$ x $K_p$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void<br>NOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 | |

**Table 6.6.24.0.2-4: Time period for time index detection, when UE indicate no-gap-with-interruption (FR1)**

| DRX cycle | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | max(120ms, $M_{SSB_index_inter}$ x max(80ms, SMTC period))[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x $M_{SSB_index_inter}$) x [max(80ms, SMTC period, DRX cycle)]) x $CSSF_{inter}$ |
| DRX cycle>320ms | $M_{SSB_index_inter}$ x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void<br>NOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 | |

**Table 6.6.24.0.2-5: Measurement period for inter-frequency measurements without gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, ceil($M_{meas_period_inter}$ x $K_p$) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x $M_{meas_period_inter}$ x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil( $M_{meas_period_inter}$ x $K_p$ ) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 6.6.24.0.2-6: Measurement period for inter-frequency measurements without gaps when UE indicate [no-gap-with-interruption] (FR1)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, $M_{meas_period_inter}$ x max(80ms, SMTC period))[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x $M_{meas_period_inter}$) x max(80ms, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | $M_{meas_period_inter}$ x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

### 6.6.24.0.3 Minimum conformance requirements for measurements without gap carried out by UE supporting NeedForInterruptionInfoNR

[TS 38.133 [6], clause 8.2.2.2.19]

When a UE supports *NeedForInterruptionInfoNR-r18* measurements and indicates *no-gap-with-interruption* on intra-frequency SSB-based or inter-frequency SSB-based measurements, the UE is allowed to cause interruptions while performing measurements on the frequency layers of the bands for which *no-gap-with-interruption* is indicated. Requirements in this section apply only when the UE is in SA operation mode.

The UE is allowed to cause interruption with interruption ratio no more than the requirements specified below upon UE measurements on a specific frequency layer that corresponds to the configured MO, where $T_{cycle,i}$ is the interruption

cycle on a certain frequency layer i, specified in Table 6.6.24.0.3-1, where $CSSF_{outside_gap,i}$ is defined in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

**Table 6.6.24.0.3-1: $T_{cycle,i}$ length for inter/intra-frequency measurement target carrier i**

| DRX cycle | $T_{Cycle,i}$ |
|---|---|
| No DRX | max (80ms, SMTC period) x $CSSF_{outside_gap,i}$ |
| DRX cycle ≤ 320ms | 1.5*max(80ms, SMTC period, DRX cycle) x $CSSF_{outside_gap,i}$ |
| DRX cycle>320ms | DRX cycle x $CSSF_{outside_gap,i}$ |

UE is allowed to cause interruption on a certain frequency layer *i* with the maximum interruption ratio that equals $\frac{2L}{T_{cycle,i}}$.

The total allowed maximum interruption ratio (D) on each of the active serving cells due to UE measurements without gap applied in this sub-clause is specified as

$$D = \sum_{i=1}^{N} \frac{2L}{T_{cycle,i}}$$

Where,

- N is the total number of configured SSB based frequency layers to be measured outside gap including intra-frequency and inter-frequency target carriers where UE indicates that interruption is needed through *[no-gap-with-interruption]*, and
- L is the maximum interruption length for each interruption occasion specified in the Table 6.6.24.0.3-2.

When no SMTC occasion of the NR measurement objects occurs within the time period which starts from [4ms] before the starting point of the DRX ON duration to [4ms] after the ending point of the DRX ON duration, UE is not allowed to cause interruption during DRX ON duration except the time duration extended due to *drx-inactivityTimer*.

The interruptions are allowed for all the active serving cells in the same FR as all NR MOs being measured with interruption if UE supports per-FR measurement gaps, and all the active serving cells if UE does not support per-FR measurement gaps.

**Table 6.6.24.0.3-2: Interruption length L in FR1**

| $\mu$ | SCS (kHz) of victim cell | NR Slot length (ms) of victim cell | Number of interrupted slots in the victim cell (slots) | Interruption length L (ms) |
|---|---|---|---|---|
| 0 | 15 | 1 | [1] | [1] |
| 1 | 30 | 0.5 | [2] | [1] |
| 2 | 60 | 0.25 | [4] | [1] |

## 6.6.24.1 NR SA FR1 event-triggered reporting without gap with interruptions

### 6.6.24.1.1 Test purpose

To verify the UE's ability to perform correct reporting of an event within intra-frequency cell search without gap and to verify that the interruption ratio does not exceed the limit for the NR PCell during the measurement without gaps and with interruptions.

### 6.6.24.1.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and NR NeedForGap capability. The UE is capable of *nr-NeedForGap-Reporting-r16*, *nr-NeedForInterruptionReport-r18* and reports 'no-gap' in NeedForGapsIntraFreq-r16 and 'no-gap-with-interruption' in interruptionIndication-r18 for intra-frequency.

#### 6.6.24.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.24.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.24.1.

#### 6.6.24.1.4 Test description

##### 6.6.24.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.6.24.1.4.1-1.

**Table 6.6.24.1.4.1-1: NR SA FR1 event-triggered reporting without gap with interruptions test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.24.1.4.1-2.

**Table 6.6.24.1.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap with interruptions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.6.24.1.4.1-3.
2. Message contents are defined in clause 6.6.24.1.4.3.
3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.24.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 without DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |

| | | | | |
|---|---|---|---|---|
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 10 | |

#### 6.6.24.1.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table 6.6.24.1.4.1-1, 6.6.24.1.4.1-3 and 6.6.24.1.5-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T1 until the UE has sent the measurement report during T2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

The UE is capable of measurements without gaps with interruption and report 'no-gap' through NeedForGapsIntraFreq-r16 and 'no-gap-with-interruption' in interruptionIndication-r18 for PCell. UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.24.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsIntraFreq-r16* set to 'no-gap' and *intraFreq-needForInterruption-r18* set to 'no-gap-with-interruption'.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
7. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
8. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.24.1.5-1. T2 start.
9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1002ms and if UE transmits ACK/NACK in PCell with a missed ACK/NACK rate of no more than 2.5% from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or the rate of missed ACK/NACK in PCell exceeds 2.5% from T2, then the number of failure tests is increased by one.
10. After the SS receive the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

OR

- switch the UE off.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
- if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.24.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.24.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions (step 5) | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for 6.6.24.1-1 and 6.6.24.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for 6.6.24.1-3<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 6.6.24.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

**Table 6.6.24.1.4.3-3: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.24.1.4.3-4**: ***RRCReconfigurationComplete*** **(step 4)**

| Derivation Path: TS 36.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | no-gap | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | Not checked | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-with-interruption | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.24.1.5 Test requirements

Table 6.6.24.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.24.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 without DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TN/A | | TN/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | N/A | |
| | | 2 | CCR.1.1 TDD | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.2 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.2 | |
| RLM-RS | | 1, 2, 3 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25+ TT | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16+ TT | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall be continuously scheduled on PCell during the entire length of T1 and T2.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1000 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

During 1000ms from the beginning of time period T2, the UE shall transmit ACK/NACK in PCell and the rate of missed ACK/NACK shall no more than 2.5%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.24.2 NR SA FR1-FR1 event-triggered reporting without gap with interruption with SSB index

### 6.6.24.2.1 Test purpose

To verify the UE's ability to perform correct reporting of an event within inter-frequency cell search without gap and to verify that the interruption ratio does not exceed the limit for the NR PCell during the measurement without gaps and with interruptions.

### 6.6.24.2.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting NR NeedForGap capability. The UE is capable of *nr-NeedForGap-Reporting-r16*, *nr-NeedForInterruptionReport-r18* and reports 'no-gap' in NeedForGapsInterFreq-r16 and 'no-gap-with-interruption' in interruptionIndication-r18 for the target frequency given the serving frequency.

### 6.6.24.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.24.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.24.2.

### 6.6.24.2.4 Test description

#### 6.6.24.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.6.24.2.4.1-1.

**Table 6.6.24.2.4.1-1: NR SA event triggered reporting tests for FR1 for inter-frequency measurement without gap with interruption test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.24.2.4.1-2.

**Table 6.6.24.2.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting for inter-frequency measurement without gap with interruptions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.6.24.2.4.1-3.
2. Message contents are defined in clause 6.6.24.2.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.6.24.2.4.1-3: General test parameters for SA event triggered reporting tests for FR1 for inter-frequency measurement without gap with interruption**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2 |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |

| | | | | |
|---|---|---|---|---|
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 2 | |

#### 6.6.24.2.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters for PCell are given in Table 6.6.24.2.4.1-1, 6.6.24.2.4.1-3 and 6.6.24.2.5-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T2 until the UE has sent the measurement report during T2.

NR RF channel 1 and NR RF channel 2 should be selected such that UE reports 'no-gap' and 'no-gap-with-interruption' for the target frequency on NR RF channel 2

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.24.2.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsInterFreq-r16* set to 'no-gap' and *interFreq-needForInterruption-r18* set to 'no-gap-with-interruption'.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.24.2.5-1. T2 start.
8. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1522ms and if UE transmits ACK/NACK in PCell with a missed ACK/NACK rate of no more than 2.5% from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or the rate of missed ACK/NACK in PCell exceeds 2.5% from T2, then the number of failure tests is increased by one.
10. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),

OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.24.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.24.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions (step 5) | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTER-FREQ<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.5 FR1 and SMTC.5 for configuration 6.6.24.2-1<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.5 FR1 and SMTC.4 and synchronous cells for configuration 6.6.24.2-2<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.6 FR1, SMTC.4 and synchronous cells for configuration 6.6.24.2-3<br><br>Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index |

**Table 6.6.24.2.4.3-2: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.24.2.4.3-3**: ***RRCReconfigurationComplete*** **(step 4)**

| Derivation Path: TS 36.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | Not checked | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | no-gap | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-with-interruption | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 6.6.24.2.5 Test requirements

Table 6.6.24.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.24.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without gap**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 2 | TRS.1.1 TDD | | NA | |
| | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1 | SR.1.1 FDD | | | |
| | | Config 2 | SR.1.1 TDD | | | |
| | | Config 3 | SR2.1 TDD | | | |
| CORESET Reference Channel | | Config 1 | CR.1.1 FDD | | | |
| | | Config 2 | CR.1.1 TDD | | | |
| | | Config 3 | CR2.1 TDD | | | |
| SSB parameters | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.4 | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1520 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

During 1520ms from the beginning of time period T2, the UE shall transmit ACK/NACK in PCell and the rate of missed ACK/NACKs shall no more than 2.5%.

UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.24.3 NR SA FR1-FR1 event-triggered reporting without gap with interruption

### 6.6.24.3.1 Test purpose

To verify the UE's ability to perform correct reporting of an event within inter-frequency cell search without gap and to verify that the interruption ratio does not exceed the limit for the NR PCell during the measurement without gaps and with interruptions.

### 6.6.24.3.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting NR NeedForGap capability. The UE is capable of *nr-NeedForGap-Reporting-r16, nr-NeedForInterruptionReport-r18* and reports 'no-gap' in NeedForGapsInterFreq-r16 and 'no-gap-with-interruption' in interruptionIndication-r18 for the target frequency given the serving frequency.

### 6.6.24.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.24.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.24.3.

### 6.6.24.3.4 Test description

#### 6.6.24.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.6.24.3.4.1-1.

**Table 6.6.24.3.4.1-1: NR SA event triggered reporting tests for FR1 for inter-frequency measurement without gap with interruption test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.24.3.4.1-2.

**Table 6.6.24.3.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting for inter-frequency measurement without gap with interruptions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.6.24.3.4.1-3.
2. Message contents are defined in clause 6.6.24.3.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.6.24.3.4.1-3: General test parameters for SA event triggered reporting tests for FR1 for inter-frequency measurement without gap with interruption**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| SMTC for NR RF channel number 2 | | Config 1,2,3 | SMTC.3 | As specified in clause A.4.1 |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

### 6.6.24.3.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters for PCell are given in Table 6.6.24.3.4.1-1, 6.6.24.3.4.1-3 and 6.6.24.3.5-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T2 until the UE has sent the measurement report during T2.

NR RF channel 1 and NR RF channel 2 should be selected such that UE reports ‘no-gap’ and ‘no-gap-with-interruption’ for the target frequency on NR RF channel 2

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.24.3.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsInterFreq-r16* set to ‘no-gap’ and *interFreq-needForInterruption-r18* set to ‘no-gap-with-interruption’.
5. SS shall transmit an *RRCReconfiguration* message.

6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

7. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

8. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.24.3.5-1. T2 start.

9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2562ms and if UE transmits ACK/NACK in PCell with a missed ACK/NACK rate of no more than 1.25% from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or the rate of missed ACK/NACK in PCell exceeds 1.25% from T2, then the number of failure tests is increased by one.

10. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 0, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.24.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.24.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTER-FREQ<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and SMTC.3 for configuration 6.6.24.3-1 and 6.6.24.3-2<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1, SMTC.3 and synchronous cells for configuration 6.6.24.3-3<br><br>Table H.3.1-4 with A3-offset = -6dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 6.6.24.3.4.3-2: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.24.3.4.3-3**: ***RRCReconfigurationComplete*** **(step 4)**

| Derivation Path: TS 36.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | Not checked | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | no-gap | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-with-interruption | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.24.3.5 Test requirements

Table 6.6.24.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.24.3.5-1: Cell specific test parameters for inter-frequency event triggered reporting without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2,3 | TDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is 2.56 s as derived based on inter-frequency measurement requirements in TS 38.133 [6] clause 9.3.4.

In the test, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots with an interruption ratio between number of interrupted slot over the total number of slots no larger than 1.25%.

In the test UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.24.4 NR SA FR1-FR1 event-triggered reporting without gap without interruption

- [] still existed in 6.6.24.4.5

### 6.6.24.4.1 Test purpose

To verify the UE's ability to perform correct reporting of an event within inter-frequency cell search without gap and to verify that UE has no interruption during inter-frequency measurement without gap.

### 6.6.24.4.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting NR NeedForGap capability. The UE is capable of *nr-NeedForGap-Reporting-r16*, *nr-NeedForInterruptionReport-r18* and reports 'no-gap' in NeedForGapsInterFreq-r16 and 'no-gap-no-interruption' in interruptionIndication-r18 for the target frequency given the serving frequency.

#### 6.6.24.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.24.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.24.4.

#### 6.6.24.4.4 Test description

##### 6.6.24.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.6.24.4.4.1-1.

**Table 6.6.24.4.4.1-1: NR SA event triggered reporting tests for FR1 for inter-frequency measurement without gap with interruption test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.24.4.4.1-2.

**Table 6.6.24.4.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting for inter-frequency measurement without gap without interruptions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.6.24.4.4.1-3.
2. Message contents are defined in clause 6.6.24.4.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.6.24.4.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 with NeedForInterruption 'no-gap-no-interruption'**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| Neighbour cell | | Config 1,2,3 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1 | |

#### 6.6.24.4.4.2 Test procedure

In this test, there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters for PCell are given in Table 6.6.24.4.4.1-1, 6.6.24.4.4.1-3 and 6.6.24.4.5-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T2 until the UE has sent the measurement report during T2.

NR RF channel 1 and NR RF channel 2 should be selected such that UE reports ‘no-gap’ and ‘no-gap-no-interruption’ for the target frequency on NR RF channel 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.24.4.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsInterFreq-r16* set to ‘no-gap’ and *interFreq-needForInterruption-r18* set to ‘no-gap-no-interruption’.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.24.4.5-1. T2 start.
8. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than [202]ms and if UE transmits ACK/NACK for the corresponding PDSCH scheduled in PCell in all slots from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed bfrom T2, then the number of failure tests is increased by one.
10. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.24.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.24.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTER-FREQ<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.5 FR1 and SMTC.5 for configuration 6.6.24.4-1<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.5 FR1 and SMTC.4 and synchronous cells for configuration 6.6.24.4-2<br><br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.6 FR1, SMTC.4 and synchronous cells for configuration 6.6.24.4-3<br><br>Table H.3.1-4 with A3-offset = -6dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 6.6.24.4.4.3-2: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.6.24.4.4.3-3**: ***RRCReconfigurationComplete*** **(step 4)**

| Derivation Path: TS 36.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | Not checked | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | no-gap | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-no-interruption | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.24.4.5 Test requirements

Table 6.6.24.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.24.4.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with NeedForInterruption 'no-gap-no-interruption'**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2,3 | TDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| SSB parameters | | | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.4 | | | Config 1 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| | | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [200] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

During T2, UE shall send HARQ-ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots.

The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to read the neighbour cell SSB index in this test.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 6.6.24.5 NR SA FR1 event-triggered reporting without gap without interruption

#### 6.6.24.5.1 Test purpose

To verify the UE's ability to perform correct reporting of an event within intra-frequency cell search and to verify that UE has no interruption during intra-frequency measurement without gap.

#### 6.6.24.5.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and NR NeedForGap capability. The UE is capable of *nr-NeedForGap-Reporting-r16*, *nr-NeedForInterruptionReport-r18* and reports 'no-gap' in NeedForGapsIntraFreq-r16 and 'no-gap-no-interruption' in interruptionIndication-r18.

#### 6.6.24.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.24.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.24.5.

#### 6.6.24.5.4 Test description

##### 6.6.24.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.6.24.5.4.1-1.

**Table 6.6.24.5.4.1-1: NR SA FR1 event-triggered reporting without gap without interruptions test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.6.24.5.4.1-2.

**Table 6.6.24.5.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap without interruptions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 6.6.24.5.4.1-3.
2. Message contents are defined in clause 6.6.24.5.4.3.
3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 6.6.24.5.4.1-3: General test parameters for SA intra-frequency event triggered reporting without gap for FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3 | Cell 1 | |
| Neighbour cell | | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| Time offset between serving and neighbour cells | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

### 6.6.24.5.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table 6.6.24.5.4.1-1, 6.6.24.5.4.1-3 and 6.6.24.5.5-1. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T1 until the UE has sent the measurement report during T2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

The UE is capable of measurements without gaps with interruption and report 'no-gap' through NeedForGapsIntraFreq-r16 and 'no-gap-no-interruption' in interruptionIndication-r18 for PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.24.5.5-1.

3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.

4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsIntraFreq-r16* set to 'no-gap' and *intraFreq-needForInterruption-r18* set to 'no-gap-without-interruption'.

5. SS shall transmit an *RRCReconfiguration* message.

6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

7. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

8. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.24.5.5-1. T2 start.

9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802ms and if UE transmits ACK/NACK for the corresponding PDSCH scheduled in PCell in all slots from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed bfrom T2, then the number of failure tests is increased by one.

10. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 6.6.24.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.24.5.4.3-1: Common Exception messages**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions (step 5) | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 6.6.24.5.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

**Table 6.6.24.5.4.3-3: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.24.5.4.3-4**: ***RRCReconfigurationComplete*** **(step 4)**

| Derivation Path: TS 36.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | no-gap | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | Not checked | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-without-interruption | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.6.24.5.5 Test requirements

Table 6.6.24.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.24.5.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| TDD configuration | | 1 | TN/A | | TN/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | CR.1.1 TDD | | N/A | |
| | | 3 | CR.2.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | N/A | |
| | | 2 | CCR.1.1 TDD | | N/A | |
| | | 3 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration | | 1, 2, 3 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3 | DLBWP.1.2 | | DLBWP.1.2 | |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.2 | | ULBWP.1.2 | |
| RLM-RS | | 1, 2, 3 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16 MHz | 3 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

UE is not allowed to cause interruption during intra-frequency measurement without gap.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 6.6.25 SA NR - E-UTRAN event-triggered without measurement gaps

## 6.6.25.0 Minimum conformance requirements

### 6.6.25.0.1 Minimum conformance requirements for NR – E-UTRAN FDD measurements when no DRX is used

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements when no DRX is used.

The UE shall be able to identify a new detectable FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ according to the following expression:

$$T_{\mathrm{Identify,E-UTRAN\ FDD}} = T_{\mathrm{BasicIdentify}} \cdot \frac{[480]}{T_{\mathrm{Inter1}}} \cdot \mathrm{CSSF}_{\mathrm{interRAT}} \cdot K_{\mathrm{P}} \quad ms$$

where:

- $T_{BasicIdentify}$ = [480 ms]
- $T_{Inter1}$ is defined in TS 38.133 [6] clause 9.4.8.1
- $CSSF_{interRAT}$ = [$CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1]
- $K_p$ is the scaling factor due to overlapping between EMW and SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement. $K_p$ =1 if the measurement is performed outside EMW or if EMW is fully non-overlapped with SMTC, SSB/CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement and measurement gap. Otherwise, $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:
  - For a window W of duration max(EMW period, SMTC period, MGRP, $T_{SSB}$, $T_{CSI\text{-}RS}$), where SMTC period follows *smtc1* if high layer in TS 38.331 [13] signaling of *smtc2* is not present on the same carrier frequency. Otherwise, SMTC period follows *smtc2*, $T_{SSB}/T_{CSI\text{-}RS}$ is the periodicity of SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement on the same carrier frequency, and starting from the beginning of any SMTC occasion.
  - $N_{total}$ is the total number of EMW occasions within the window W, including those overlapped with SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement, and
  - $N_{available}$ is the number of EMW occasions that are not overlapped with any SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement within the window W, after accounting for EMW collisions by applying the EMW collision rule in TS 38.133 [6] section 9.4.8.2.
  - No requirement applies for the measurement when $N_{available}$ = 0.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{measure,\ E\text{-}UTRAN\ FDD}$ defined in Table 6.6.25.0.1-1.

**Table 6.6.25.0.1-1: Measurement period and measurement bandwidth configuration**

| Configuration | Physical Layer Measurement period: $T_{measure,\ E\text{-}UTRAN\ FDD}$ [ms] | Measurement bandwidth [RB] |
|---|---|---|
| 0 | 480 x $CSSF_{interRAT}$ x $K_p$ | 6 |
| 1 (Note 1) | 240 x $CSSF_{interRAT}$ x $K_p$ | 50 |
| Note 1: This configuration is optional. | | |

The UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period $T_{measure,\ E\text{-}UTRAN\ FDD}$ given by Table 6.6.25.0.1-1.

The normative reference for this requirement is TS 38.133 [6] clauses 9.4.8.1, 9.4.8.2 and 9.4.8.3.

6.6.25.0.2 Minimum conformance requirements for NR – E-UTRAN TDD measurements when no DRX is used

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements when no DRX is used.

The UE shall be able to identify a new detectable TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ according to the following expression:

- When configuration 0 or configuration 1 in Table 6.6.25.0.2-1 is applied,

$$T_{\mathrm{Identify,E-UTRAN\ TDD}} = T_{\mathrm{BasicIdentify}} \cdot \frac{[480]}{T_{\mathrm{Inter1}}} \cdot CSSF_{\mathrm{interRAT}} \cdot K_{\mathrm{P}} \quad ms$$

- When configuration 2 or configuration 3 in Table 6.6.25.0.2-1 is applied,

$$T_{\mathrm{Identify,E-UTRAN\ TDD}} = T_{\mathrm{BasicIdentify}} \cdot \frac{[480]}{T_{\mathrm{Inter1}}} \cdot CSSF_{\mathrm{interRAT}} \cdot K_{\mathrm{P}} + 240 \cdot \mathrm{CSSF}_{\mathrm{interRAT}} \cdot K_{\mathrm{P}} \quad ms$$

where:

- $T_{BasicIdentify}$ = [480 ms]
- $T_{Inter1}$ is defined in TS 38.133 [6] clause 9.4.8.1
- $CSSF_{interRAT}$ = [$CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1]
- $K_p$ is the scaling factor due to overlapping between EMW and SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement. $K_p$ =1 if the measurement is performed outside EMW or if EMW is fully non-overlapped with SMTC, SSB/CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement and measurement gap. Otherwise, $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:
  - For a window W of duration max(EMW period, SMTC period, MGRP, $T_{SSB}$, $T_{CSI\text{-}RS}$), where SMTC period follows *smtc1* if high layer in TS 38.331 [13] signaling of *smtc2* is not present on the same carrier frequency. Otherwise, SMTC period follows *smtc2*, $T_{SSB}/T_{CSI\text{-}RS}$ is the periodicity of SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement on the same carrier frequency, and starting from the beginning of any SMTC occasion
  - $N_{total}$ is the total number of EMW occasions within the window, including those overlapped with SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement, and
  - $N_{available}$ is the number of EMW occasions that are not overlapped with any SMTC, measurement gap, or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement within the window W, after accounting for EMW collisions by applying the EMW collision rule in TS 38.133 [6] section 9.4.8.2.
  - No requirement applies for the measurement when $N_{available}$ = 0.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ TDD}$ defined in Table 6.6.25.0.2-1.

**Table 6.6.25.0.2-1: $T_{Measure,\ E\text{-}UTRAN\ TDD}$ for different configurations**

| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) | | DwPTS | | $T_{Measure,\ E\text{-}UTRAN\ TDD}$ (ms) |
|---|---|---|---|---|---|---|
| | | DL | UL | Normal CP | Extended CP | |
| 0 | 6 | 2 | 2 | $19760\,T_s$ | $20480\,T_s$ | [480 x $CSSF_{interRAT}$ x $K_p$] |
| 1 (Note 1) | 50 | 2 | 2 | $19760\,T_s$ | $20480\,T_s$ | [240 x $CSSF_{interRAT}$ x $K_p$] |
| 2 | 6 | 1 | 3 | $19760\,T_s$ | $20480\,T_s$ | [720 x $CSSF_{interRAT}$ x $K_p$] |
| 3 (Note 1) | 50 | 1 | 3 | $19760\,T_s$ | $20480\,T_s$ | [480 x $CSSF_{interRAT}$ x $K_p$] |

| |
|---|
| Note 1: This configuration is optional.<br>Note 2: Void |

The UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period $T_{measure, E\text{-}UTRAN\ TDD}$ given by Table 6.6.25.0.2-1.

The normative reference for this requirement is TS 38.133 [6] clauses 9.4.8.1, 9.4.8.2 and 9.4.8.4.

## 6.6.25.1 NR SA FR1 - E-UTRAN event-triggered reporting without gap without interruption

Editor's Note: This test case is incomplete in following aspects:

- Test applicability is FFS.
- TT analysis is missing.

### 6.6.25.1.1 Test purpose

The purpose of this test is to verify that if UE reports "*nogap-noncsg*" via *NeedForGapNCSG-InfoEUTRA-r17*, the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1.

### 6.6.25.1.2 Test applicability

This test applies to all types of NR UEs supporting "*nogap-noncsg*" via *NeedForGapNCSG-InfoEUTRA-r17* capability from release 18 onwards.

### 6.6.25.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.25.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.25.1.

### 6.6.25.1.4 Test description

#### 6.6.25.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.25.1.4.1-1.

**Table 6.6.25.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.25.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.25.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.25.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.25.1-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in Table 6.6.25.1.4.1-2.

**Table 6.6.25.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.25.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | |

1. The general test parameter settings are set up according to Table 6.6.25.1.4.1-3.

2. Message contents are defined in clause 6.6.25.1.4.3.

3. There are two cells: Cell 1 and Cell 2. Cell 1 (NR PCell) is used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter-RAT E-UTRAN neighbour cell) is configured according to TS 36.521-3 [26] Annex C.0 and C.1.

**Table 6.6.25.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 6.6.25.1.5-1 and 6.6.25.1.5-2. | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Effective Measurement Window (EMW) Id | | 0 | As specified in TS 38.133 [6] Table 9.4.8.2-1 |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for RSRP measurement on Cell 2 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in Table 6.6.25.1.5-1 | | | |

### 6.6.25.1.4.2 Test procedure

In the measurement control information from the PCell, it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.25.1.5-1.

3. SS shall transmit *RRCReconfiguration* message to configure Event B2 triggered measurement report.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. T1 starts. SS continuously schedules the UE to receive PDSCH on Pcell, and monitors corresponding ACK/NACK feedbacks sent by the UE.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.25.1.5-1. T2 starts.

7. UE shall transmit *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842ms, and ACK/NACKs are observed by the SS for the

corresponding PDSCHs scheduled in PCell in all slots excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5, the number of successful tests is increased by one. If the UE fails to report the events within the overall measured delays requirements, or DTX in PCell is observed by the SS excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.3.4.5, the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:

    - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    OR

    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.25.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.25.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-RAT<br>Table H.3.1-4A<br>Table H.3.1-5 with condition INTER-RAT<br>Table H.3.1-7 with condition INTER-RAT |
| Specific message contents exceptions for Cell 1 | Table H.3.1-3 with condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3A |

#### 6.6.25.1.5 Test requirement

Table 6.6.25.1.5-1 and Table 6.6.25.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.25.1.5-1: FR1 PCell specific test parameters**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |

| | | | | | |
|---|---|---|---|---|---|
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| BWchannel | | MHz | 1, 4 | 10: $N_{PRB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{PRB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{PRB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note 1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note 2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $N_{oc}$[Note 2] | | dBm/SCS | 1, 2, 4, 5 | -104+TT | |
| | | | 3, 6 | -101+TT | |
| Ês/$N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| Ês/Iot[Note 3] | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| SS-RSRP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| SSB_RP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.94+TT | -73.04+TT |
| | | dBm/38.16 MHz | 3, 6 | -53.84+TT | -66.93+TT |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Ês/Iot, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.25.1.5-2: E-UTRAN neighbour cell specific test parameters**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note 1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note 1] | | 4, 5, 6 | 1 | |
| BWchannel | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{PRB,c}$ = 25<br>10 MHz: $N_{PRB,c}$ = 50<br>20 MHz: $N_{PRB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note 2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note 3] | | | | |
| OCNG_RB[Note 3] | | | | |
| $N_{oc}$[Note 4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $\hat{E}s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| $\hat{E}s/Iot$[Note 5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| RSRP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| SCH_RP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| Io[Note 5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21+10log ($N_{PRB,c}$ /50)+TT | -56.12+10log ($N_{PRB,c}$ /50)+TT |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}s/Iot$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria are not fulfilled.

During the T1 and T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.25.2 NR SA FR1 - E-UTRAN event-triggered reporting without interruption outside gap

Editor's Note: This test case is incomplete in following aspects:

- Test applicability is FFS.
- TT analysis is missing.
- Test configurations are missing.

### 6.6.25.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements without gap as there are vacant RF chains available for UE measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in TS 38.133 [6] clause 9.4.8, and also verify the scheduling availability during inter-RAT measurement without gap in TS 38.133 [6] clauses 9.4.8.3.5 and 9.4.8.4.5.

### 6.6.25.2.2 Test applicability

This test applies to all types of NR UEs supporting "*nogap-noncsg*" via "*NeedForGapNCSG-InfoEUTRA-r17*" and "*eutra-NoGapMeasurementOutsideBWP-r18*" capability from release 18 onwards.

### 6.6.25.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.25.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.25.2.

### 6.6.25.2.4 Test description

#### 6.6.25.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in table 6.6.25.2.4.1-1.

**Table 6.6.25.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.25.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.25.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.25.2-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.25.2-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in table 6.6.25.2.4.1-2.

**Table 6.6.25.2.4.1-2: Test environment parameters**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.25.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.25.2.4.1-3.

2. Message contents are defined in clause 6.6.25.2.4.3.

3. There are two cells: Cell 1 and Cell 2. Cell 1 (NR PCell) is used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter-RAT E-UTRAN neighbour cell) is configured according to TS 36.521-3 [26] Annex C.0 and C.1.

**Table 6.6.25.2.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in tables 6.6.25.2.5-1 and 6.6.25.2.5-2 | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | As specified in TS 38.133 [6] clause table 9.1.2-1 Per-UE gap pattern |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for RSRP measurement on Cell 2 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in table 6.6.25.2.5-1 | | | |

### 6.6.25.2.4.2 Test procedure

In the measurement control information from the PCell, it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in table 6.6.25.2.5-1.

3. SS shall transmit *RRCReconfiguration* message to configure Event B2 triggered measurement report.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. T1 starts. SS continuously schedules the UE to receive PDSCH on PCell, and monitors corresponding ACK/NACK feedbacks sent by the UE.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in table 6.6.25.2.5-1. T2 starts.

7. UE shall transmit *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842ms, and ACK/NACKs are observed by the SS for the corresponding PDSCHs scheduled in PCell in all slots excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5, the number of successful tests is increased by one. If the UE fails to report the events within the overall measured delays requirements, or DTX in PCell is observed by the SS excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.3.4.5, the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:

    - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    OR

    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.25.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.25.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-RAT, GAP NEEDED<br>Table H.3.1-4A<br>Table H.3.1-5 with condition INTER-RAT<br>Table H.3.1.6 with condition gapUE<br>Table H.3.1-7 with condition INTER-RAT |
| Specific message contents exceptions for Cell 1 | Table H.3.1-3 with condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3A |

6.6.25.2.5 Test requirement

Table 6.6.25.2.5-1 and table 6.6.25.2.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.25.2.5-1: FR1 PCell specific test parameters**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 4 | FDD | |
| | | | 2, 3, 5, 6 | TDD | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{PRB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{PRB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{PRB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note 1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note 2] | | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $N_{oc}$[Note 2] | | dBm/SCS | 1, 2, 4, 5 | -104+TT | |
| | | | 3, 6 | -101+TT | |
| $\hat{E}s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| $\hat{E}s/Iot$[Note 3] | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| SS-RSRP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| SSB_RP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.94+TT | -73.04+TT |
| | | dBm/38.16 MHz | 3, 6 | -53.84+TT | -66.93+TT |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | |

| | | | |
|---|---|---|---|
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Ês/Iot, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.6.25.2.5-2: E-UTRAN neighbour cell specific test parameters**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note 1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note 1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{PRB,c}$ = 25<br>10 MHz: $N_{PRB,c}$ = 50<br>20 MHz: $N_{PRB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note 2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note 3] | | | | |
| OCNG_RB[Note 3] | | | | |
| $N_{oc}$[Note 4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $\hat{E}s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| $\hat{E}s/Iot$[Note 5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| RSRP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| SCH_RP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| Io[Note 5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21+10log ($N_{PRB,c}$ /50)+TT | -56.12+10log ($N_{PRB,c}$ /50)+TT |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

| | |
|---|---|
| Note 1: | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24]. |
| Note 2: | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively. |
| Note 3: | OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 4: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 5: | Ês/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria are not fulfilled.

During the T1 and T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.25.3 NR SA FR1 - E-UTRAN event-triggered reporting without gap when CRS contained within active DL BWP

Editor's Note: This test case is incomplete in following aspects:

- Test applicability is FFS.

- TT analysis is missing.

### 6.6.25.3.1 Test purpose

The purpose of this test is to verify that the UE which supports inter-RAT E-UTRAN measurement without gap when E-UTRAN CRS is contained within UE's active DL BWP makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in TS 38.133 [6] clause 9.4.8, and also verify the scheduling availability during inter-RAT E-UTRAN measurement without gap in TS 38.133 [6] clauses 9.4.8.3.5 and 9.4.8.4.5.

### 6.6.25.3.2 Test applicability

This test applies to all types of NR UEs supporting "*eutra-NoGapMeasurementInsideBWP-r18*" and "*eutra-MeasEMW-r18"* capability from release 18 onwards.

### 6.6.25.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.25.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.25.3.

### 6.6.25.3.4 Test description

#### 6.6.25.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in table 6.6.25.3.4.1-1.

**Table 6.6.25.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 6.6.25.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 6.6.25.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.3-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 6.6.25.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 6.6.25.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6.6.25.3-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |

NOTE: The UE is only required to be tested in one of the supported test configurations

Test environment parameters are given in table 6.6.25.3.4.1-2.

**Table 6.6.25.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from table 6.6.25.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to table 6.6.25.3.4.1-3.

2. Message contents are defined in clause 6.6.25.3.4.3.

3. There are two cells: Cell 1 and Cell 2. Cell 1 (NR PCell) is used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter-RAT E-UTRAN neighbour cell) is configured according to TS 36.521-3 [26] Annex C.0 and C.1. The CRS of Cell 2 is completely within UE's active BWP BW.

**Table 6.6.25.3.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in tables 6.6.25.3.5-1 and 6.6.25.3.5-2 | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| EMW periodicity | ms | 40 | |
| EMW duration | ms | 5 | |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for RSRP measurement on Cell 2 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in table 6.6.25.3.5-1 | | | |

### 6.6.25.3.4.2 Test procedure

In the measurement control information from the PCell, it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in table 6.6.25.3.5-1.
3. SS shall transmit *RRCReconfiguration* message to configure Event B2 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. T1 starts. SS continuously schedules the UE to receive PDSCH on PCell, and monitors corresponding ACK/NACK feedbacks sent by the UE.
6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in table 6.6.25.3.5-1. T2 starts.
7. UE shall transmit *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842ms, and ACK/NACKs are observed by the SS for the corresponding PDSCHs scheduled in PCell in all slots excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5, the number of successful tests is increased by one. If the UE fails to report the events within the overall measured delays requirements, or DTX in PCell is observed by the SS excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.3.4.5, the number of failure tests is increased by one.
8. After the SS receive the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Depending on the choice in Step 8, the SS:

    - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    OR

    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.25.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 6.6.25.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-RAT and EMW_Setup<br>Table H.3.1-4A<br>Table H.3.1-5 with condition INTER-RAT<br>Table H.3.1-7 with condition INTER-RAT<br>Table H.3.1-14 with condition MS40 |
| Specific message contents exceptions for Cell 1 | Table H.3.1-3 with condition INTRA-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

| | |
|---|---|
| Specific message contents exceptions for Cell 2 | Table H.3.1-3A |

6.6.25.3.5 Test requirement

Table 6.6.25.3.5-1 and table 6.6.25.3.5-2 define the primary level settings including test tolerances for all tests.

**Table 6.6.25.3.5-1: FR1 PCell specific test parameters**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | | 1, 4 | FDD | |
| | | | 2, 3, 5, 6 | TDD | |
| TDD Configuration | SCS=15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS=30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{PRB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{PRB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 40: $N_{PRB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | |
| OCNG pattern[Note 1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.2 FR1 | |
| CSI-RS for tracking | | | 1, 4 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| b2-Threshold1 | | dBm | 1, 2, 4, 5 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note 2] | | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $N_{oc}$[Note 2] | | dBm/SCS | 1, 2, 4, 5 | -104+TT | |
| | | | 3, 6 | -101+TT | |
| $\hat{E}s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| $\hat{E}s/Iot$[Note 3] | | dB | 1, 2, 3, 4, 5, 6 | 16+TT | 0+TT |
| SS-RSRP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| SSB_RP[Note 3] | | dBm/SCS | 1, 2, 4, 5 | -88+TT | -104+TT |
| | | | 3, 6 | -85+TT | -101+TT |
| Io[Note 3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.94+TT | -73.04+TT |

| | | | | |
|---|---|---|---|---|
| | dBm/38.16 MHz | 3, 6 | -53.84+TT | -66.93+TT |
| Propagation condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Ês/Iot, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table 6.6.25.3.5-2: E-UTRAN neighbour cell specific test parameters**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note 1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note 1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{PRB,c}$ = 25<br>10 MHz: $N_{PRB,c}$ = 50<br>20 MHz: $N_{PRB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note 2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note 2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note 3] | | | | |
| OCNG_RB[Note 3] | | | | |
| $N_{oc}$[Note 4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104+TT | |
| $Ês/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| Ês/Iot[Note 5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 17+TT |
| RSRP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| SCH_RP[Note 5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -87+TT |
| Io[Note 5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -73.21+10log ($N_{PRB,c}$ /50)+TT | -56.12+10log ($N_{PRB,c}$ /50)+TT |

| | | | |
|---|---|---|---|
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].<br>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.<br>Note 3: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 5: Ês/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria are not fulfilled.

During T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those symbols as defined in TS 38.133 [6] clause 9.4.8.3.5 or clause 9.4.8.4.5.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 6.6.26 LTM Intra-frequency L1-RSRP measurement

### 6.6.26.0 Minimum conformance requirements

#### 6.6.26.0.1 Minimum conformance requirements for SSB-based intra-frequency L1-RSRP measurement

If a neighbour cell is known according to TS 38.133 [6] clause 9.14.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ if *deriveSSB-IndexFromCell* is enabled or UE has reported SSB index in L3 measurement report of the same cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}+T_{SSB_time_index_intra}$, where $T_{SSB_time_index_intra}$ is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] clause 9.2.5.1.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ is defined for FR1 in Table 6.6.26.0.1-1 for UE incapable of [*capability of measurement with RTD>CP*] and in Table 6.6.26.0.1-2 for UE capable of [*capability of measurement with RTD>CP*], where

- M = 1
- P value for SSB resource to be measured is defined as
  - $N_{total}$ / $N_{outside_MG}$ in FR1

    For a window W of duration max ($T_{L1,}$ MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:
    - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
    - $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
    - $T_{L1}$ is periodicity of the target SSB.

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer measurement period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer measurement period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 6.6.26.0.1-1: Intra-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ in FR1 for UE incapable of [*capability of measurement with RTD>CP*]**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, ceil(M*P)*T_{SSB_NBC})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, ceil(K*M*P)*\max(T_{DRX},T_{SSB_NBC}))$ |
| DRX cycle > 320ms | $ceil(M*P)*T_{DRX}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbour cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: K = 1.5.<br>Note 3: The requirements apply when the max RTD between the serving cell and any candidate cell on which UE is required to perform L1-RSRP measurement on the same frequency layer is not larger than CP length of the cell on the frequency layer. | |

**Table 6.6.26.0.1-2: Intra-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ in FR1 for UE capable of [*capability of measurement with RTD>CP*]**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, ceil(M*P)*T_{SSB_NBC}*N_{Layer})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, ceil(K*M*P)*\max(T_{DRX},T_{SSB_NBC})*N_{Layer})$ |
| DRX cycle > 320ms | $ceil(M*P)*T_{DRX}*N_{Layer}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbour cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. [$N_{Layer}$ = the number of intra-frequency layers configured for L1-RSRP measurement with [*LTM-CSI-ResourceConfig-r18*] + the number of inter-frequency layers without measurement gaps which are configured for L1-RSRP measurement with [*LTM-CSI-ResourceConfig-r18*]].<br>Note 2: K = 1.5.<br>Note 3: UE shall at least measure neighbour cells which are activated for TCI state within UE capability and additional cells to measure is up to UE implementation. | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.14.3.1, 9.14.5, 9.14.6 and 9.14.7.

## 6.6.26.1 NR SA FR1 Intra-frequency SSB based L1-RSRP measurement

### 6.6.26.1.1 Test purpose

To verify that the UE makes correct reporting of intra-frequency SSB based L1-RSRP measurement on neighbour cell in FR1 within L1-RSRP measurement requirements specified in TS 38.133 [6] clause 9.14.

### 6.6.26.1.2 Test applicability

This test applies to all types of NR UEs supporting intra-frequency L1 measurement and reports for LTM from release 18 and forward. Test 2 is applicable only to UEs supporting *multiCellL1-measRTD-greaterThan-CP-r18*, otherwise Test 1 is applicable.

### 6.6.26.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.26.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.26.1.

6.6.26.1.4 Test description

6.6.26.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.26.1.4.1-1.

**Table 6.6.26.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.26.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.26.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.26.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in Table 6.6.26.1.4.1-2.

**Table 6.6.26.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.26.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | -Without LTE link<br>-For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.26.1.4.1-3.
2. Message contents are defined in clause 6.6.26.1.4.3.
3. There are one NR carrier and two cells specified in the tests. Cell 1 (Pcell) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (intra neighbour cell) is on the same frequency as the Cell 1.

**Table 6.6.26.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | | Cell 1 | | |
| Neighbouring cell | | | Cell 2 | | Cell 2 is the candidate cell |
| A3-Offset | | dB | -6 | | |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | ms | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | OFF | | DRX is not used |
| Time offset between cells | | | 2μs | 20μs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | | | Enabled | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 20 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | | |
| T2 | | s | ≤ 0.5 | | |

#### 6.6.26.1.4.2 Test procedure

There are two tests in the test case, test 1 and test 2:

- In test 1, time offset between cells is within CP length.
- In test 2, time offset between cells is larger than CP length.

If a UE does not support *multiCellL1-measRTD-greaterThan-CP-r18*, it is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. SSB_RP of Cell 2 in T1 and T2 are different. No gap patterns are configured in the test case.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.26.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.
6. SS shall transmit an *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.
7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 20 slots.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.26.1.5-1. T2 starts at the beginning of a frame with an odd SFN.
10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    -R1: the UE shall start to transmit valid reports no later than 40 ms for configuration 1, 2 and no later than 30 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 6.6.26.1.5-2 for test configurations 1, 2 and Table 6.6.26.1.5-3 for test configuration 3). For candidate Cell 2, the reported L1-RSRP value in T2 shall be larger than the value reported in T1. If the first valid report is received earlier than the specified time, and includes a larger L1-RSRP value of Cell 2, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    -R2: the UE shall transmit reports every 20 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    -R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.26.1.5-2 for test configurations 1, 2 and in Table 6.6.26.1.5-3 for test configuration 3, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.
12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
14. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.26.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.6.26.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-7 with conditions INTRA-FREQ, SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with conditions INTRA-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.6.26.1.4.3-2: ReportConfigNR (a3-Offset) (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -12 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.26.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-9 with conditions FR1, SSB#0, FDD |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS15 |
| Specific message contents exceptiosn for Test Configuration 3 | Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS30 |

**Table 6.6.26.1.4.3-4: LTM-CSI-ReportConfig-r18 (step 6)**

| Derivation path: Table H.3.12-5 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-CSI-ReportConfig-r18 ::= SEQUENCE { | | | |
| ltm-ReportConfigType-r18 CHOICE { | | | |
| periodic-r18 SEQUENCE { | | | |
| reportSlotConfig-r18 | | | |
| slots20 | 2 | Periodicity 20 slots and offset 2 | SCS15 |
| slots20 | 7 | Periodicity 20 slots and offset 7 | SCS30 |
| } | | | |
| } | | | |
| } | | | |

6.6.26.1.5 Test requirement

Table 6.6.26.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.26.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | | |
| SSB GSCN | | | freq1 | | | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | N/A | |
| | Config 3 | | SR.2.1 TDD | | N/A | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | N/A | |
| | Config 3 | | CR.2.1 TDD | | N/A | |
| CP length | | | Normal | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -101 | -101 | -101 | -101 |
| | Config 3 | | -101 | -102.2 | -101 | -102.2 |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -101 | -101 | -101 | -101 |
| | Config 3 | | -98 | -99.2 | -98 | -99.2 |
| $\hat{E}_s/I_{ot}$ | | dB | -1.76 | -0.19 | -1.76 | -0.19 |
| $\hat{E}_s/N_{oc}$ | | dB | 3 | 13.5 | 3 | 13.5 |
| SSB_RP | Config 1,2 | dBm/SCS | -98 | -87.5 | -98 | -87.5 |
| | Config 3 | dBm/SCS | -94.99 | -85.69 | -94.99 | -85.69 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -66.07 | -56.44 | -66.07 | -56.44 |
| | Config 3 | dBm/ 38.16MHz | -59.96 | -51.54 | -59.96 | -51.54 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 20 slots. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 20 ms plus 20 slots from the beginning of time period T2. During T2, each L1-RSRP measurement report of Cell 2 shall meet the corresponding absolute accuracy requirement in Table 6.6.26.1.5-2 for test configuration 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.26.1.5-3 for test configuration 3.

**Table 6.6.26.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 59 |
| Highest reported value (Cell 2) | 79 |

**Table 6.6.26.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T2 |
|---|---|

| | |
|---|---|
| Lowest reported value (Cell 2) | 61 |
| Highest reported value (Cell 2) | 81 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 6.6.27 LTM Inter-frequency L1-RSRP measurement with measurement gap

## 6.6.27.0 Minimum conformance requirements

### 6.6.27.0.1 Minimum conformance requirements for SSB-based inter-frequency L1-RSRP measurement with gap

If an inter-frequency neighbour cell is known according to TS 38.133 [6] clause 9.15.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ if *deriveSSB-IndexFromCellInter-r17* is enabled or UE has reported SSB index in L3 measurement report of the same cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter}+T_{SSB_time_index_inter}$, where $T_{SSB_time_index_inter}$ is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] clause 9.3.4.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter}$ is defined in Table 6.6.27.0.1-1 for FR1, where

- M = 2
- $CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap}$ in TS 38.133 [6] clause 9.1.5.4 for L1-RSRP measurement conducted within measurement gaps.

**Table 6.6.27.0.1-1: Inter-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ for known cells in FR1**

| Condition | $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ |
|---|---|
| No DRX | $Max(T_{report}, Ceil(M * K_{gap}) \times Max(MGRP, SSB\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(T_{report}, Ceil(M \times 1.5 * K_{gap}) \times Max(MGRP, SSB\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $Ceil(M * K_{gap}) \times DRX\ cycle \times CSSF_{inter}$ |
| Note 1: The definition of $K_{gap}$ is the same as L3 measurement which is a scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. | |
| Note 2: If the UE is incapable of [*capability of measurement with RTD>CP*], the requirements apply for the cells configured by *LTM-CSI-ResourceConfig-r18* on which UE is required to perform L1 measurements, when the max RTD among the cells on the same inter-frequency layer is not larger than CP length. | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.15.3.1 and 9.15.5.1.

## 6.6.27.1 NR SA FR1 Inter-frequency SSB based L1-RSRP measurement with measurement gap

### 6.6.27.1.1 Test purpose

To verify that the UE makes correct reporting of inter-frequency SSB based L1-RSRP measurement with measurement gap on candidate neighbour cell in FR1 within L1-RSRP measurement requirements specified in TS 38.133 [6] clause 9.15.

### 6.6.27.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements with measurement gaps and reports for LTM from release 18 and forward.

#### 6.6.27.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.27.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.27.1.

#### 6.6.27.1.4 Test description

##### 6.6.27.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.27.1.4.1-1.

**Table 6.6.27.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.27.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.27.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.27.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.6.27.1.4.1-2.

**Table 6.6.27.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.27.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | -Without LTE link<br>-For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.27.1.4.1-3.
2. Message contents are defined in clause 6.6.27.1.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.6.27.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | Cell 1 | |
| Neighbouring cell | | Cell 2 | Cell 2 is the candidate cell |
| A3-Offset | dB | -7 | Including test tolerance (-1dB) given in Annex F.1.3.2 |
| Hysteresis | dB | 0 | |
| Time To Trigger | ms | 160 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| reportQuantityRS-Indexes | | rsrp | |
| maxNrofRS-IndexesToReport | | 1 | |
| includeBeamMeasurements | | True | |
| DRX | | OFF | DRX is not used |
| Time offset between cells | | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| Gap Pattern Id | | 0 | |

| | | | | |
|---|---|---|---|---|
| Measurement gap offset | | ms | 39 | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | |
| | spCellInclusion | | N/A | |
| ltm-ConfigComplete | | | True | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | |
| T2 | | s | ≤ 0.5 | |

### 6.6.27.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively.

Measurement gap pattern configuration defined in Table 6.6.27.1.4.1-3 is provided.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.27.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. The UE shall transmit a *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.

6. SS shall transmit an *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.

7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 80 slots.

9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.27.1.5-1. T2 starts.

10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    -R1: the UE shall start to transmit valid reports no later than 160 ms for configuration 1, 2 and no later than 120 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 6.6.27.1.5-2 for test configurations 1, 2 and Table 6.6.27.1.5-3 for test configuration 3). For candidate Cell 2, the reported L1-RSRP value in T2 shall be larger than the value reported in T1. If the first valid report is received earlier than the specified time and includes a larger L1-RSRP value of Cell 2, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    -R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    -R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.27.1.5-2 for test configurations 1, 2 and in Table 6.6.27.1.5-3 for test configuration 3, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.

12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

14. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

    or:

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.27.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.6.27.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-6 with conditions gapUE and Pattern #0<br>Table H.3.1-7 with conditions INTER-FREQ, SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.6.27.1.4.3-2: ReportConfigNR (a3-Offset) (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -14 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms160 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.27.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-5 with condition SCS15<br>Table H.3.12-9 with conditions FR1, SSB#0, FDD |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-5 with condition SCS15<br>Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS15 |
| Specific message contents exceptiosn for Test Configuration 3 | Table H.3.12-5 with condition SCS30<br>Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS30 |

### 6.6.27.1.5 Test requirement

Table 6.6.27.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.27.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| SSB GSCN | 1~3 | | freq1 | | freq2 | |
| Duplex mode | 1 | | FDD | | | |
| | 2 | | TDD | | | |
| | 3 | | TDD | | | |
| TDD Configuration | 1 | | N/A | | | |
| | 2 | | TDDConf.1.1 | | | |
| | 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | | N/A | |
| | 2 | | SR.1.1 TDD | | N/A | |
| | 3 | | SR.2.1 TDD | | N/A | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | | N/A | |
| | 2 | | CR.1.1 TDD | | N/A | |
| | 3 | | CR.2.1 TDD | | N/A | |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | | N/A | |
| | 2 | | CCR.1.1 TDD | | N/A | |
| | 3 | | CCR.2.1 TDD | | N/A | |
| SSB configuration | 1 | | SSB.1 FR1 | | | |
| | 2 | | SSB.1 FR1 | | | |
| | 3 | | SSB.2 FR1 | | | |
| OCNG Patterns | 1~3 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | | | |
| SMTC configuration | 1~3 | | SMTC.1 | | | |
| TRS Configuration | 1 | | TRS.1.1 FDD | | N/A | |
| | 2 | | TRS.1.1 TDD | | N/A | |
| | 3 | | TRS.1.2 TDD | | N/A | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~3 | dB | 0 | 0 | 0 | 8 |
| $\hat{E}_s/N_{oc}$ | 1~3 | dB | 0 | 0 | 0 | 8 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -94.65 | -86.65 |
| | 3 | | -91.64 | -91.64 | -91.64 | -83.64 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -63.69 | -58.06 |
| | 3 | dBm/38.16 MHz | -57.58 | -57.58 | -57.58 | -51.96 |
| Propagation condition | 1~3 | | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 4: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall send L1-RSRP report every 80 slots. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 80 ms plus 80 slots from the beginning of time period T2. During T2, each L1-RSRP measurement report of Cell 2 shall meet the corresponding absolute accuracy requirement in Table 6.6.27.1.5-2 for test configuration 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.27.1.5-3 for test configuration 3.

**Table 6.6.27.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 60 |
| Highest reported value (Cell 2) | 80 |

**Table 6.6.27.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 63 |
| Highest reported value (Cell 2) | 83 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 6.6.28 LTM Inter-frequency L1-RSRP measurement without measurement gap

## 6.6.28.0 Minimum conformance requirements

### 6.6.28.0.1 Minimum conformance requirements for SSB-based inter-frequency L1-RSRP measurement without gap

When configured by the network and the inter-frequency cell's SSB is completely contained in the DL active BWP, the UE shall be able to perform L1-RSRP measurements without gaps and without interruptions.

If a neighbour cell is known according TS 38.133 [6] clause 9.15.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ if *deriveSSB-IndexFromCellInter-r17* is enabled or UE has reported SSB index in L3 measurement report of the same cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}+T_{SSB_time_index_inter}$, where $T_{SSB_time_index_inter}$ is the time period used to acquire the index of the SSB being measured given in TS38.133 [6] clause 9.3.9.1.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ is defined for FR1 in Table 6.6.28.0.1-1, where

- M = 1
- P value for SSB resource to be measured is defined as
  - $N_{total}$ / $N_{outside_MG}$ in FR1

    For a window W of duration max ($T_{L1,}$ MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:

    - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
    - $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
    - $T_{L1}$ is periodicity of the target SSB.

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer measurement period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer measurement period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 6.6.28.0.1-1: Measurement delay for inter-frequency L1-RSRP measurement without measurement gaps in FR1 for UE capable of [*capability of measurement with RTD>CP*]**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB_NBC}*N_{Layer})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(K*M*P)*\max(T_{DRX}, T_{SSB_NBC})*N_{Layer})$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}*N_{Layer}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbour cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. $N_{Layer}$ = the number of inter-frequency layers which are configured for L1-RSRP measurement with [*LTM-CSI-ResourceConfig-r18*] and measured without measurement gaps + the number of intra-frequency layers | |

| | |
|---|---|
| | configured for L1-RSRP measurement with [*LTM-CSI-ResourceConfig-r18*]. |
| Note 2: | K = 1.5. |
| Note 3: | Void. |

**Table 6.6.28.0.1-2: Measurement delay for inter-frequency L1-RSRP measurement without measurement gaps in FR1 for UE incapable of [*capability of measurement with RTD>CP]***

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB_NBC})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(K*M*P)*\max(T_{DRX},T_{SSB_NBC}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbour cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: K = 1.5. | |
| Note 3: The requirements apply for the cells configured by *LTM-CSI-ResourceConfig-r18* on which UE is required to perform L1 measurements, when the max RTD between the serving cell and the inter-frequency cell whose SSB are completely contained in the DL active BWP is not larger than CP length. | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.15.3.1, 9.15.6.1, 9.15.6.2 and 9.15.6.3.

## 6.6.28.1 NR SA FR1 Inter-frequency SSB based L1-RSRP measurement without measurement gap

### 6.6.28.1.1 Test purpose

To verify that the UE makes correct reporting of inter-frequency SSB based L1-RSRP measurement without measurement gap on candidate neighbour cell in FR1 within L1-RSRP measurement requirements specified in TS 38.133 [6] clause 9.15.

### 6.6.28.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements without measurement gaps and reports for LTM from release 18 and forward. Test 2 is applicable only to UEs supporting *multiCellL1-measRTD-greaterThan-CP-r18*, otherwise Test 1 is applicable.

### 6.6.28.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.28.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.28.1.

### 6.6.28.1.4 Test description

#### 6.6.28.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.28.1.4.1-1.

**Table 6.6.28.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.6.28.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.6.28.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.6.28.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.6.28.1.4.1-2.

**Table 6.6.28.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.28.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | -Without LTE link<br>-For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | | |

1. The general test parameter settings are set up according to Table 6.6.28.1.4.1-3.
2. Message contents are defined in clause 6.6.28.1.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.6.28.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | | Cell 1 | | |
| Neighbour cell | | | Cell 2 | | Cell 2 is candidate cell |
| RF Channel Number | | | 1: Cell 1<br>2: Cell 2 | | |
| A3-Offset | | dB | -7 | | Including test tolerance (-1dB) given in Annex F.1.3.2 |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| reportQuantityRS-Indexes | | | rsrp | | |
| maxNrofRS-IndexesToReport | | | 1 | | |
| includeBeamMeasurements | | | True | | |
| Time offset between cells | | µs | 2 | 20 | The timing of Cell 2 is later than the timing of Cell 1 |
| DRX | | | OFF | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 20 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | | |
| T2 | | s | 0.5 | | |

### 6.6.28.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically. The SSB of Cell 2 is completely within UE's active BWP BW. The RBs containing SSB from Cell 1 and Cell 2 should be different in frequency location within the cell bandwidth.

There are two tests in the test case, test 1 and test 2:

- In test 1, time offset between cells is within CP length.

- In test 2, time offset between cells is larger than CP length.

UE not capable of *multiCellL1-measRTD-greaterThan-CP-r18* is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time duration of T1 and T2 respectively. There is no measurement gap configured in the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.6.28.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.
6. SS shall transmit an *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.
7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 20 slots.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.28.1.5-1. T2 starts at the beginning of a frame with an even SFN.
10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    -R1: the UE shall start to transmit valid reports no later than 40 ms for configuration 1, 2 and no later than 30 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 6.6.28.1.5-2 for test configurations 1, 2 and Table 6.6.28.1.5-3 for test configuration 3). If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    -R2: the UE shall transmit reports every 20 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    -R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.28.1.5-2 for test configurations 1, 2 and in Table 6.6.28.1.5-3 for test configuration 3, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.
12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
14. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.6.28.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.6.28.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-7 with conditions INTER-FREQ, SSB Index |
| Specific message contents exceptions for Cell 1 | Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 for configuration 6.6.28.1-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 for configuration 6.6.28.1-2 and configuration 6.6.28.1-3 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 for configuration 6.6.28.1-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 for configuration 6.6.28.1-2 and configuration 6.6.28.1-3 |

**Table 6.6.28.1.4.3-2: ReportConfigNR (a3-Offset) (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -14 | The actual value is field value * 0.5 dB | |
| } | | | |
| Hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.6.28.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-9 with conditions FR1, SSB#0, FDD |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS15 |
| Specific message contents exceptiosn for Test Configuration 3 | Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS30 |

**Table 6.6.28.1.4.3-4: LTM-CSI-ReportConfig-r18 (step 6)**

| Derivation path: Table H.3.12-5 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-CSI-ReportConfig-r18 ::= SEQUENCE { | | | |
| ltm-ReportConfigType-r18 CHOICE { | | | |
| periodic-r18 SEQUENCE { | | | |
| reportSlotConfig-r18 | | | |
| slots20 | 2 | Periodicity 20 slots and offset 2 | SCS15 |
| slots20 | 7 | Periodicity 20 slots and offset 7 | SCS30 |
| } | | | |
| } | | | |
| } | | | |

6.6.28.1.5 Test requirement

Table 6.6.28.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.6.28.1.5-1: Cell specific test parameters**

| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | | 1 | | 2 | |
| SSB GSCN | | | freq1 | | freq2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | N/A | |
| | Config 3 | | SR.2.1 TDD | | N/A | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | N/A | |
| | Config 3 | | CR.2.1 TDD | | N/A | |
| CP length | | | Normal | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| | Config 1 | | SMTC.2 | | SMTC.5 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SMTC Configuration | Config 2,3 | | SMTC.1 | | SMTC.4 | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | SSB.5 FR1 | |
| | Config 3 | | SSB.2 FR1 | | SSB.6 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | NA | |
| | Dedicated DL BWP | | DLBWP.1.1 | | NA | |
| | Initial UL BWP | | ULBWP.0.1 | | NA | |
| | Dedicated UL BWP | | ULBWP.1.1 | | NA | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -101 | -101 | -101 | -101 |
| | Config 3 | | -101 | -102.2 | -101 | -102.2 |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -101 | -101 | -101 | -101 |
| | Config 3 | | -98 | -99.2 | -98 | -99.2 |
| $\hat{E}_s/I_{ot}$ | | dB | -1.76 | -0.19 | -1.76 | -0.19 |
| $\hat{E}_s/N_{oc}$ | | dB | 3 | 13.5 | 3 | 13.5 |
| SSB_RP | Config 1,2 | dBm/SCS | -98 | -87.5 | -98 | -87.5 |
| | Config 3 | dBm/SCS | -94.99 | -85.69 | -94.99 | -85.69 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -66.07 | -56.44 | -66.07 | -56.44 |
| | Config 3 | dBm/ 38.16MHz | -59.96 | -51.54 | -59.96 | -51.54 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 20 slots. The UE shall start to report L1-RSRP value of Cell 2 in no later than 20 ms plus 20 slots from the beginning of time period T2. During T2, each L1-RSRP measurement report of Cell 2 shall meet the corresponding absolute accuracy requirements in Table 6.6.28.1.5-2 for test configuration 1, 2 and the corresponding absolute accuracy requirements in Table 6.6.28.1.5-3 for test configuration 3.

**Table 6.6.28.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 59 |
| Highest reported value (Cell 2) | 79 |

**Table 6.6.28.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 61 |
| Highest reported value (Cell 2) | 81 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 6.7 Measurement performance requirements

## 6.7.1 SS-RSRP

### 6.7.1.0 Minimum conformance requirements

#### 6.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.1.

#### 6.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.2.

#### 6.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.3.

#### 6.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.4.

### 6.7.1.1 Intra-frequency measurements

#### 6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy

##### 6.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

##### 6.7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

##### 6.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

##### 6.7.1.1.1.4 Test description

###### 6.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.1.4.1-1.

**Table 6.7.1.1.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.1.1.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.1.1.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.1.1.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.1.4.1-2.

**Table 6.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra-frequency absolute accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

### 6.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.1.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 6.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.1.1.1.5-1 as appropriate and repeat steps 5-7.

### 6.7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.1.1.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 |
| Specific message contents exceptions for Test Configuration 6.7.1.1.1-1 | Table H.3.1-3 with Condition SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.1.1.1-2 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 6.7.1.1.1-3 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.1.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

6.7.1.1.1.5 Test requirement

Table 6.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.1.1.1.5-3 for test configuration 3.

**Table 6.7.1.1.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters**

| **Parameter** | | **Unit** | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Physical cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control Channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1 | | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 |
| | Config 2 | | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 | SSB 1.FR1 | SSB.1 FR1 |
| | Config 3 | | SSB 2.FR1 | SSB.2 FR1 | SSB 2.FR1 | SSB.2 FR1 | SSB 2.FR1 | SSB.2 FR1 |
| Time offset with Cell 2 | Config 1 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2,3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC Configuration | Config 1 | | SMTC.2 | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group | dBm/15KhZ | -107.5 | | -88 | | -114 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | N/A Note 6 | | -94 | | -115 + $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -107.4 | | -88 | | Same as Noc/15kHz |
| | Config 3 | Depending on band group | | N/A Note 6 | | -91 | | -112 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.23 | -5.57 | 2.23 | -5.57 | 0.37 | -5.56 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | -0.8 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group | dBm/SCS | -101.5 | -106.1 | -82 | -86.6 | -111 + $\Delta_{BG_offset}$ | -114.8 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | N/A Note 6 | N/A Note 6 | -85 | -89.6 | -109+ $\Delta_{BG_offset}$ | -112.8+ $\Delta_{BG_offset}$ |
| Io Note3 | Config 1,2 | Depending on band group | dBm/ 9.36MHz | -71.68 | | -52.18 | | -80.39+ $\Delta_{BG_offset}$ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | Depending on band group | dBm/ 38.16MHz | N/A[Note 6] | -51.91 | -75.12 + $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | | 1x2 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |
| Note 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | |
| Note 6: Subtest 1 is not used when testing with 30kHz SSB SCS. | | | | | | |

**Table 6.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1 and 2**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | 44 | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 36 |
| | | | Bands NR_FDD_FR1_B | 36 |
| | | | Bands NR_TDD_FR1_C | 37 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 38 |
| | | | Bands NR_FDD_FR1_G | 39 |
| | | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 2) | 56 | 79 | NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | | NR_FDD_FR1_B | 48 |
| | | | NR_TDD_FR1_C | 49 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | | NR_FDD_FR1_G | 51 |
| | | | NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | 40 | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | | Bands NR_FDD_FR1_B | 32 |
| | | | Bands NR_TDD_FR1_C | 32 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 33 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 33 |
| | | | Bands NR_FDD_FR1_G | 34 |
| | | | Bands NR_FDD_FR1_H | 35 |
| Highest reported value (Cell 2) | 61 | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | | Bands NR_FDD_FR1_B | 53 |
| | | | Bands NR_TDD_FR1_C | 53 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 54 |
| | | | Bands NR_FDD_FR1_G | 55 |
| | | | Bands NR_FDD_FR1_H | 56 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | | |

**Table 6.7.1.1.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | N/A | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 38 |
| | | | Bands NR_FDD_FR1_B | 38 |
| | | | Bands NR_TDD_FR1_C | 39 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 39 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 40 |
| | | | Bands NR_FDD_FR1_G | 41 |
| | | | Bands NR_FDD_FR1_H | 41 |
| Highest reported value (Cell 2) | N/A | 76 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 50 |
| | | | Bands NR_FDD_FR1_B | 50 |
| | | | Bands NR_TDD_FR1_C | 51 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 52 |
| | | | Bands NR_FDD_FR1_G | 53 |
| | | | Bands NR_FDD_FR1_H | 53 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | N/A | 54 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | | Bands NR_FDD_FR1_B | 34 |
| | | | Bands NR_TDD_FR1_C | 34 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 35 |
| | | | Bands NR_FDD_FR1_G | 36 |
| | | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 2) | N/A | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 54 |
| | | | Bands NR_FDD_FR1_B | 55 |
| | | | Bands NR_TDD_FR1_C | 55 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 56 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 56 |
| | | | Bands NR_FDD_FR1_G | 57 |
| | | | Bands NR_FDD_FR1_H | 58 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy

#### 6.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 6.7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

#### 6.7.1.1.2.4 Test description

##### 6.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.2.4.1-1.

**Table 6.7.1.1.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.1.1.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.1.1.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.1.1.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.2.4.1-2.

**Table 6.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.1.1.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 6.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR* Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.1.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 1 and Cell 2 in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 6.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.1.1.2.5-1 as appropriate and repeat steps 5-7.

#### 6.7.1.1.2.4.3 Message contents

Message contents are same as in clause 6.7.1.1.1.4.3.

#### 6.7.1.1.2.5 Test requirement

Table 6.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.2.5-2.

**Table 6.7.1.1.2.5-1: Same as Table 6.7.1.1.1.5-1 with the following exceptions:**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group | dBm/15KhZ | -106 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | N/A | | -94 | | -114+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | Same as Noc/15kHz | | Same as Noc/15kHz | | Same as Noc/15kHz | |
| | Config 3,6 | Depending on band group | | N/A | | -91 | | -111 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 1.88 | -4.97 | 1.88 | -4.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 2 | 6 | 2 | 3 | 0 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group | dBm/SCS | -100 | -104 | -82 | -86 | -111 + $\Delta_{BG_offset}$ | - 114 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | N/A | N/A | -85 | -89 | -108 + $\Delta_{BG_offset}$ | -111 + $\Delta_{BG_offset}$ |
| Io Note3 | Config 1,2 | Depending on band group | dBm/ 9.36MHz | -70.05 | | -52.05 | | -80.20+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/ 38.16MHz | N/A | | -51.77 | | -73.93 + $\Delta_{BG_offset}$ | |

**Table 6.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.1.2 Inter-frequency measurements

### 6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy

#### 6.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 6.7.1.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

#### 6.7.1.2.1.4 Test description

##### 6.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.1.4.1-1.

**Table 6.7.1.2.1.4.1-1: NR SA FR1-FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.1.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.1.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.1.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.1.4.1-2.

**Table 6.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.1.2.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

##### 6.7.1.2.1.4.2 Test procedure

Same as in clause 6.7.1.1.1.4.2 but replacing Table 6.7.1.1.1.5-1 and 6.7.1.1.1.5-2 with 6.7.1.2.1.5-1 and 6.7.1.2.1.5-2, respectively.

##### 6.7.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.1.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.1-6 with condition Pattern #0 |
| Specific message contents exceptions for Test Configuration 6.7.1.2.1-1 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.1.2.1-2 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.7.1.2.1-3 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.1.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

6.7.1.2.1.5 Test requirement

Table 6.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.2.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.1.2.1.5-3 for test configuration 3.

**Table 6.7.1.2.1.5-1: SS-RSRP inter-frequency test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | 1 | | FDD | | FDD | |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| TDD configuration | 1 | | N/A | | N/A | |
| | 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 3 | | CR.2.1 TDD | - | CR.2.1 TDD | - |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 3 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | | 1~3 | | OP.1 | | OP.1 | |
| TRS configuration | | 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | | 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | | 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | | 1 | | SMTC.2 | | SMTC.2 | |
| | | 2,3 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | | 1 | ms | 3 | | 3 | |
| | | 2,3 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1~3 | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15 kHz | -94.65 | -94.65 | ($N_{oc}$ for Cell 2 +8dB) | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 3 | dBm/15 kHz | -96 | -96 | ($N_{oc}$ for Cell 2 +8dB) | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | ($N_{oc}$ for Cell 2 +8dB) | -115+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3 | | -93 | -93 | ($N_{oc}$ for Cell 2 +8dB) | -112.00+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| SS-RSRP Note3 | Depending on band group | 1,2, | dBm/SCS | -84.65 | -84.65 | (RSRP for Cell 2 +24dB) | -118.00+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3 | | -83 | -83 | (RSRP for Cell 2 +24dB) | -115.00+ $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2 | dBm/ 9.36MHz | 56.28 | 56.28 | (Io for Channel 2 +19.45dB) | -85.28+ $\Delta_{BG_offset}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Depending on band group | 3 | dBm/ 38.16M Hz | -51.53 | -51.53 | (Io for Channel 2 +19.45dB) | -79.19+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~3 | - | AWGN | | AWGN | |
| Antenna configuration | | | | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | |
| Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |
| Note 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |
| Note 6: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. | | | | | | | |

**Table 6.7.1.2.1.5-2: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 32 |
| | | Bands NR_FDD_FR1_B | 33 |
| | | Bands NR_TDD_FR1_C | 33 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 34 |
| | | Bands NR_FDD_FR1_G | 35 |
| | | Bands NR_FDD_FR1_H | 36 |
| Highest reported value (Cell 2) | 81 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 45 |
| | | Bands NR_FDD_FR1_B | 45 |
| | | Bands NR_TDD_FR1_C | 46 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 47 |
| | | Bands NR_FDD_FR1_G | 48 |
| | | Bands NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 28 |
| | | Bands NR_FDD_FR1_B | 28 |
| | | Bands NR_TDD_FR1_C | 29 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 29 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 30 |
| | | Bands NR_FDD_FR1_G | 31 |
| | | Bands NR_FDD_FR1_H | 31 |
| Highest reported value (Cell 2) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 50 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_G | 52 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_H | 53 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 6.7.1.2.1.5-3: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 64 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | Bands NR_FDD_FR1_B | 36 |
| | | Bands NR_TDD_FR1_C | 36 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 37 |
| | | Bands NR_FDD_FR1_G | 38 |
| | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 2) | 83 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 49 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | Bands NR_FDD_FR1_G | 51 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 61 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 2) | 86 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 53 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 56 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy

#### 6.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 6.7.1.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

#### 6.7.1.2.2.4 Test description

##### 6.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.2.4.1-1.

**Table 6.7.1.2.2.4.1-1: NR SA FR1-FR1 SS-RSRP relative measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.1.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.1.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.1.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.2.4.1-2.

**Table 6.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.1.2.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

##### 6.7.1.2.2.4.2 Test procedure

Same as in clause 6.7.1.1.2.4.2 but replacing Table 6.7.1.1.2.5-1 and 6.7.1.1.2.5-2 with 6.7.1.2.2.5-1 and 6.7.1.2.2.5-2, respectively.

##### 6.7.1.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.1.2.1.4.3.

#### 6.7.1.2.2.5 Test requirement

Table 6.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.1.2.2.5-2.

**Table 6.7.1.2.2.5-1: same as Table 6.7.1.2.1.5-1**

**Table 6.7.1.2.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 7 | SS-RSRP_x - 31 |
| Highest reported value (Cell 2) | SS-RSRP_x + 7 | SS-RSRP_x - 18 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 9 | SS-RSRP_x - 33 |
| Highest reported value (Cell 2) | SS-RSRP_x + 9 | SS-RSRP_x - 17 |
| SS-RSRP_x is the reported value of Cell 1 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.2 SS-RSRQ

### 6.7.2.0 Minimum conformance requirements

#### 6.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 4.7.2.0.1.

#### 6.7.2.0.2 Inter-frequency SS-RSRQ absolute measurement accuracy requirements

Same as in clause 4.7.2.0.2.

#### 6.7.2.0.3 Inter-frequency SS-RSRQ relative measurement accuracy requirements

Same as in clause 4.7.2.0.3.

### 6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy

#### 6.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

#### 6.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.1.

#### 6.7.2.1.4 Test description

##### 6.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.1.4.1-1.

**Table 6.7.2.1.4.1-1: NR SA FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.1.4.1-2.

**Table 6.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.3.

### 6.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 6.7.2.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.2.1.5-1 as appropriate and repeat steps 5-7.

### 6.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.2.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRQ measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 |
| Specific message contents exceptions for Test Configuration 6.7.2.1-1 | Table H.3.1-3 with Condition SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.2.1-2 | Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.7.2.1-3 | Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

6.7.2.1.5 Test requirement

Table 6.7.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 6.7.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.1.5-2.

**Table 6.7.2.1.5-1: SS-RSRQ Intra frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| | Config 1 | ms | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 2, 3 | | SMTC.1 | | | | | |
| | Config 1 | | SMTC.2 | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note 2 | Config 1,2 | Depending on band group | dBm/15kHz | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | -92.6 | | - | | -114+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note 2 | Config 1,2 | Depending on band group | dBm/SCS | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | -89.6 | | - | | -111+ $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group | dBm/SCS | -83.5 | -83.5 | -103.9 | -103.9 | -118+$\Delta_{BG_offset}$ | -118+$\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -86.6 | -86.6 | - | - | -115+$\Delta_{BG_offset}$ | -115+$\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
| Io Note3 | Config 1,2 | Depending on band group | dBm/9.36MHz | -51.57 | | -70 | | -83.28+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/38.16MHz | -51.56 | | - | | -76.67+ $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2. |
| Note 6: | Subtest 2 is not used when testing with 30kHz SSB SCS. |
| Note 7: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |

**Table 6.7.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_46 | SS-RSRQ_44 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_60 | SS-RSRQ_59 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_45 | SS-RSRQ_43 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_61 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.2.2 Inter-Frequency SS-RSRQ measurement accuracy

### 6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy

#### 6.7.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

#### 6.7.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.2.1.

#### 6.7.2.2.1.4 Test description

##### 6.7.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.2.1.4.1-1.

**Table 6.7.2.2.1.4.1-1: NR SA FR1-FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.2.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.2.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.2.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.2.1.4.1-2.

**Table 6.7.2.2.1.4.1-2: Initial conditions for SS-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.2.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

### 6.7.2.2.1.4.2 Test procedure

Same as in clause 6.7.2.1.1.4.2 but replacing Table 6.7.2.1.1.5-1 and 6.7.2.1.1.5-2 with 6.7.2.2.1.5-1 and 6.7.2.2.1.5-2, respectively.

### 6.7.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.2.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.1-6 with condition Pattern #0 |
| Specific message contents exceptions for Test Configuration 6.7.2.2.1-1 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.2.2.1-2 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.7.2.2.1-3 | Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.2.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

### 6.7.2.2.1.5 Test requirement

Table 6.7.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.2.1.5-2.

**Table 6.7.2.2.1.5-1: SS-RSRQ Inter frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Gap pattern ID | | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |

| OCNG Patterns | | | | OP.1 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Time offset with Cell 1 | | Config 2, 3 | µs | 3 | | | | | |
| | | Config 1 | ms | 3 | | | | | |
| SMTC configuration | | Config 2, 3 | | SMTC.1 | | | | | |
| | | Config 1 | | SMTC.2 | | | | | |
| SSB configuration | | Config 1,2 | | SSB.1 in FR1 | | | | | |
| | | Config 3 | | SSB.2 in FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
| | | Config 3 | | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group | dBm/15kHz | -81.68 | -81.68 | -106 | -106 | -116 + $\Delta_{BG_offset}$ | -116 + $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 3 | Depending on band group | dBm/15kHz | -87.80 | -87.80 | -113 | -113 | -116+ $\Delta_{BG_offset}$ | -116+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group | dBm/SCS | -81.68 | -81.68 | -106 | -106 | -116 + $\Delta_{BG_offset}$ | -116 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -84.8 | -84.8 | -110 | -110 | -113+ $\Delta_{BG_offset}$ | -113+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group | dBm/SCS | -83.43 | -83.43 | -107.75 | -107.75 | -113+ $\Delta_{BG_offset}$ | -117.75+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -86.54 | -86.54 | -111.75 | -111.75 | -110+ $\Delta_{BG_offset}$ | -114.75+ $\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | | dB | -14.76 | -14.76 | -14.76 | -14.76 | -12.56 | -14.76 |
| Io Note3 | Config 1,2 | Depending on band group | dBm/Ch BW | -51.51 | -51.51 | -75.83 | -75.83 | -83.28 + $\Delta_{BG_offset}$ | -85.83 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -51.52 | -51.52 | -76.73 | -76.73 | -77.19 + $\Delta_{BG_offset}$ | -79.73 + $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

| | |
|---|---|
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2 |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |

**Table 6.7.2.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_52 | SS-RSRQ_52 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_62 | SS-RSRQ_62 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_49 | SS-RSRQ_49 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_65 | SS-RSRQ_65 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy

#### 6.7.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands.

#### 6.7.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.2.2.

#### 6.7.2.2.2.4 Test description

##### 6.7.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.2.2.4.1-1.

**Table 6.7.2.2.2.4.1-1: NR SA FR1-FR1 SS-RSRQ measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.2.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.2.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.2.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.2.2.4.1-2.

**Table 6.7.2.2.2.4.1-2: Initial conditions for SS-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.2.2.2.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.2.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.2.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the SS-RSRQ value of Cell 1 reported by the UE. If the difference between both values is outside the limits in Table 6.7.2.2.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.2.2.2.5-1 as appropriate and repeat steps 5-7.

#### 6.7.2.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.2.2.1.4.3.

### 6.7.2.2.2.5 Test requirement

Table 6.7.2.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 6.7.2.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.2.2.5-2.

**Table 6.7.2.2.2.5-1: same as Table 6.7.2.2.1.5-1**

**Table 6.7.2.2.2.5-2: SS-RSRQ Inter frequency relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 7 | SS-RSRQ_x - 7 | SS-RSRQ_x - 11 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 7 | SS-RSRQ_x + 7 | SS-RSRQ_x + 2 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x – 13 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| SS-RSRQ_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.3 SS-SINR

### 6.7.3.0 Minimum conformance requirements

#### 6.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.1.

#### 6.7.3.0.2 Inter-frequency absolute SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.2.

#### 6.7.3.0.3 Inter-frequency relative SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.3.

### 6.7.3.1 NR SA FR1 SS-SINR measurement accuracy

#### 6.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

#### 6.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

#### 6.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.1.

#### 6.7.3.1.4 Test description

##### 6.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.1.4.1-1.

**Table 6.7.3.1.4.1-1: NR SA FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.3.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.3.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.3.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.1.4.1-2.

**Table 6.7.3.1.4.1-2: Initial conditions for SS-SINR intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |

| | | | |
|---|---|---|---|
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.3.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 6.7.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.3.1.5-1 as appropriate and repeat steps 5-7.

#### 6.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.3.1.4.3-1: Common Exception messages for NR SA FR1 SS-SINR measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5<br>Table H.3.1-7 |
| Specific message contents exceptions for Test Configuration 6.7.3.1-1 | Table H.3.1-3 with Condition SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.3.1-2 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.7.3.1-3 | Table H.3.1-3 with Condition Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-SINR Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.7.3.1.5 Test requirements

Table 6.7.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.3.1.5-2

**Table 6.7.3.1.5-1: SS-SINR Intra frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | - | TRS.1.1 TDD | - |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| Time offset with Cell 1 | Config 2, 3 | µs | - | 3 | - | 3 |
| | Config 1 | ms | - | 3 | - | 3 |
| SMTC configuration | Config 2, 3 | | SMTC.1 | | | |
| | Config 1 | | SMTC.2 | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | | Depending on band group | dBm/15kHz | -93 | | -116+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -93.2 | | Same as Noc for 15kHz | |
| | Config 3 | Depending on band group | | -90.2 | | -113+ $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 4.54 | 2.66 | -3.5 | -3.5 |
| SS-RSRP Note 3 | Config 1,2 | Depending on band group | dBm/SCS | -88.46 | -90.34 | -119.5+ $\Delta_{BG_offset}$ | -119.5+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -85.65 | -87.53 | -116.5+ $\Delta_{BG_offset}$ | -116.5+ $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | | dB | 0 | -3.19 | -5.1 | -5.1 |
| Io Note3 | Config 1,2 | Depending on band group | dBm/ 9.36MHz | -57.5 | | -85.28+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/ 38.16MHz | -51.59 | | -79.17+ $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 6.7.3.1.5-2: SS-SINR Intra frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 2) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 2) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.3.2 Inter-Frequency SS-SINR measurement accuracy

### 6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy

#### 6.7.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

#### 6.7.3.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

#### 6.7.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.2.1.

#### 6.7.3.2.1.4 Test description

##### 6.7.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.2.1.4.1-1.

**Table 6.7.3.2.1.4.1-1: NR SA FR1-FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.3.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.3.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.3.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.2.1.4.1-2.

**Table 6.7.3.2.1.4.1-2: Initial conditions for SS-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.3.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.3.2.1.4.2 Test procedure

Same as in clause 6.7.3.1.4.2 but replacing Table 6.7.3.1.5-1 and 6.7.3.1.5-2 with 6.7.3.2.1.5-1 and 6.7.3.2.1.5-2, respectively.

#### 6.7.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.3.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-SINR absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.1-6 with condition Pattern #0 |
| Specific message contents exceptions for Test Configuration 6.7.3.2.1-1 | Table H.3.1-3 with Conditions INTER-FREQ MO and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.7.3.2.1-2 | Table H.3.1-3 with Conditions INTER-FREQ MO, and Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.7.3.2.1-3 | Table H.3.1-3 with Conditions INTER-FREQ MO, and Synchronous cells and SS-SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.3.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-SINR Accuracy**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.7.3.2.1.5 Test requirements

Table 6.7.3.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.3.2.1.5-2.

**Table 6.7.3.2.1.5-1: SS-SINR Inter frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3 | | TDDConf.2.1 | | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | | |
| Gap pattern ID | | | 0 | - | 0 | - | 0 | - | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | TRS.1.1 FDD | | TRS.1.1 FDD | | |
| | Config 2 | | TRS.1.1 TDD | - | TRS.1.1 TDD | - | TRS.1.1 TDD | - | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - | |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Patterns | | | OP.1 | | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | | |
| Time offset with Cell 1 | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 | |
| | Config 1 | ms | - | 3 | - | 3 | - | 3 | |
| SMTC configuration | Config 2, 3 | | SMTC.1 | | | | | | |
| | Config 1 | | SMTC.2 | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | | | | |
| | Config 3 | | 30 | | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | 0 | 0 | 0 | 0 | 0 | 0 | |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group | dBm/15kHz | -88 | -88 | -108.5 | -108.5 | -119.5+ $\Delta_{BG_offset}$ | -119.5+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -88 | -88 | -108.5 | -108.5 | Same as Noc | Same as Noc |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | for 15kHz | for 15kHz |
| | Config 3 | Depending on band group | | -85 | -85 | -105.5 | -105.5 | -116.5+ $\Delta_{BG_offset}$ | 116.5+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group | dBm/SCS | -89.75 | -89.75 | -88.5 | -88.5 | -122.7+ $\Delta_{BG_offset}$ | -122.7+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | -86.75 | -86.75 | -85.5 | -85.5 | -119.7+ $\Delta_{BG_offset}$ | -119.7+ $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| Io Note3 | Config 1,2 | Depending on band group | dBm/ 9.36MHz | -57.83 | -57.83 | -60.5 | -60.5 | -89.85+ $\Delta_{BG_offset}$ | -89.85+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | dBm/ 38.16MHz | -51.73 | -51.73 | -54.41 | -54.41 | -83.75+ $\Delta_{BG_offset}$ | -83.75+ $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 6.7.3.2.1.5-2: SS-SINR Inter frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_35 | SS-SINR_79 | SS-SINR_32 |
| Highest reported value (Cell 2) | SS-SINR_51 | SS-SINR_94 | SS-SINR_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_33 | SS-SINR_77 | SS-SINR_31 |
| Highest reported value (Cell 2) | SS-SINR_53 | SS-SINR_96 | SS-SINR_50 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy

#### 6.7.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

#### 6.7.3.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

#### 6.7.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.2.2.

6.7.3.2.2.4 Test description

6.7.3.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.2.2.4.1-1.

**Table 6.7.3.2.2.4.1-1: NR SA FR1-FR1 SS-SINR measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.3.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.3.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.3.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.2.2.4.1-2.

**Table 6.7.3.2.2.4.1-2: Initial conditions for SS-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.3.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in clause 6.7.3.2.2.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.3.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.3.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the SS- SINR value of Cell 1 reported by the UE. If the difference between both values is outside the limits in Table 6.7.3.2.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.3.2.2.5-1 as appropriate and repeat steps 5-7.

#### 6.7.3.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.3.2.1.4.3.

#### 6.7.3.2.2.5 Test requirements

Table 6.7.3.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.3.2.2.5-2

**Table 6.7.3.2.2.5-1: same as Table 6.7.3.2.1.5-1**

**Table 6.7.3.2.2.5-2: SS-SINR Inter frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| SS-SINR_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.4 L1-RSRP

### 6.7.4.0 Minimum conformance requirements

#### 6.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.1.

#### 6.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.2.

#### 6.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.3.

#### 6.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.4.

### 6.7.4.1 SSB based L1-RSRP measurements

#### 6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy

##### 6.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

##### 6.7.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

##### 6.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

#### 6.7.4.1.1.4 Test description

##### 6.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.1.4.1-1.

**Table 6.7.4.1.1.4.1-1: NR SA FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.4.1.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.4.1.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.4.1.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.1.4.1-2.

**Table 6.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.4.1.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.4.1.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.1.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.1.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 6.7.4.1.1.5-2 or Table 6.7.4.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.1.1.5-1 as appropriate and repeat steps 3-5.

#### 6.7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.4.1.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table H.3.6-10<br>Table H.3.5-8<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.4.1.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.7.4.1.1.5 Test requirement

Table 6.7.4.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.4.1.1.5-3 for test configuration 3.

**Table 6.7.4.1.1.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 | freq1 |
| Duplex mode | 1 | | FDD | FDD |
| | 2 | | TDD | TDD |
| | 3 | | TDD | TDD |
| TDD Configuration | 1 | | N/A | N/A |
| | 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD | SR.1.1 TDD |

| | | | | | |
|---|---|---|---|---|---|
| | | 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 2 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 3 | | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~3 | | OP.1 | OP.1 |
| TRS configuration | | 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~3 | | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~3 | | periodic | periodic |
| reportQuantity | | 1~3 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1~3 | | 2 | 2 |
| L1-RSRP reporting period | | 1~3 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1~3 | dB | 0 | 0 |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -96.00 | 117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| Propagation condition | | 1~3 | | AWGN | AWGN |
| Antenna configuration | | 1~3 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification |

**Table 6.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 1) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_F | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 1) | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 44 |
| | | Bands NR_FDD_FR1_B | 45 |
| | | Bands NR_TDD_FR1_C | 45 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 46 |
| | | Bands NR_FDD_FR1_F | 47 |
| | | Bands NR_FDD_FR1_G | 47 |
| | | Bands NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | Bands NR_FDD_FR1_B | 27 |
| | | Bands NR_TDD_FR1_C | 27 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 28 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 28 |
| | | Bands NR_FDD_FR1_F | 29 |
| | | Bands NR_FDD_FR1_G | 29 |
| | | Bands NR_FDD_FR1_H | 30 |
| Highest reported value (Cell 1) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 49 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 50 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_F | 51 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 6.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 1) | 63 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 34 |
| | | Bands NR_FDD_FR1_B | 34 |
| | | Bands NR_TDD_FR1_C | 35 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 36 |
| | | Bands NR_FDD_FR1_F | 36 |
| | | Bands NR_FDD_FR1_G | 37 |
| | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 1) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 47 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 48 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 49 |
| | | Bands NR_FDD_FR1_F | 50 |
| | | Bands NR_FDD_FR1_G | 50 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 29 |
| | | Bands NR_FDD_FR1_B | 30 |
| | | Bands NR_TDD_FR1_C | 30 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 31 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 31 |
| | | Bands NR_FDD_FR1_F | 32 |
| | | Bands NR_FDD_FR1_G | 32 |
| | | Bands NR_FDD_FR1_H | 33 |
| Highest reported value (Cell 1) | 87 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 52 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 53 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_F | 54 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 55 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy

#### 6.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 6.7.4.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

#### 6.7.4.1.2.4 Test description

##### 6.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.2.4.1-1.

**Table 6.7.4.1.2.4.1-1: NR SA FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.4.1.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.4.1.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.4.1.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.2.4.1-2.

**Table 6.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.4.1.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

##### 6.7.4.1.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.1.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.1.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-. If the DIFF-RSRP value is within the limits in Table 6.7.4.1.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.1.2.5-1 as appropriate and repeat steps 3-5.

#### 6.7.4.1.2.4.3 Message contents

Message contents are same as in Clause 6.7.4.1.1.4.3.

#### 6.7.4.1.2.5 Test requirement

Table 6.7.4.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.1.2.5-2.

**Table 6.7.4.1.2.5-1: Same as Table 6.7.4.1.1.5-1**

**Table 6.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.4.2 CSI-RS based L1-RSRP measurements

### 6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy

#### 6.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 6.7.4.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

#### 6.7.4.2.1.4 Test description

##### 6.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.1.4.1-1.

**Table 6.7.4.2.1.4.1-1: NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.4.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.4.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.4.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.1.4.1-2.

**Table 6.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.4.2.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The UE is configured to perform RLM and BFD measurement based on the SSB. The connection setup is done according to the settings in Annex C.1.1.

##### 6.7.4.2.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.2.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.2.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.2.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS#0 or CSI-RS#1 in the periodic L1-RSRP reports. If the value for the strongestCSI-RS is within the limits in Table 6.7.4.2.1.5-2 or Table 6.7.4.2.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

#### 6.7.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.4.2.1.4.3-1: Common Exception messages EN-DC CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.4.2.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.7.4.2.1.5 Test requirement

Table 6.7.4.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.2.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.4.2.1.5-3 for test configuration 3.

**Table 6.7.4.2.1.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 | freq1 |
| Duplex mode | 1 | | FDD | FDD |
| | 2 | | TDD | TDD |
| | 3 | | TDD | TDD |
| TDD Configuration | 1 | | N/A | N/A |
| | 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD | CR.2.1 TDD |
| | 1 | | CCR.1.1 FDD | CCR.1.1 FDD |

| | | | | | |
|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 2 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 3 | | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~3 | | OP.1 | OP.1 |
| TRS configuration | | 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~3 | | SMTC.1 | SMTC.1 |
| CSI-RS | | 1,4 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | | 2,5 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | | 3,6 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~3 | | periodic | periodic |
| reportQuantity | | 1~3 | | cri-RSRP | cri-RSRP |
| Number of reported RS | | 1~3 | | 2 | 2 |
| L1-RSRP reporting period | | 1~3 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1~3 | dB | 0 | 0 |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -96.00 | 117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2 | dBm/CSI-RS SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| CSI-RSRP Note3 | Depending on band group | 1,2 | dBm/CSI-RS SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | -2.2 |
| Propagation condition | | 1~3 | | AWGN | AWGN |
| Antenna configuration | | 1~3 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification |

**Table 6.7.4.2.1.5-2: Same as Table 6.7.4.1.1.5-2**

**Table 6.7.4.2.1.5-3: Same as Table 6.7.4.1.1.5-3**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy

#### 6.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 6.7.4.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

#### 6.7.4.2.2.4 Test description

##### 6.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.2.4.1-1.

**Table 6.7.4.2.2.4.1-1: NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.4.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 6.7.4.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 6.7.4.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.2.4.1-2.

**Table 6.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |

| | | | |
|---|---|---|---|
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.4.2.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The UE is configured to perform RLM and BFD measurement based on the SSB. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.4.2.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.2.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.2.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.2.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of CSI-RS#0 or CSI-RS#1 reported by the UE is compared to the expected DIFF-. If the DIFF-RSRP value is within the limits in Table 6.7.4.2.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.2.2.5-1 as appropriate and repeat steps 3-5.

#### 6.7.4.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.4.2.1.4.3.

### 6.7.4.2.2.5 Test requirement

Table 6.7.4.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.2.2.5-2.

**Table 6.7.4.2.2.5-1: Same as Table 6.7.4.2.1.5-1**

**Table 6.7.4.2.2.5-2: Same as Table 6.7.4.1.2.5-2**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.5 E-UTRAN RSRP

### 6.7.5.0 Minimum conformance requirements

#### 6.7.5.0.1 E-UTRAN RSRP absolute accuracy

The measurement period of E-UTRA RSRP in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 of TS 38.133 [6].

The accuracy requirements of E-UTRA RSRP measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3 of TS 36.133 [23]:

The requirements for absolute accuracy of RSRP in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 6.7.5.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.3 of TS 36.133 [23] for a corresponding Band.

**Table 6.7.5.0.1-1: RSRP Inter frequency absolute accuracy**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | |
| Normal condition | Extreme condition | Ês/Iot | E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm/15kHz Note 2 | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±4.5 | ±9 | ≥-6 dB | FDD_A, TDD_A | -121 | N/A | -70 |
| | | | FDD_B1, FDD_B2 | -120.5 | N/A | -70 |
| | | | FDD_C, TDD_C | -120 | N/A | -70 |
| | | | FDD_D | -119.5 | N/A | -70 |
| | | | FDD_E, TDD_E | -119 | N/A | -70 |
| | | | FDD_F | -118.5 | N/A | -70 |
| | | | FDD_G | -118 | N/A | -70 |
| | | | FDD_H | -117.5 | N/A | -70 |
| | | | FDD_N | -114.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 dB | FDD_A, TDD_A, FDD_B1, FDD_B2, FDD_C, TDD_C, FDD_D, FDD_E, TDD_E, FDD_F, FDD_G, FDD_H, FDD_N | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta$>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 3: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [23] shall apply:

The reporting range of RSRP is defined from -156 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 6.7.5.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.5.0.1-2: RSRP measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| RSRP_-17 | RSRP< -156 | dBm |
| RSRP_-16 | -156 ≤ RSRP< -155 | dBm |
| … | … | … |
| RSRP_-03 | -143 ≤ RSRP< -142 | dBm |
| RSRP_-02 | -142 ≤ RSRP< -141 | dBm |
| RSRP_-01 | -141 ≤ RSRP< -140 | dBm |
| RSRP_00 | RSRP < -140 | dBm |
| RSRP_01 | -140 ≤ RSRP < -139 | dBm |
| RSRP_02 | -139 ≤ RSRP < -138 | dBm |
| … | … | … |
| RSRP_95 | -46 ≤ RSRP < -45 | dBm |
| RSRP_96 | -45 ≤ RSRP < -44 | dBm |
| RSRP_97 | -44 ≤ RSRP | dBm |

## 6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy

### 6.7.5.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RSRP absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

### 6.7.5.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA.

### 6.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.5.1.

### 6.7.5.1.4 Test description

#### 6.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.5.1.4.1-1.

**Table 6.7.5.1.4.1-1: test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.5.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD |
| 6.7.5.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.5.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.5.1-4 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD |
| 6.7.5.1-5 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD |
| 6.7.5.1-6 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.5.1.4.1-2.

**Table 6.7.5.1.4.1-2: initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.5.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

#### 6.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.5.1.5-1 and Table 6.7.5.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RSRP reported values in the periodic MeasurementReport. The RSRP value of Cell 2 reported by the UE is compared to the expected RSRP. If the value is outside the limits in Table 6.7.5.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.5.1.5-2 as appropriate and repeat steps 5-7.

#### 6.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.5.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-RAT and GAP NEEDED<br>Table H.3.1-3<br>Table H.3.1-3a<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-7 with condition INTER-RAT<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.5.1.4.3-1A: MeasConfig (Test procedure step 3)**

| Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigE-UTRA-DEFAULT(Periodical) | Table 6.7.5.1.4.3-2 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EVENT | Table 6.7.5.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 2 | | |
| reportConfigId | 2 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.5.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.5.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1 SEQUENCE { | | | |
| b1-ThresholdEUTRA CHOICE { | | | |
| rsrp | 97 | Set threshold to -44dBm to ensure measId 2 will never be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.5.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.7.5.1.5 Test requirement

Table 6.7.5.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.5.1.5-1 and 6.7.5.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.5.1.5-3.

**Table 6.7.5.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 (FDD) |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 (TDD) |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 (TDD) |
| Gap pattern Id | | | 0 |
| PDSCH reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |

| | | | |
|---|---|---|---|
| RMSI CORSET reference channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| BWP configurations | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | -104 |
| $N_{oc}$[Note2] | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 17 |
| SS-RSRP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io[Note3] | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | | | AWGN |
| Antenna Configuration and Correlation Matrix | | | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.7.5.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | Test 1 | Test 2 |
| E-UTRA RF channel number | | | 1 | |
| Duplex mode | Config 1, 2, 3 | | FDD | |
| | Config 4, 5, 6 | | TDD | |
| TDD special subframe configuration[Note1] | Config 1, 2, 3 | | N/A | |
| | Config 4, 5, 6 | | 6 | |
| TDD uplink-downlink configuration[Note1] | Config 1, 2, 3 | | N/A | |
| | Config 4, 5, 6 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | | - | |
| PCFICH/PDCCH/PHICH parameters: | Config 1, 2, 3 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD | |

| | | | | |
|---|---|---|---|---|
| DL Reference Measurement Channel[Note2] | | | 20 MHz: R.10 FDD | |
| | Config 4, 5, 6 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | Config 1, 2, 3 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | |
| | Config 4, 5, 6 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | Depending on band group | dBm/15kHz | -91.65 | -117 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | dB | 10 | -3.2 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | 10 | -3.2 |
| RSRP[Note5] | Depending on band group | dBm/15kHz | -81.65 | -120.2+ $\Delta_{BG_offset}$ |
| SCH_RP[Note5] | Depending on band group | dBm/15kHz | -81.65 | -120.2+ $\Delta_{BG_offset}$ |
| Io[Note5] | Depending on band group | dBm/Ch BW | -53.45 + 10log($N_{RB,c}$/50) | -87.52+ $\Delta_{BG_offset}$ + 10log($N_{RB,c}$/50) |
| Propagation Condition | | | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void.
Note 9: Void
Note 10: Void
Note 11: $\Delta_{BG_offset}$ for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

**Table 6.7.5.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 49 | FDD_A, TDD_A | 14 |
| | | FDD_B | 15 |
| | | TDD_C | 15 |
| | | FDD_D, TDD_D | 16 |
| | | FDD_E, TDD_E | 16 |
| | | FDD_G | 17 |
| | | FDD_H | 18 |
| Highest reported value (Cell 2) | 69 | FDD_A, TDD_A | 27 |
| | | FDD_B | 27 |
| | | TDD_C | 28 |
| | | FDD_D, TDD_D | 28 |

| | | | |
|---|---|---|---|
| | | FDD_E, TDD_E | 29 |
| | | FDD_G | 30 |
| | | FDD_H | 30 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 46 | FDD_A, TDD_A | 10 |
| | | FDD_B | 10 |
| | | TDD_C | 11 |
| | | FDD_D, TDD_D | 11 |
| | | FDD_E, TDD_E | 12 |
| | | FDD_G | 13 |
| | | FDD_H | 13 |
| Highest reported value (Cell 2) | 72 | FDD_A, TDD_A | 31 |
| | | FDD_B | 32 |
| | | TDD_C | 32 |
| | | FDD_D, TDD_D | 33 |
| | | FDD_E, TDD_E | 33 |
| | | FDD_G | 34 |
| | | FDD_H | 35 |
| Note 1: E-UTRA operating band groups are as defined in TS 36.521-3 [26] clause 3.5.1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.6 E-UTRAN RSRQ

### 6.7.6.0 Minimum conformance requirements

#### 6.7.6.0.1 E-UTRAN RSRQ absolute accuracy

The measurement period of E-UTRA RSRQ in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 on TS 38.133 [6].

The accuracy requirements of E-UTRA RSRQ measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [23]:

The requirements for absolute accuracy of RSRQ in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 6.7.6.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.3 of TS 36.133 [23] for a corresponding Band

**Table 6.7.6.0.1-1: RSRQ Inter frequency absolute accuracy**

| **Accuracy** | | **Conditions** | | | |
|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **Ês/Iot** | **Io [Note 1] range** | | |
| | | | **E-UTRA operating band groups [Note 4]** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm/15kHz [Note 3]** | **dBm/BW$_{Channel}$** |
| ±2.5 | ±4 | ≥-3 dB | FDD_A, TDD_A | -121 | -50 |
| | | | FDD_B1, FDD_B2 | -120.5 | -50 |
| | | | FDD_C, TDD_C | -120 | -50 |
| | | | FDD_D | -119.5 | -50 |
| | | | FDD_E, TDD_E | -119 | -50 |
| | | | FDD_F | -118.5 | -50 |
| | | | FDD_G | -118 | -50 |
| | | | FDD_H | -117.5 | -50 |
| | | | FDD_N | -114.5 | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The condition level is increased by Δ>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 4: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [23] shall apply:

The reporting range of RSRQ is defined from -34 dB to 2.5 dB with 0.5 dB resolution.

The mapping of measured quantity is defined in table 6.7.6.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.6.0.1-2: RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| RSRQ_-30 | RSRQ < -34 | dB |
| RSRQ_-29 | -34 ≤ RSRQ < -33.5 | dB |
| … | … | … |
| RSRQ_-02 | -20.5 ≤ RSRQ < -20 | dB |
| RSRQ_-01 | -20 ≤ RSRQ < -19.5 | dB |
| RSRQ_00 | RSRQ < -19.5 | dB |
| RSRQ_01 | -19.5 ≤ RSRQ < -19 | dB |
| RSRQ_02 | -19 ≤ RSRQ < -18.5 | dB |
| … | … | … |
| RSRQ_32 | -4 ≤ RSRQ < -3.5 | dB |
| RSRQ_33 | -3.5 ≤ RSRQ < -3 | dB |
| RSRQ_34 | -3 ≤ RSRQ | dB |
| RSRQ_35 | -3 ≤ RSRQ < -2.5 | dB |
| RSRQ_36 | -2.5 ≤ RSRQ < -2 | dB |
| … | … | … |
| RSRQ_45 | 2 ≤ RSRQ < 2.5 | dB |
| RSRQ_46 | 2.5 ≤ RSRQ | dB |

Note: The ranges from RSRQ_-30 to RSRQ_-01 and from RSRQ_35 to RSRQ_46 apply for the UE who can support extended RSRQ range.

## 6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy

### 6.7.6.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RSRQ absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

### 6.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA.

### 6.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.6.1.

### 6.7.6.1.4 Test description

#### 6.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.6.1.4.1-1.

**Table 6.7.6.1.4.1-1: test configurations**

| Test Case ID | Description |
|---|---|

| | |
|---|---|
| 6.7.6.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD |
| 6.7.6.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.6.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.6.1-4 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD |
| 6.7.6.1-5 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD |
| 6.7.6.1-6 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.6.1.4.1-2.

**Table 6.7.6.1.4.1-2: initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.6.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

### 6.7.6.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.6.1.5-1 and Table 6.7.6.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RSRQ reported values in the periodic MeasurementReport. The RSRQ value of Cell 2 reported by the UE is compared to the expected RSRQ. If the value is outside the limits in Table 6.7.6.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.6.1.5-2 as appropriate and repeat steps 5-7.

### 6.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.6.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-RAT and GAP NEEDED<br>Table H.3.1-3<br>Table H.3.1-3a<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-7 with condition INTER-RAT<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.6.1.4.3-1A: MeasConfig (Test procedure step 3)**

| Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigE-UTRA-DEFAULT(Periodical) | Table 6.7.6.1.4.3-2 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EVENT | Table 6.7.6.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 2 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.6.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.6.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1 SEQUENCE { | | | |
| b1-ThresholdEUTRA CHOICE { | | | |
| rsrq | 34 | Set threshold to -3dB to ensure measId 2 will never be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 6.7.6.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

6.7.6.1.5 Test requirement

Table 6.7.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.6.1.5-1 and 6.7.6.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.6.1.5-3.

**Table 6.7.6.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 (FDD) |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 (TDD) |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 (TDD) |
| Gap pattern Id | | | 0 |
| PDSCH reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET reference channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| BWP configurations | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | -104 |
| $N_{oc}$[Note2] | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 17 |
| SS-RSRP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io[Note3] | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | | | AWGN |
| Antenna Configuration and Correlation Matrix | | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table 6.7.6.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | | | 1 | | |
| Duplex mode | Config 1, 2, 3 | | FDD | | |
| | Config 4, 5, 6 | | TDD | | |
| TDD special subframe configuration[Note1] | Config 1, 2, 3 | | N/A | | |
| | Config 4, 5, 6 | | 6 | | |
| TDD uplink-downlink configuration[Note1] | Config 1, 2, 3 | | N/A | | |
| | Config 4, 5, 6 | | 1 | | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | | - | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1, 2, 3 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | Config 4, 5, 6 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note2] | Config 1, 2, 3 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | | |
| | Config 4, 5, 6 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | | |
| PBCH_RA | | dB | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note3] | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| OCNG_RB[Note3] | | | | | |
| $N_{oc}$[Note4] | Depending on band group | dBm/15kHz | -83 | -104.70 | -119.5+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | dB | -1.75 | -3.2 | -3.2 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | -1.75 | -3.2 | -3.2 |
| RSRP[Note5] | Depending on band group | dBm/15kHz | -84.75 | -107.90 | -122.7+ $\Delta_{BG_offset}$ |
| RSRQ[Note5] | Depending on band group | dB | -14.76 | -15.69 | -15.69 |
| Io[Note5] | Depending on band group | dBm/Ch BW | -53 + 10log($N_{RB,c}$ /50) | -75.22 + 10log($N_{RB,c}$ /50) | -90.02+ $\Delta_{BG_offset}$ + 10log($N_{RB,c}$ /50) |
| Propagation Condition | | | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Void
Note 11: $\Delta_{BG_offset}$ for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

**Table 6.7.6.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
|---|---|---|---|
| Lowest reported value (Cell 2) | 4 | 0 | 0 |
| Highest reported value (Cell 2) | 16 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | 1 | 0 | 0 |
| Highest reported value (Cell 2) | 19 | 17 | 17 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.7 E-UTRAN RS-SINR

### 6.7.7.0 Minimum conformance requirements

#### 6.7.7.0.1 E-UTRAN RS-SINR absolute accuracy

The measurement period of E-UTRA RS-SINR in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 of TS 38.133 [6].

The accuracy requirements of E-UTRA RS-SINR measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RS-SINR Accuracy Requirements in clause 9.1.17.3 of TS 36.133 [23]:

The reporting range and mapping for E-UTRA RS-SINR measurements shall be the same as specified for RS-SINR measurements in clause 9.1.17.1 of TS 36.133 [23]:

The requirements for absolute accuracy of intra-frequency RS-SINR in this clause apply to a cell on the same frequency as that of the serving cell.

The accuracy requirements in Table 6.7.7.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.18 of TS 36.133 [23] for a corresponding Band.

**Table 6.7.7.0.1-1: Intra-frequency RS-SINR absolute accuracy**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| | | | Io Note 1 range | | |
| Normal condition | Extreme condition | Ês/Iot | E-UTRA operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB | | dBm/15kHz Note 3 | $dBm/BW_{Channel}$ |
| ±3.0 | ±4 | ≥-3 dB Note 5 | FDD_A, TDD_A | -121 | -50 |
| | | | FDD_B1, FDD_B2 | -120.5 | -50 |
| | | | FDD_C, TDD_C | -120 | -50 |
| | | | FDD_D | -119.5 | -50 |
| | | | FDD_E, TDD_E | -119 | -50 |
| | | | FDD_F | -118.5 | -50 |
| | | | FDD_G | -118 | -50 |
| | | | FDD_H | -117.5 | -50 |
| | | | FDD_N | -114.5 | -50 |
| ±3.5 | ±4 | ≥-6 dB | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The condition level is increased by Δ>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 4: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].
NOTE 5: The requirements apply for Ês/Iot ≤ 25 dB.

The reporting range of RS-SINR measurement is defined from -23 dB to 40 dB with 0.5 dB resolution.

The mapping of the measured quantity is defined in table 6.7.7.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.7.0.1-2: RS-SINR measurement report mapping**

| Reported Value | Measured Quantity Value | Unit |
|---|---|---|
| RS-SINR_000 | RS-SINR < -23 | dB |
| RS-SINR_001 | -23 ≤ RS-SINR < -22.5 | dB |
| … | … | … |
| RS-SINR_126 | 39.5 ≤ RS-SINR < 40 | dB |
| RS-SINR_127 | 40 ≤ RS-SINR | dB |

## 6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy

### 6.7.7.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RS-SINR absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

### 6.7.7.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA and *rs-SINR-MeasEUTRA*.

#### 6.7.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.7.1.

#### 6.7.7.1.1.4 Test description

##### 6.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.7.1.4.1-1.

**Table 6.7.7.1.4.1-1: test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.7.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD |
| 6.7.7.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.7.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD |
| 6.7.7.1-4 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD |
| 6.7.7.1-5 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD |
| 6.7.7.1-6 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.7.1.4.1-2.

**Table 6.7.7.1.4.1-2: initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.7.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

#### 6.7.7.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.7.1.5-1 and Table 6.7.7.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RS-SINR reported values in the periodic MeasurementReport. The RS-SINR value of Cell 2 reported by the UE is compared to the expected RS-SINR. If the value is outside the limits in Table 6.7.7.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.7.1.5-2 as appropriate and repeat steps 5-7.

#### 6.7.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.7.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-RAT and GAP NEEDED<br>Table H.3.1-3<br>Table H.3.1-3a<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-7 with condition INTER-RAT<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.7.1.4.3-1A: MeasConfig (Test procedure step 3)**

| Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigE-UTRA-DEFAULT(Periodical) | Table 6.7.7.1.4.3-2 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EVENT | Table 6.7.7.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 2 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.7.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.7.1.4.3-1A)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |

| | | | |
|---|---|---|---|
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1 SEQUENCE { | | | |
| b1-ThresholdEUTRA CHOICE { | | | |
| sinr | 127 | Set threshold to 40dB to ensure measId 2 will never be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.7.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.7.7.1.5 Test requirement

Table 6.7.7.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.7.1.5-1 and 6.7.7.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.7.1.5-3.

**Table 6.7.7.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 (FDD) |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 (TDD) |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 106 (TDD) |
| Gap pattern Id | | | 0 |
| PDSCH reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET reference channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET reference channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |

| | | | |
|---|---|---|---|
| | Config 3, 6 | | TRS.1.2 TDD |
| BWP configurations | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.2 FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | -104 |
| $N_{oc}$[Note2] | Config 1, 2, 4, 5 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 17 |
| SS-RSRP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP[Note3] | Config 1, 2, 4, 5 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io[Note3] | Config 1, 2, 4, 5 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/38.16 MHz | -52.87 |
| Propagation condition | | | AWGN |
| Antenna Configuration and Correlation Matrix | | | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 6.7.7.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | | | 1 | | |
| Duplex mode | Config 1, 2, 3 | | FDD | | |
| | Config 4, 5, 6 | | TDD | | |
| TDD special subframe configuration[Note1] | Config 1, 2, 3 | | N/A | | |
| | Config 4, 5, 6 | | 6 | | |
| TDD uplink-downlink configuration[Note1] | Config 1, 2, 3 | | N/A | | |
| | Config 4, 5, 6 | | 1 | | |
| $BW_{channel}$ | | MHz | 5 MHz: NRB,c = 25<br>10 MHz: NRB,c = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | | - | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1, 2, 3 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | Config 4, 5, 6 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note2] | Config 1, 2, 3 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | | |

| | | | | | |
|---|---|---|---|---|---|
| | Config 4, 5, 6 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | | |
| PBCH_RA | | dB | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA Note3 | | | | | |
| OCNG_RB Note3 | | | | | |
| $N_{oc1}$ Note4 | Depending on band group | dBm/15kHz | -88 | -108.50 | -119.5+ $\Delta_{BG_offset}$ |
| CRS $\hat{E}_s/N_{oc1}$ | | dB | -1.75 | 20.0 | -3.2 |
| CRS $\hat{E}_s/I_{ot}$ Note5 | | dB | -1.75 | 20.0 | -3.2 |
| RSRP Note5 | Depending on band group | dBm/15kHz | -89.75 | -88.50 | -122.7+ $\Delta_{BG_offset}$ |
| RS-SINR Note5 | | dB | -1.75 | 20 | -3.2 |
| Io Note5 | Depending on band group | dBm/Ch BW | -58.00 + 10log($N_{RB,c}$ /50) | -60.68 + 10log($N_{RB,c}$ /50) | -90.02+ $\Delta_{BG_offset}$ + 10log($N_{RB,c}$ /50) |
| Propagation Condition | | | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over CRS subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc1}$ to be fulfilled.
Note 4a: Void
Note 5: CRS $\hat{E}_s/I_{ot}$, RSRP, RS-SINR and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Void
Note 11: $\Delta_{BG_offset}$ for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

**Table 6.7.7.1.5-3: RS-SINR Intra frequency absolute accuracy requirements for the reported values**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
|---|---|---|---|
| Lowest reported value (Cell 2) | 35 | 79 | 32 |
| Highest reported value (Cell 2) | 51 | 94 | 49 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | 33 | 77 | 31 |
| Highest reported value (Cell 2) | 53 | 96 | 50 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.8 CLI Measurements

### 6.7.8.0 Minimum conformance requirements

#### 6.7.8.0.1 Minimum conformance requirements for SRS-RSRP accuracy

Same as in clause 4.7.6.0.1.

#### 6.7.8.0.2 Minimum conformance requirements for CLI-RSSI measurement accuracy with FR1 serving cell

Same as in clause 4.7.6.0.2

### 6.7.8.1 NR SA FR1 SRS-RSRP measurement accuracy

#### 6.7.8.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the SRS-RSRP measurement requirements in clause 6.7.8.0.

#### 6.7.8.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR and CLI-based SRS-RSRP measurements.

#### 6.7.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.8.1.

#### 6.7.8.1.4 Test description

In this set of test cases there is one cell in the test, FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 6.7.8.1.5-1 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 6.7.8.1.5-2. The SRS resource configuration is given in Table 6.7.8.1.5-3.

##### 6.7.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.8.1.4.1-1.

**Table 6.7.8.1.4.1-1: Supported test configurations for NR SA FR1 SRS-RSRP measurement accuracy**

| Config | Description |
|---|---|
| 6.7.8.1-1 | 15kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.8.1-2 | 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.8.1.4.1-2.

**Table 6.7.8.1.4.1-2: Initial conditions for NR SA FR1 SRS-RSRP measurement accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.8.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |

| | | | |
|---|---|---|---|
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.8.1.4.3.
2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Virtual UE 1 is the target for SRS-RSRP measurements.
3. The test parameters are given in Table 6.7.8.1.4.1-3

### 6.7.8.1.4.2 Test procedure

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS resource configuration in Table 6.7.8.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR* SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to the corresponding Test in Table 6.7.8.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message configuring a CLI measurement object with periodic reporting, as specified in section 6.7.8.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SRS-RSRP reported values in the periodic *MeasurementReport*. The reported SRS-RSRP value of the neighbour virtual UE is compared to the expected SRS-RSRP as specified in Table 6.7.8.1.5-4 and Table 6.7.8.1.5-5 for Test 1 and Test 2, correspondingly. If the reported value is outside the limits specified in such tables, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each Test in Table 6.7.8.1.5-1 as appropriate and repeat steps 2-7.

### 6.7.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 6.7.8.1.4.3-1: Common Exception messages for NR SA FR1 SRS-RSRP measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5 |

**Table 6.7.8.1.4.3-2: *MeasObjectToAddModList* for NR SA FR1 SRS-RSRP measurement accuracy**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-77 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 1 entry | | |

| | | | |
|---|---|---|---|
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectCLI-r16 | MeasObjectCLI-r16 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.8.1.4.3-3: *MeasObjectCLI-r16* for NR SA FR1 SRS-RSRP measurement accuracy**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectCLI-r16 ::= SEQUENCE { | | | |
| cli-ResourceConfig-r16 SEQUENCE { | | | |
| srs-ResourceConfig-r16 CHOICE { | | | |
| setup SEQUENCE { | | | |
| SRS-ResourceListConfigCLI-r16 SEQUENCE { | 1 entry | | |
| srs-Resource-r16 | SRSConf.1 | entry 1 | Config 1 |
| | SRSConf.2 | entry 1 | Config 2 |
| srs-SCS-r16 | kHz15 | | Config 1 |
| | kHz30 | | Config 2 |
| refServCellIndex-r16 | 0 | PCell | |
| refBWP-r16 | 0 | BWP-0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.8.1.4.3-4: *ReportConfigNR* for NR SA FR1 SRS-RSRP measurement accuracy**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| cli-Periodical-r16 SEQUENCE { | | | |
| reportInterval-r16 | ms240 | | |
| reportAmount-r16 | infinity | | |
| reportQuantityCLI-r16 | srs-rsrp | | |
| maxReportCLI-r16 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.8.1.4.3-5: *MeasResultCLI-r16* for NR SA FR1 SRS-RSRP measurement accuracy**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultCLI-r16 ::= SEQUENCE { | | | |
| measResultsListSRS-r16 CHOICE { | | | |
| srs-ResourceId-r16 | SRS-ResourceId | | |
| srs-RSRP-Result-r16 | SRS-RSRP-Range-r16 | INTEGER (0..98) | |
| } | | | |
| } | | | |

### 6.7.8.1.5 Test requirement

Table 6.7.8.1.5-1 and Table 6.7.8.1.5-2 define the primary level settings including test tolerances for NR SA FR1 SRS-RSRP measurement accuracy. Table 6.7.8.1.5-3 defines the SRS resource configurations. Table 6.7.8.1.5-4 and Table 6.7.8.1.5-5 define the absolute accuracy requirements for Tests 1, 2 and 3 for configurations 1 and 2, correspondingly.

**Table 6.7.8.1.5-1: NR Cell specific test parameters for NR SA FR1 SRS-RSRP measurement accuracy**

| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| SSB GSCN | | 1~2 | | freq1 | freq1 | freq1 |
| Duplex mode | | 1~2 | | TDD | TDD | TDD |
| TDD configuration | | 1 | | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
| | | 2 | | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| | | 2 | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| | | 2 | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 2 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | | 2 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~2 | | OP.1 | OP.1 | OP.1 |
| TRS configuration | | 1 | | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 2 | | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~2 | | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | | 1~2 | µs | 17.67 | 17.67 | 17.67 |
| EPRE ratio of PSS to SSS | | 1~2 | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 3 | 1 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 4 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 3 | 1 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 3 | 2 | | Not applicable Note 4 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |
| Note 1: | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 3: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | |
| Note 4: | Test 1 is not used when testing with 30kHz SSB SCS | | | | | |

**Table 6.7.8.1.5-2: Neighbor UE specific test parameters for NR SA FR1 SRS-RSRP measurement accuracy**

| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 5 | 1 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 6 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 5 | 1 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 6 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |
| $\hat{E}_s/I_{ot}$ on SRS | NR_TDD_FR1_A NOTE 5 | 1 | dB | 1.5 | 1.5 | 1.75 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 6 | 1.5 | 2.25 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| SRS RSRP Note3 | NR_TDD_FR1_A NOTE 5 | 1 | dBm/SRS SCS | -104.5 | -86.5 | -112.25 |
| | NR_TDD_FR1_C | | | | | -111.5 |
| | NR_TDD_FR1_D | | | | | -111 |
| | NR_TDD_FR1_E | | | | | -110.5 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 6 | -86.49 | -108.74 |
| | NR_TDD_FR1_C | | | | | -108.49 |
| | NR_TDD_FR1_D | | | | | -107.99 |
| | NR_TDD_FR1_E | | | | | -107.49 |
| Io Note3 | NR_TDD_FR1_A NOTE 5 | 1 | dBm/9.36 MHz | -74.42 | -56.42 | -82.28 |
| | NR_TDD_FR1_C | | | | | -81.42 |
| | NR_TDD_FR1_D | | | | | -80.92 |
| | NR_TDD_FR1_E | | | | | -80.42 |
| | NR_TDD_FR1_A NOTE 5 | 2 | dBm/38.16 MHz | Not applicable Note 6 | -54.80 | -77.49 |
| | NR_TDD_FR1_C | | | | | -76.80 |
| | NR_TDD_FR1_D | | | | | -76.30 |
| | NR_TDD_FR1_E | | | | | -75.80 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ on SRS | NR_TDD_FR1_A NOTE 5 | 1 | dB | 1.5 | 1.5 | 1.75 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| | NR_TDD_FR1_A NOTE 5 | 2 | | Not applicable Note 6 | 1.5 | 2.25 |
| | NR_TDD_FR1_C | | | | | 1.5 |
| | NR_TDD_FR1_D | | | | | 1.5 |
| | NR_TDD_FR1_E | | | | | 1.5 |
| Propagation condition | | 1~2 | | AWGN | AWGN | AWGN |
| Antenna configuration | | 1~2 | | 1x2 | 1x2 | 1x2 |
| SRS configuration | | 1 | | SRSConf.1 | SRSConf.1 | SRSConf.1 |
| | | 2 | | SRSConf.2 | SRSConf.2 | SRSConf.2 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
Note 6: Test 1 is not used when testing with 30kHz SSB SCS
Note 7: For Test 3, values are specified based on NR_TDD_FR1_X but they apply also to the FDD band group counterpart, NR_FDD_FR1_X. Informatively, test parameters are defined based on band group A and then add $\Delta_{BG_offset}$, which is the band group dependent component defined in clause 3A.4, Table 3A.4.1-2.

**Table 6.7.8.1.5-3: SRS configurations for NR SA FR1 SRS-RSRP measurement accuracy**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |
| | srs-ResourceIdList | 0 | 0 |
| | resourceType | Periodic | Periodic |
| | Usage | Codebook | Codebook |
| SRS-Resource | SRS-ResourceId | 0 | 0 |
| | nrofSRS-Ports | Port1 | Port1 |
| | transmissionComb | n2 | n2 |
| | combOffset-n2 | 0 | 0 |
| | cyclicShift-n2 | 0 | 0 |
| | resourceMapping startPosition | 0 | 0 |
| | resourceMapping nrofSymbols | n1 | n1 |
| | resourceMapping repetitionFactor | n1 | n1 |
| | freqDomainPosition | 0 | 0 |
| | freqDomainShift | 0 | 0 |
| | freqHopping c-SRS | 12 | 12 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl20, 9 | sl40, 19 |
| | sequenceId | 0 | 0 |

**Table 6.7.8.1.5-4: Absolute accuracy requirements for the reported values for test configuration 1 of NR SA FR1 SRS-RSRP measurement accuracy**

| Normal Conditions | Test 1 | Test 2 | Test 3 |
|---|---|---|---|

| | All bands | All bands | | |
|---|---|---|---|---|
| Lowest SRS-RSRP reported value | 30 | 45 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 23 |
| | | | Bands NR_TDD_FR1_C | 23 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 24 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 24 |
| Highest SRS-RSRP reported value | 41 | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | | Bands NR_TDD_FR1_C | 34 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 35 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | | |

**Table 6.7.8.1.5-5: Absolute accuracy requirements for the reported values for test configuration 2 of NR SA FR1 SRS-RSRP measurement accuracy**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest SRS-RSRP reported value | N/A Note 2 | 44 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | | Bands NR_TDD_FR1_C | 26 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 26 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 27 |
| Highest SRS-RSRP reported value | N/A Note 2 | 63 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 37 |
| | | | Bands NR_TDD_FR1_C | 37 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 38 |
| | | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 38 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2<br>Note 2: Test 1 is not used when testing with 30kHz SSB SCS | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.9 L1-SINR measurement for beam reporting

### 6.7.9.0 Minimum conformance requirements

#### 6.7.9.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

The UE shall be capable of performing L1-SINR measurements with the CSI-RS configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 6.7.9.0.1-1 for FR1 and in Table 6.7.9.0.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS}$ < MGRP)
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq$ MGRP or
- $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS} <$ MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} <$ MGRP)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 6.7.9.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320ms | ceil(M*P)*$T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

**Table 6.7.9.0.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P*N)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P*N)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320ms | ceil(M*P*N)*$T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The accuracy requirements in Table 6.7.9.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.

- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 6.7.9.0.1-3.

**Table 6.7.9.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/BW Channel | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±5.5 | ±6.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.27.1.

### 6.7.9.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 6.7.9.0.2-1 for FR1 and in Table 6.7.9.0.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of $P_{CMR}$ shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1 of TS 38.133 [6], in which the occasions and period of the SSB for CMR shall be used instead.

- the value of $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as "repetition = OFF" or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

**Table 6.7.9.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

**Table 6.7.9.0.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(1.5*M*P*N)*T_{DRX}$ |
| Note 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 6.7.9.0.2-3 and 6.7.9.0.2-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 6.7.9.0.2-3 and 6.7.9.0.2-4.

**Table 6.7.9.0.2-3: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB-CMR Ês/Iot | NZP-IMR Ês/Iot | Io Note 1 range | | | |
| | | | | NR operating band groups Note 2 | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | | dBm / $SCS_{SSB}$ | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |

| | | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
|---|---|---|---|---|---|---|---|---|
| ±4.0 | ±5.0 | ≥0 | ≥0 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

**Table 6.7.9.0.2-4: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB-CMR Ês/Iot** | **Io [Note 1] range** | | | | |
| | | | **NR operating band groups [Note 2]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±4.5 | ±5.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.27.2.

### 6.7.9.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 6.7.9.0.3-1 for FR1 and in Table 6.7.9.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if

- aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
- aperiodic CSI-IMR as dedicated IMR, or
- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
- periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of $P_{CMR}$ and $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 6.7.9.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |
| Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

**Table 6.7.9.0.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P*N)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |
| Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 6.7.9.0.3-3 and 6.7.9.0.3-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 6.7.9.0.3-3 and 6.7.9.0.3-4.

**Table 6.7.9.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot | NZP-IMR Ês/Iot | Io [Note 1] range | | | |
| | | | | NR operating band groups [Note 2] | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | | dBm / $SCS_{CSI\text{-}RS}$ | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |

| | | | | | **$SCS_{CSI-RS}$ = 15 kHz** | **$SCS_{CSI-RS}$ = 30 kHz** | **$SCS_{CSI-RS}$ = 60 kHz** | | |
|---|---|---|---|---|---|---|---|---|---|
| ±4.0 | ±5.0 | ≥0 | ≥0 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | | |

**Table 6.7.9.0.3-4: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1**

| **Accuracy** | | **Conditions** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS CMR Ês/Iot** | **Io [Note 1] range** | | | | | |
| | | | **NR operating band groups [Note 2]** | **Minimum Io** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{CSI-RS}$** | | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | | **$SCS_{CSI-RS}$ = 15 kHz** | **$SCS_{CSI-RS}$ = 30 kHz** | **$SCS_{CSI-RS}$ = 60 kHz** | | |
| ±4.5 | ±5.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. | | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.27.3.

## 6.7.9.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement

### 6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy

#### 6.7.9.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 6.7.9.1.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

#### 6.7.9.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.1.

#### 6.7.9.1.1.4 Test description

##### 6.7.9.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.1.1.4.1-1.

**Table 6.7.9.1.1.4.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description |
|---|---|
| 1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.1.1.4.1-2.

**Table 6.7.9.1.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.9.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.9.1.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-SINR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. The connection setup is done according to the settings in Annex C.1.1.

##### 6.7.9.1.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.1.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.1.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. If the value for both CSI-RSs is within the limits in Table 6.7.9.1.1.5-2 or Table 6.7.9.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.1.1.5-1 as appropriate and repeat steps 3-5.

#### 6.7.9.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.9.1.1.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.9.1.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. | |
| } | | | |
| } | | | |

#### 6.7.9.1.1.5 Test requirement

Table 6.7.9.1.1.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.1.1.5-3 for test configuration 3.

**Table 6.7.9.1.1.5-1: FR1 CSI-RS based L1-SINR test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 | freq1 |
| Duplex mode | 1 | | FDD | FDD |
| | 2 | | TDD | TDD |
| | 3 | | TDD | TDD |
| TDD Configuration | 1 | | N/A | N/A |
| | 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |

| | | | | | |
|---|---|---|---|---|---|
| | | 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | | 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | | 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 | | SSB.1 FR1 | SSB.1 FR1 |
| | | 2 | | SSB.1 FR1 | SSB.1 FR1 |
| | | 3 | | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~3 | | OP.1 | OP.1 |
| TRS configuration | | 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~3 | | SMTC.1 | SMTC.1 |
| CSI-RS | | 1 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | | 2 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | | 3 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~3 | | periodic | periodic |
| reportQuantity-r16 | | 1~3 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~3 | | 2 | 2 |
| L1-SINR reporting period | | 1~3 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -96.00 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | -2.2 |
| Propagation condition | | 1~3 | | AWGN | AWGN |
| Antenna configuration | | 1~3 | | 1x2 | 1x2 |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |

**Table 6.7.9.1.1.5-2: Same as Table Table 4.7.7.1.1.5-2**

**Table 6.7.9.1.1.5-3: Same as Table Table 4.7.7.1.1.5-3**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy

#### 6.7.9.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

#### 6.7.9.1.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

#### 6.7.9.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

#### 6.7.9.1.2.4 Test description

##### 6.7.9.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.7.9.1.2.4.1-2.

**Table 6.7.9.1.2.4.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description |
|---|---|
| 1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 6.7.9.1.2.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.9.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.9.1.2.4.3.
2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-SINR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.9.1.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.1.2.4.1-2.
2. Set the parameters according to T1 in Table 6.7.9.1.1.5-1.
3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.
4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 6.7.9.1.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 6.7.9.1.1.5-1 as appropriate and repeat steps 3-5.

#### 6.7.9.1.2.4.3 Message contents

Same message contents as described in section 6.7.9.1.1.4.3

#### 6.7.9.1.2.5 Test requirement

Table 6.7.9.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.9.1.2.5-2.

**Table 6.7.9.1.2.5-1: Same as Table 4.7.7.1.2.5-1**

**Table 6.7.9.1.2.5-2: Same as Table 4.7.7.1.2.5-2**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

#### 6.7.9.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 6.7.9.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

#### 6.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.2.

#### 6.7.9.2.4 Test description

##### 6.7.9.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.2.4.1-1.

**Table 6.7.9.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.2.4.1-2.

**Table 6.7.9.2.4.1-2: Initial conditions for SSB based and CSI-RS based L1-SINR absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.9.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.9.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

#### 6.7.9.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.2.5-1. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 6.7.9.2.5-2 and Table 6.7.9.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.2.5-1 as appropriate and repeat steps 3-5.

### 6.7.9.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.4.1.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.4.1.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.7.9.2.5 Test requirement

Table 6.7.9.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.9.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.2.5-3 for test configuration 3.

**Table 6.7.9.2.5-1: FR1 SSB based L1-SINR test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 | freq1 |

| | | | | | |
|---|---|---|---|---|---|
| Duplex mode | | 1 | | FDD | FDD |
| | | 2 | | TDD | TDD |
| | | 3 | | TDD | TDD |
| TDD Configuration | | 1 | | N/A | N/A |
| | | 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | | 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | | 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | | 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | | 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | | 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 2 | | SSB.3 FR1 | SSB.3 FR1 |
| | | 3 | | SSB.4 FR1 | SSB.4 FR1 |
| CSI-RS configuration | | 1 | | CSI-RS 1.1A FDD | CSI-RS 1.1A FDD |
| | | 2 | | CSI-RS 1.1A TDD | CSI-RS 1.1A TDD |
| | | 3 | | CSI-RS 2.1A TDD | CSI-RS 2.1A TDD |
| OCNG Patterns | | 1~3 | | OP.1 | OP.1 |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| TRS configuration | | 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~3 | | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~3 | | periodic | periodic |
| reportQuantity-r16 | | 1~3 | | ssb-Index-SINR-r16 | ssb-Index-SINR-r16 |
| Number of reported RS | | 1~3 | | 2 | 2 |
| L1-SINR reporting period | | 1~3 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -96.00 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |

| | | | | | |
|---|---|---|---|---|---|
| Io Note3 | Depending on band group | 1,2 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| Propagation condition | | 1~3 | | AWGN | AWGN |
| Antenna configuration | | 1~3 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 6.7.9.2.5-2: Same as Table 4.7.7.2.5-2**

**Table 6.7.9.2.5-3: Same as Table 4.7.7.2.5-3**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

### 6.7.9.3.1 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy

#### 6.7.9.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 6.7.9.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

#### 6.7.9.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.3.

#### 6.7.9.3.1.4 Test description

##### 6.7.9.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.3.1.4.1-1.

**Table 6.7.9.3.1.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| Config | Description |
|---|---|
| 1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.1.4.1-2.

**Table 6.7.9.3.1.4.1-2: Initial conditions for CSI-RS based CMR and CSI-IM based IMR absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.9.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.9.3.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based CMR and CSI-IM based IMR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR. The connection setup is done according to the settings in Annex C.1.1.

### 6.7.9.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.3.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.3.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.3.1.5-1. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 6.7.9.3.1.5-2 and Table 6.7.9.3.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.3.1.5-1 as appropriate and repeat steps 3-5.

### 6.7.9.3.1.4.3 Message contents

Same message content as in subclause 6.7.9.1.4.3 with the following exception:

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.9.3.1.4.3-1: Common Exception messages NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.9.3.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

6.7.9.3.1.5 Test requirement

Table 6.7.9.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.3.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.3.1.5-3 for test configuration 3.

**Table 6.7.9.3.5-1: FR1 CSI-RS based L1-SINR test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~3 | | freq1 | freq1 |
| Duplex mode | 1 | | FDD | FDD |
| | 2 | | TDD | TDD |
| | 3 | | TDD | TDD |
| TDD Configuration | 1 | | N/A | N/A |
| | 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | 1 | | SSB.1 FR1 | SSB.1 FR1 |
| | 2 | | SSB.1 FR1 | SSB.1 FR1 |
| | 3 | | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~3 | | OP.1 | OP.1 |
| TRS configuration | 1 | | TRS.1.1 FDD | TRS.1.1 FDD |

| | | | | | |
|---|---|---|---|---|---|
| | | 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1~3 | | SMTC.1 | SMTC.1 |
| CSI-RS | | 1 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| | | 2 | | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD |
| | | 3 | | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD |
| reportConfigType | | 1~3 | | periodic | periodic |
| reportQuantity-r16 | | 1~3 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 1~3 | | 2 | 2 |
| L1-SINR reporting period | | 1~3 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1,2 | dBm/15kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -96.00 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | | 1,2 | dBm/SSB SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | | 3 | | -93.00 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | -2.2 |
| SSB RSRP Note3 | Depending on band group | 1,2 | dBm/SSB SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | | 3 | | -83.00 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | Depending on band group | 1,2 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | | 3 | dBm/38.16 MHz | -51.53 | -80.90 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | -2.2 |
| Propagation condition | | 1~3 | | AWGN | AWGN |
| Antenna configuration | | 1~3 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 6.7.9.3.5-2: Same as Table 4.7.7.3.5-2**

**Table 6.7.9.3.5-3: Same as Table 4.7.7.3.5-3**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy

#### 6.7.9.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

#### 6.7.9.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

#### 6.7.9.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.7.9.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.3.

#### 6.7.9.3.2.4 Test description

##### 6.7.9.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.2.4.1-2.

**Table 6.7.9.3.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| Config | Description |
|---|---|
| 1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.2.4.1-2.

**Table 6.7.9.3.2.4.1-2: Initial conditions for CSI-RS based CMR and CSI-IM based IMR absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.9.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 6.7.9.3.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based CMR and CSI-IM based IMR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR. The connection setup is done according to the settings in Annex C.1.1.

#### 6.7.9.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.3.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.3.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.3.2.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 6.7.9.3.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.3.2.5-1 as appropriate and repeat steps 3-5.

#### 6.7.9.3.2.4.3 Message contents

Same message contents as described in section 6.7.9.3.1.4.3

### 6.7.9.3.2.5 Test requirement

Table 6.7.9.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.9.3.2.5-2.

**Table 6.7.9.3.2.5-1: Same as Table 6.7.9.3.1.5-1**

**Table 6.7.9.3.2.5-2: Same as Table 4.7.7.3.2.5-2**

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.10 CSI-RSRP

### 6.7.10.0 Minimum conformance requirements

Same as in clause 4.7.8.0.

### 6.7.10.1 Intra-frequency measurements

#### 6.7.10.1.1 NR SA FR1 CSI-RSRP absolute measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing
- Test procedure is missing
- Cell mapping is missing
- Antenna connection diagram is missing
- Applicability is missing
- TT is missing

#### 6.7.10.1.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP absolute measurement accuracy is within the specified limits for all bands. This test will partly verify the requirements in clause 10.1.2.3.1 in TS 38.133 [6].

#### 6.7.10.1.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 6.7.10.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7.10.0

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.10.1.

#### 6.7.10.1.1.1.4 Test description

##### 6.7.10.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.10.1.1.4.1-1.

**Table 6.7.10.1.1.4.1-1: NR SA FR1 CSI-RSRP absolute measurement accuracy supported test configurations**

| Configuration | Description |
|---|---|
| 6.7.10.1.1-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.7.10.1.1-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.10.1.1-3 | NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.10.1.1.4.1-2.

**Table 6.7.10.1.1.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.10.1.1.4.3.

2. There are two cells on the same frequency. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

#### 6.7.10.1.1.4.2 Test procedure

TBD

#### 6.7.10.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.10.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

#### 6.7.10.1.1.5 Test requirement

Table 6.7.10.1.1.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 6.7.10.1.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| | Config 2 | | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
| | Config 3 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Control channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Time offset with Cell 1 | Config 1 | ms | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 2,3 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1 | | SMTC.2 | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/15KhZ | -106 | | -88 | | -114 |
| | | NR_FDD_FR1_B | | | | | | -113.5 |
| | | NR_TDD_FR1_C | | | | | | -113 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 |
| | | NR_FDD_FR1_F | | | | | | -111.5 |
| | | NR_FDD_FR1_G | | | | | | -111 |
| | | NR_FDD_FR1_H | | | | | | -110.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | | -94 | | -114 |
| | | NR_FDD_FR1_B | | | | | | -113.5 |
| | | NR_TDD_FR1_C | | | | | | -113 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 |
| | | NR_FDD_FR1_F | | | | | | -111.5 |
| | | NR_FDD_FR1_G | | | | | | -111 |
| | | NR_FDD_FR1_H | | | | | | -110.5 |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -106 | | -88 | | Same as Noc/15kHz |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | | -91 | | -111 |
| | | NR_FDD_FR1_B | | | | | | -110.5 |
| | | NR_TDD_FR1_C | | | | | | -110 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109 |
| | | NR_FDD_FR1_F | | | | | | -108.5 |
| | | NR_FDD_FR1_G | | | | | | -108 |
| | | NR_FDD_FR1_H | | | | | | -107.5 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | | dB | 2.46 | -5.97 | 2.46 | -5.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1 | 6 | 1 | 3 | 0 |
| CSI-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -100 | -105 | -82 | -87 | -111.00 | -114.00 |
| | | NR_FDD_FR1_B | | | | | | -110.50 | -113.50 |
| | | NR_TDD_FR1_C | | | | | | -110.00 | -113.00 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.50 | -112.50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109.00 | -112.00 |
| | | NR_FDD_FR1_F | | | | | | -108.50 | -111.50 |
| | | NR_FDD_FR1_G | | | | | | -108.00 | -111.00 |
| | | NR_FDD_FR1_H | | | | | | -107.50 | -110.50 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | Not applicable Note 5 | -85 | -90 | -108.00 | -111.00 |
| | | NR_FDD_FR1_B | | | | | | -107.50 | -110.50 |
| | | NR_TDD_FR1_C | | | | | | -107.00 | -110.00 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -106.50 | -109.50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -106.00 | -109.00 |
| | | NR_FDD_FR1_F | | | | | | -105.50 | -108.50 |
| | | NR_FDD_FR1_G | | | | | | -105.00 | -108.00 |
| | | NR_FDD_FR1_H | | | | | | -104.50 | -107.50 |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -70.09 | | -52.09 | | -80.03 | |
| | | NR_FDD_FR1_B | | | | | | -79.53 | |
| | | NR_TDD_FR1_C | | | | | | -79.03 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -78.53 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -78.03 | |
| | | NR_FDD_FR1_F | | | | | | -77.53 | |
| | | NR_FDD_FR1_G | | | | | | -77.03 | |
| | | NR_FDD_FR1_H | | | | | | -76.53 | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16MHz | Not applicable Note 5 | | -51.99 | | -73.94 | |
| | | NR_FDD_FR1_B | | | | | | -73.44 | |
| | | NR_TDD_FR1_C | | | | | | -72.94 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -72.44 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -71.94 | |
| | | NR_FDD_FR1_F | | | | | | -71.44 | |
| | | NR_FDD_FR1_G | | | | | | -70.94 | |
| | | NR_FDD_FR1_H | | | | | | -70.44 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| | |
|---|---|
| Note 3: | CSI -RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | CSI -RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | Subtest 1 is not used when testing with 30kHz SSB SCS. |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification |

**Table 6.7.10.1.1.5-2: CSI-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

### 6.7.10.1.2 NR SA FR1 CSI-RSRP relative measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing
- Test procedure is missing
- Cell mapping is missing
- Antenna connection diagram is missing
- Applicability is missing
- TT is missing

#### 6.7.10.1.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP relative measurement accuracy is within the specified limits for all bands. This test will partly verify the requirements in clause 10.1.2.3.2 in TS 38.133 [6].

#### 6.7.10.1.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 6.7.10.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7.10.0

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.10.1.

#### 6.7.10.1.2.1.4 Test description

#### 6.7.10.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.10.1.2.4.1-1.

**Table 6.7.10.1.2.4.1-1: NR SA FR1 CSI-RSRP absolute measurement accuracy supported test canfigurations**

| Configuration | Description |
|---|---|
| 6.7.10.1.2-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.7.10.1.2-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.10.1.2-3 | NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.10.1.2.4.1-2.

**Table 6.7.10.1.2.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.10.1.2.4.3.
2. There are two cells on the same frequency. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

### 6.7.10.1.2.4.2 Test procedure

TBD

### 6.7.10.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.10.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

### 6.7.10.1.2.5 Test requirement

Table 6.7.10.1.2.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 6.7.10.1.2.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| | Config 2 | | | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
| | Config 3 | | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control channel RMC | Config 1 | | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1 | | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 2 | | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3 | | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Time offset with Cell 1 | Config 1 | | ms | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 2,3 | | μs | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1 | | | SMTC.2 | | | | | |
| | Config 2,3 | | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | kHz | 15 kHz | | | | | |
| | Config 3 | | | 30kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/15KhZ | -106 | | -88 | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | | -94 | | -114 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -106 | | -88 | | Same as Noc/15kHz | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | | -91 | | -111 | |
| | | NR_FDD_FR1_B | | | | | | -110.5 | |
| | | NR_TDD_FR1_C | | | | | | -110 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109 | |
| | | NR_FDD_FR1_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.46 | -5.97 | 2.46 | -5.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1 | 6 | 1 | 3 | 0 |
| CSI-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -100 | -105 | -82 | -87 | -111.00 | -114.00 |
| | | NR_FDD_FR1_B | | | | | | -110.50 | -113.50 |
| | | NR_TDD_FR1_C | | | | | | -110.00 | -113.00 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.50 | -112.50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109.00 | -112.00 |
| | | NR_FDD_FR1_F | | | | | | -108.50 | -111.50 |
| | | NR_FDD_FR1_G | | | | | | -108.00 | -111.00 |
| | | NR_FDD_FR1_H | | | | | | -107.50 | -110.50 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | Not applicable Note 5 | Not applicable Note 5 | -85 | -90 | -108.00 | -111.00 |
| | | NR_FDD_FR1_B | | | | | | -107.50 | -110.50 |
| | | NR_TDD_FR1_C | | | | | | -107.00 | -110.00 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -106.50 | -109.50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -106.00 | -109.00 |
| | | NR_FDD_FR1_F | | | | | | -105.50 | -108.50 |
| | | NR_FDD_FR1_G | | | | | | -105.00 | -108.00 |
| | | NR_FDD_FR1_H | | | | | | -104.50 | -107.50 |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -70.09 | | -52.09 | | -80.03 | |
| | | NR_FDD_FR1_B | | | | | | -79.53 | |
| | | NR_TDD_FR1_C | | | | | | -79.03 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -78.53 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -78.03 |
| | | NR_FDD_FR1_F | | | | -77.53 |
| | | NR_FDD_FR1_G | | | | -77.03 |
| | | NR_FDD_FR1_H | | | | -76.53 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16MHz | Not applicable Note 5 | -51.99 | -73.94 |
| | | NR_FDD_FR1_B | | | | -73.44 |
| | | NR_TDD_FR1_C | | | | -72.94 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -72.44 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -71.94 |
| | | NR_FDD_FR1_F | | | | -71.44 |
| | | NR_FDD_FR1_G | | | | -70.94 |
| | | NR_FDD_FR1_H | | | | -70.44 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI -RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI -RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 6.7.10.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

## 6.7.10.2 Inter-frequency measurements

### 6.7.10.2.1 NR SA FR1-FR1 CSI-RSRP absolute measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing

- Test procedure is missing

- Cell mapping is missing

- Antenna connection diagram is missing

- Applicability is missing

- TT is missing

#### 6.7.10.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency CSI-RSRP absolute measurement accuracy is within the specified limits for all bands. This test will partly verify the requirements in clause 10.1.4.3.1 in TS 38.133 [6].

#### 6.7.10.2.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 6.7.10.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7.10.0

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.10.2.

#### 6.7.10.2.1.1.4 Test description

##### 6.7.10.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.10.2.1.4.1-1.

**Table 6.7.10.2.1.4.1-1: NR SA FR1 CSI-RSRP absolute measurement accuracy supported test canfigurations**

| Configuration | Description |
|---|---|
| 6.7.10.2.1-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.7.10.2.1-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.10.2.1-3 | NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.10.2.1.4.1-2.

**Table 6.7.10.2.1.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.10.2.1.4.3.
2. There are two cells on different frequencies. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

##### 6.7.10.2.1.4.2 Test procedure

TBD

##### 6.7.10.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.10.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | TBD |

6.7.10.2.1.5 Test requirement

Table 6.7.10.2.1.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 6.7.10.2.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Duplex mode | 1 | | FDD | | FDD | |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| TDD configuration | 1 | | N/A | | N/A | |
| | 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | 3 | | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | 3 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 | | OP.1 | | OP.1 | |
| TRS configuration | 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | |
| | 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| Time offset with Cell 1 | 1,2 | µs | - | 4.7 | - | 4.7 |
| | 3 | µs | - | 2.35 | - | 2.35 |
| SMTC configuration | 1 | | SMTC.2 | | SMTC.2 | |
| | 2,3 | | SMTC.1 | | SMTC.1 | |
| CSI-RS configuration for RRM | 1 | | CSI-RS.RRM.FR1.1 FDD | | CSI-RS.RRM.FR1.1 FDD | |
| | 2 | | CSI-RS.RRM.FR1.1 TDD | | CSI-RS.RRM.FR1.1 TDD | |
| | 3 | | CSI-RS.RRM.FR1.2 TDD | | CSI-RS.RRM.FR1.2 TDD | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$[Note2] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -115 |
| | NR_FDD_FR1_B | | | | | | -114.5 |
| | NR_TDD_FR1_C | | | | | | -114 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 |
| | NR_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| $N_{oc}$[Note2] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/SSB SCS | -94.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -115 |
| | NR_FDD_FR1_B | | | | | | -114.5 |
| | NR_TDD_FR1_C | | | | | | -114 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 |
| | NR_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | | -91.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -112.00 |
| | NR_FDD_FR1_B | | | | | | -112.50 |
| | NR_TDD_FR1_C | | | | | | -112.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -111.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -111.00 |
| | NR_FDD_FR1_F | | | | | | -110.50 |
| | NR_FDD_FR1_G | | | | | | -110.00 |
| | NR_FDD_FR1_H | | | | | | -110.50 |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| CSI-RSRP[Note3] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/SCS | -84.65 | | (RSRP for Cell 2 +25dB) | -118.00 |
| | NR_FDD_FR1_B | | | | | | -117.50 |
| | NR_TDD_FR1_C | | | | | | -117.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -116.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -116.00 |
| | NR_FDD_FR1_F | | | | | -115.50 |
| | NR_FDD_FR1_G | | | | | -115.00 |
| | NR_FDD_FR1_H | | | | | -114.50 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | | -81.65 | (RSRP for Cell 2 +25dB) | -115.00 |
| | NR_FDD_FR1_B | | | | | -114.50 |
| | NR_TDD_FR1_C | | | | | -114.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -113.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -113.00 |
| | NR_FDD_FR1_F | | | | | -112.50 |
| | NR_FDD_FR1_G | | | | | -112.00 |
| | NR_FDD_FR1_H | | | | | -111.50 |
| Io[Note3] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/ 9.36MHz | -56.28 | Io for Channel 2 +19.75dB | -85.28 |
| | NR_FDD_FR1_B | | | | | -84.78 |
| | NR_TDD_FR1_C | | | | | -84.28 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -83.78 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -83.28 |
| | NR_FDD_FR1_F | | | | | -82.78 |
| | NR_FDD_FR1_G | | | | | -82.28 |
| | NR_FDD_FR1_H | | | | | -81.78 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | dBm/ 38.16MHz | -50.19 | Io for Channel 2 +19.75dB | -79.19 |
| | NR_FDD_FR1_B | | | | | -78.69 |
| | NR_TDD_FR1_C | | | | | -78.19 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -77.69 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -77.19 |
| | NR_FDD_FR1_F | | | | | -76.69 |
| | NR_FDD_FR1_G | | | | | -76.19 |
| | NR_FDD_FR1_H | | | | | -75.69 |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~3 | - | AWGN | | AWGN | |
| Antenna configuration | | 1~3 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |
|---|---|

**Table 6.7.10.2.1.5-2: CSI-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

### 6.7.10.2.2 NR SA FR1-FR1 CSI-RSRP relative measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing
- Test procedure is missing
- Cell mapping is missing
- Antenna connection diagram is missing
- Applicability is missing
- TT is missing

#### 6.7.10.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency CSI-RSRP relative measurement accuracy is within the specified limits for all bands. This test will partly verify the requirements in clause 10.1.4.3.2 in TS 38.133 [6].

#### 6.7.10.2.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 6.7.10.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7.10.0

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.10.2.

#### 6.7.10.2.2.1.4 Test description

#### 6.7.10.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.10.2.2.4.1-1.

**Table 6.7.10.2.2.4.1-1: NR SA FR1 CSI-RSRP relative measurement accuracy supported test canfigurations**

| Configuration | Description |
|---|---|
| 6.7.10.2.2-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.7.10.2.2-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.10.2.2-3 | NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.10.2.2.4.1-2.

**Table 6.7.10.2.2.4-3: Test Environment parameters**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 6.7.10.2.2.4.3.
2. There are two cells on different frequencies. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

### 6.7.10.2.2.4.2 Test procedure

TBD

### 6.7.10.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 6.7.10.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

### 6.7.10.2.2.5 Test requirement

Table 6.7.10.2.2.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 6.7.10.2.2.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Duplex mode | 1 | | FDD | | FDD | |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| TDD configuration | 1 | | N/A | | N/A | |
| | 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | 3 | | CR.2.1 FDD | - | CR.2.1 FDD | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 3 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | | 1~3 | | OP.1 | | OP.1 | |
| TRS configuration | | 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | |
| | | 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | | 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| Time offset with Cell 1 | | 1,2 | µs | - | 4.7 | - | 4.7 |
| | | 3 | µs | - | 2.35 | - | 2.35 |
| SMTC configuration | | 1 | | SMTC.2 | | SMTC.2 | |
| | | 2,3 | | SMTC.1 | | SMTC.1 | |
| CSI-RS configuration for RRM | | 1 | | CSI-RS.RRM.FR1.1 FDD | | CSI-RS.RRM.FR1.1 FDD | |
| | | 2 | | CSI-RS.RRM.FR1.1 TDD | | CSI-RS.RRM.FR1.1 TDD | |
| | | 3 | | CSI-RS.RRM.FR1.2 TDD | | CSI-RS.RRM.FR1.2 TDD | |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -115 |
| | NR_FDD_FR1_B | | | | | | -114.5 |
| | NR_TDD_FR1_C | | | | | | -114 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 |
| | NR_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/SS B SCS | -94.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -115 |
| | NR_FDD_FR1_B | | | | | | -114.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NR_TDD_FR1_C | | | | | | -114 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 |
| | NR_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | | -91.65 | | ( $N_{oc}$ for Channel 2 +8dB) | -112.00 |
| | NR_FDD_FR1_B | | | | | | -112.50 |
| | NR_TDD_FR1_C | | | | | | -112.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -111.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -111.00 |
| | NR_FDD_FR1_F | | | | | | -110.50 |
| | NR_FDD_FR1_G | | | | | | -110.00 |
| | NR_FDD_FR1_H | | | | | | -110.50 |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| CSI-RSRP[Note3] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/SCS | -84.65 | | (RSRP for Cell 2 +25dB) | -118.00 |
| | NR_FDD_FR1_B | | | | | | -117.50 |
| | NR_TDD_FR1_C | | | | | | -117.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -116.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -116.00 |
| | NR_FDD_FR1_F | | | | | | -115.50 |
| | NR_FDD_FR1_G | | | | | | -115.00 |
| | NR_FDD_FR1_H | | | | | | -114.50 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | | -81.65 | | (RSRP for Cell 2 +25dB) | -115.00 |
| | NR_FDD_FR1_B | | | | | | -114.50 |
| | NR_TDD_FR1_C | | | | | | -114.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113.00 |
| | NR_FDD_FR1_F | | | | | | -112.50 |
| | NR_FDD_FR1_G | | | | | | -112.00 |
| | NR_FDD_FR1_H | | | | | | -111.50 |
| Io[Note3] | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2 | dBm/9.36MHz | -56.28 | | Io for Channel 2 +19.75dB | -85.28 |
| | NR_FDD_FR1_B | | | | | | -84.78 |
| | NR_TDD_FR1_C | | | | | | -84.28 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -83.78 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -83.28 |
| | NR_FDD_FR1_F | | | | | | -82.78 |
| | NR_FDD_FR1_G | | | | | | -82.28 |
| | NR_FDD_FR1_H | | | | | | -81.78 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 3 | dBm/ 38.16MHz | -50.19 | | Io for Channel 2 +19.75dB | -79.19 |
| | NR_FDD_FR1_B | | | | | | -78.69 |
| | NR_TDD_FR1_C | | | | | | -78.19 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -77.69 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -77.19 |
| | NR_FDD_FR1_F | | | | | | -76.69 |
| | NR_FDD_FR1_G | | | | | | -76.19 |
| | NR_FDD_FR1_H | | | | | | -75.69 |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~3 | - | AWGN | | AWGN | |
| Antenna configuration | | 1~3 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 6.7.10.2.2.5-2: CSI-RSRP Inter frequency relative accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

# 6.7.11 CSI-RSRQ

## 6.7.11.0 Minimum conformance requirements

### 6.7.11.0.1 Intra-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.7.2 and Clause 10.1.11]

#### 6.7.11.0.1.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in Clause 9.10.2.1 in FR1 in TS 38.133 [6].

The accuracy requirements in Table 6.7.11.0.1.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 in TS 38.133 [6] for a corresponding Band for associated SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.11.0.1.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

**Table 6.7.11.0.1.1-1: CSI-RSRQ Intra frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 3] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±2.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 6.7.11.0.1.1-2. The range in the signaling may be larger than the guaranteed accuracy range.

**Table 6.7.11.0.1.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |

| | | |
|---|---|---|
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 6.7.11.0.2 Inter-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.9.2 and Clause 10.1.11]

#### 6.7.11.0.2.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the inter-frequency measurement defined in Clause 9.10.3.1 in FR1 in TS 38.133 [6].

The accuracy requirements in Table 6.7.11.0.2.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.11.0.2.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 6.7.11.0.2.1-1: CSI-RSRQ Inter frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io [Note 1] range** | | | | | |
| | | | **NR operating band groups [Note 3]** | **Minimum Io** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{CSI-RS}$** | | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | | **$SCS_{CSI-RS}$ = 15 kHz** | **$SCS_{CSI-RS}$ = 30 kHz** | **$SCS_{CSI-RS}$ = 60 kHz** | | |
| ±2.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 6.7.11.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.11.0.2.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 6.7.11.0.2.2 Relative CSI-RSRQ accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR1.

The accuracy requirements in Table 6.7.11.0.2.2-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for the associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.11.0.2.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 6.7.11.0.2.2-1: CSI-RSRQ Inter frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS $\hat{E}s/Iot$ Note 2 | Io Note 1 range | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |

| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
|---|---|---|---|---|---|---|---|---|
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].

## 6.7.11.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 6.7.11.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.2 in TS 38.133 [6].

### 6.7.11.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA and CSI-RS based RSRP and RSRQ measurements.

### 6.7.11.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 6.7.11.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.6.7.11.1.

### 6.7.11.1.4 Test description

#### 6.7.11.1.4.1 Initial conditions

Supported test configuration are shown in Table 6.7.11.1.4.1-1.

**Table 6.7.11.1.4.1-1: Intra frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.11.1.4.1-2.

**Table 6.7.11.1.4.1-2: Initial conditions for CSI-RSRQ intra-frequency accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] Clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.11.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | Without the LTE link | | |

1. Message contents are defined in Clause 6.7.11.2.4.3.

2. In this test case all cells are on the same carrier frequency. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for CSI-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.3.

### 6.7.11.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.

2. Set the parameters according to Table 6.7.11.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 2 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 6.7.11.0.1.1-1 and Table 6.7.11.0.1.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.11.1.5-1 as appropriate and repeat steps 5-7.

### 6.7.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 6.7.11.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and RSRQ |

**Table 6.7.11.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

6.7.11.1.5 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in Clause 6.7.11.0.1.

**Table 6.7.11.1.5-1: CSI-RSRQ Intra frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Gap Pattern ID | | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TRS Configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| OCNG Patterns | | | OP. 1 | | | | | | |
| Time offset with Cell 1 | Config 1 | µs | - | 4.7 | - | 4.7 | - | 4.7 | |
| | Config 2,3 | µs | - | 2.35 | - | 2.35 | - | 2.35 | |
| CSI-RS configuration for RRM | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | | | | |
| SMTC configuration | Config 1 | | SMTC.2 | | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | | |
| | Config 3 | | 30kHz | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}^{Note2}$ | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 15kHz | -85 | | -101 | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | | NR_FDD_FR1_N | | | | | | -107.5 | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -91 | | - | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | | NR_FDD_FR1_N | | | | | | -107.5 | |
| $N_{oc}^{Note2}$ | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ SCS | -85 | | -101 | | -114 | |
| | | NR_FDD_FR1_B | | | | | | -113.5 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NR_TDD_FR1_C | | | | | | -113 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -112.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -112 | |
| | | NR_FDD_FR1_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| | | NR_FDD_FR1_N | | | | | | -107.5 | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -88 | | - | | -111 | |
| | | NR_FDD_FR1_B | | | | | | -110.5 | |
| | | NR_TDD_FR1_C | | | | | | -110 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -109.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -109 | |
| | | NR_FDD_FR1_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| | | NR_FDD_FR1_N | | | | | | -104.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5..46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| SS-RSRP/ CSI-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ SCS | -82 | -82 | -103.9 | -103.9 | -118 | -118 |
| | | NR_FDD_FR1_B | | | | | | -117.5 | -117.5 |
| | | NR_TDD_FR1_C | | | | | | -117 | -117 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -116.5 | -116.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -116 | -116 |
| | | NR_FDD_FR1_F | | | | | | -115.5 | -115.5 |
| | | NR_FDD_FR1_G | | | | | | -115 | -115 |
| | | NR_FDD_FR1_H | | | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_N | | | | | | -111.5 | -111.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -85 | -85 | - | - | -115 | -115 |
| | | NR_FDD_FR1_B | | | | | | -114.5 | -114.5 |
| | | NR_TDD_FR1_C | | | | | | -114 | -114 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -113.5 | -113.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -113 | -113 |
| | | NR_FDD_FR1_F | | | | | | -112.5 | -112.5 |
| | | NR_FDD_FR1_G | | | | | | -112 | -112 |
| | | NR_FDD_FR1_H | | | | | | -111.5 | -111.5 |
| | | NR_FDD_FR1_N | | | | | | -108.5 | -108.5 |
| SS-RSRQ/CSI-RSRQ Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
| | | NR_FDD_FR1_B | | | | | | | |
| | | NR_TDD_FR1_C | | | | | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | | |
| | | NR_FDD_FR1_F | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| | | NR_FDD_FR1_N | | | | | | | |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -50 | | -70 | | -83.5 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_B | | | | | | -83 | |
| | | NR_TDD_FR1_C | | | | | | -82.5 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -82 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -81.5 | |
| | | NR_FDD_FR1_F | | | | | | -81 | |
| | | NR_FDD_FR1_G | | | | | | -80.5 | |
| | | NR_FDD_FR1_H | | | | | | -80 | |
| | | NR_FDD_FR1_N | | | | | | -77 | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16 MHz | -50 | | - | | -77.4 | |
| | | NR_FDD_FR1_B | | | | | | -76.9 | |
| | | NR_TDD_FR1_C | | | | | | -76.4 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -75.9 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -75.4 | |
| | | NR_FDD_FR1_F | | | | | | -74.9 | |
| | | NR_FDD_FR1_G | | | | | | -74.4 | |
| | | NR_FDD_FR1_H | | | | | | -73.9 | |
| | | NR_FDD_FR1_N | | | | | | -70.9 | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.11.2 SA inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 6.7.11.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.2.1 and 10.1.9.2.2 in TS 38.133 [6].

### 6.7.11.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA and CSI-RS based RSRP and RSRQ measurements.

### 6.7.11.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 6.7.11.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.6.7.11.2.

### 6.7.11.2.4 Test description

#### 6.7.11.2.4.1 Initial conditions

Supported test configurations are shown in Table 6.7.11.2.4.1-1.

**Table 6.7.11.2.4.1-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.11.2.4.1-2.

**Table 6.7.11.2.4.1-2: Initial conditions for CSI-RSRQ inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] Clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.11.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in Clause 6.7.11.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for CSI-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

### 6.7.11.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.

2. Set the parameters according to Table 6.7.11.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic MeasurementReport. The CSI-RSRQ value of Cell 2 reported by the UE is compared to the CSI-RSRQ value of Cell 1 reported by the UE. If the difference between both values is outside the limits (determined by Table 6.7.11.0.2.1-1 and Table 6.7.11.0.2.1-2) or the UE fails to report the measurement value for Cell 2 or Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.11.2.5-1 as appropriate and repeat steps 5-7.

### 6.7.11.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 6.7.11.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-6 with condition gapUE and Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and RSRQ |

**Table 6.7.11.2.4.3-2: ReportConfigNR-DEFAULT (Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 6.7.11.2.5 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in Clause 6.7.11.0.2.

**Table 6.7.11.2.5-1: CSI-RSRQ Inter frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Gap pattern ID | Config 1,2,3 | | 0 | | | | | |
| BWP BW | Config 1 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: NRB,c = 106 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2,5 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3,6 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | | |
| Time offset with Cell 1 | Config 1,2 | µs | - | 4.7 | - | 4.7 | - | 4.7 | |
| | Config 3 | µs | - | 2.35 | - | 2.35 | - | 2.35 | |
| CSI-RS configuration for RRM | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | | |
| SMTC configuration | Config 1,2 | | SMTC.2 | | | | | | |
| | Config 3 | | SMTC.1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | | |
| | Config 3 | | 30 kHz | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$Note 2 | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -80.18 | | -106 | | -116 | |
| | | NR_FDD_FR1_B | | | | | | -115.5 | |
| | | NR_TDD_FR1_C | | | | | | -115 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -114.5 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -114 | |
| | | NR_FDD_FR1_F | | | | | | -113.5 | |
| | | NR_FDD_FR1_G | | | | | | -113 | |
| | | NR_FDD_FR1_H | | | | | | -112.5 | |
| | | NR_FDD_FR1_N | | | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 3 | NR_FDD_FR1_A | dBm/15kHz | -86.27 | | -113 | | -116 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | NR_TDD_FR1_A NOTE 6 | | | | | |
| | | NR_FDD_FR1_B | | | | -115.5 | |
| | | NR_TDD_FR1_C | | | | -115 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -114.5 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -114 | |
| | | NR_FDD_FR1_F | | | | -113.5 | |
| | | NR_FDD_FR1_G | | | | -113 | |
| | | NR_FDD_FR1_H | | | | -112.5 | |
| | | NR_FDD_FR1_N | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -80.18 | -106 | -116 | |
| | | NR_FDD_FR1_B | | | | -115.5 | |
| | | NR_TDD_FR1_C | | | | -115 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -114.5 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -114 | |
| | | NR_FDD_FR1_F | | | | -113.5 | |
| | | NR_FDD_FR1_G | | | | -113 | |
| | | NR_FDD_FR1_H | | | | -112.5 | |
| | | NR_FDD_FR1_N | | | | -109.5 | |
| | Config 3 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | | -83.27 | -110 | -113 | |
| | | NR_FDD_FR1_B | | | | -112.5 | |
| | | NR_TDD_FR1_C | | | | -112 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -111.5 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -111 | |
| | | NR_FDD_FR1_F | | | | -110.5 | |
| | | NR_FDD_FR1_G | | | | -110 | |
| | | NR_FDD_FR1_H | | | | -109.5 | |
| | | NR_FDD_FR1_N | | | | -106.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP/CSI-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/SCS | -81.93 | -81.93 | -107.75 | -107.75 | -113 | -117.75 |
| | | NR_FDD_FR1_B | | | | | | -112.5 | -117.25 |
| | | NR_TDD_FR1_C | | | | | | -112 | -116.75 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -111.5 | -116.25 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -111 | -115.75 |
| | | NR_FDD_FR1_F | | | | | | -110.5 | -115.2 |
| | | NR_FDD_FR1_G | | | | | | -110 | -114.75 |
| | | NR_FDD_FR1_H | | | | | | -109.5 | -114.25 |
| | | NR_FDD_FR1_N | | | | | | -106.5 | -111.25 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | | -85.02 | -85.02 | -111.75 | -111.75 | -110 | -114.75 |
| | | NR_FDD_FR1_B | | | | | | -109.5 | -114.25 |
| | | NR_TDD_FR1_C | | | | | | -109 | -113.75 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -108.5 | -113.25 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -108 | -112.75 |
| | | NR_FDD_FR1_F | | | | | | -107.5 | -112.2 |
| | | NR_FDD_FR1_G | | | | | | -107 | -111.75 |
| | | NR_FDD_FR1_H | | | | | | -106.5 | -111.25 |
| | | NR_FDD_FR1_N | | | | | | -103.5 | -108.25 |
| SS-RSRQ/CSI-RSRQ[Note3] | | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dB | -14.77 | -14.77 | -40.59 | -40.59 | 12.56 T | 14.76 T |
| | | NR_FDD_FR1_B | | | | | | | |
| | | NR_TDD_FR1_C | | | | | | | |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | | |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | | |
| | | NR_FDD_FR1_F | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| | | NR_FDD_FR1_N | | | | | | | |
| Io[Note3] | Config 1,2 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | dBm/SCS | -50 | | -75.83 | | -83.28 | -85.83 |
| | | NR_FDD_FR1_B | | | | | | -82.78 | -85.33 |
| | | NR_TDD_FR1_C | | | | | | -82.28 | -84.83 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -81.78 | -84.33 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -81.28 | -83.83 |
| | | NR_FDD_FR1_F | | | | | | -80.78 | -83.33 |
| | | NR_FDD_FR1_G | | | | | | -80.28 | -82.83 |
| | | NR_FDD_FR1_H | | | | | | -79.78 | -82.33 |
| | | NR_FDD_FR1_N | | | | | | -76.78 | -79.33 |
| | Config 3 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NOTE 6 | | -50 | | -76.73 | | -77.19 | -79.73 |
| | | NR_FDD_FR1_B | | | | | | -76.69 | -79.23 |
| | | NR_TDD_FR1_C | | | | | | -76.19 | -78.73 |
| | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | | | | | | -75.69 | -78.23 |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | -75.19 | -77.73 |
| | | NR_FDD_FR1_F | | | | | | -74.69 | -77.23 |
| | | NR_FDD_FR1_G | | | | | | -74.19 | -76.73 |
| | | NR_FDD_FR1_H | | | | | | -73.69 | -76.53 |
| | | NR_FDD_FR1_N | | | | | | -70.69 | -73.53 |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 6.7.12 CSI-SINR

## 6.7.12.0 Minimum conformance requirements

### 6.7.12.0.1 Intra-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.12.2 and Clause 10.1.16]

#### 6.7.12.0.1.1 Absolute CSI-SINR accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 6.7.12.0.1.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for intra-frequency measurement is serving cell timing.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.12.0.1.1-1.

**Table 6.7.12.0.1.1-1: CSI-SINR Intra frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io [Note 1] range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | NR operating band groups | Minimum Io | | | | Maximum Io |
| | | | | dBm / SCS | | | dBm/BW Channel | dBm/BW Channel |
| | | | | SCS (kHz) | | | | |
| dB | dB | dB | | 15 | 30 | 60 | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].<br>NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP. | | | | | | | | |

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 6.7.12.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.12.0.1.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

### 6.7.12.0.2 Inter-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.14.2 and Clause 10.1.16]

#### 6.7.12.0.2.1 Absolute CSI-SINR accuracy

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 6.7.12.0.2.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.12.0.2.1-1.

**Table 6.7.12.0.2.1-1: CSI-SINR Inter frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / SCS | | | dBm/BW Channel | dBm/BW Channel |
| | | | | SCS (kHz) | | | | |
| | | | | 15 | 30 | 60 | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].
NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 6.7.12.0.2.1-2. The range in the signaling may be larger than the guaranteed accuracy range.

**Table 6.7.12.0.2.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

### 6.7.12.0.2.2 Relative CSI-SINR accuracy

The relative accuracy of CSI-SINR in inter-frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR1 compared to the CSI-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 6.7.12.0.2.2-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 6.7.12.0.2.2-1.

**Table 6.7.12.0.2.2-1: CSI-SINR Inter frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 3 | NR operating band groups | Minimum Io | | | | Maximum Io |
| | | | | dBm / SCS | | | dBm/BW Channel | dBm/BW Channel |
| | | | | SCS (kHz) | | | | |
| dB | dB | dB | | 15 | 30 | 60 | | |
| ±3.5 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | -108.5 | N/A | -70 |
| ±4 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
NOTE 4: NR operating band groups in FR1 are as defined in Clause 3.5.2 in TS 38.133 [6].
NOTE 5: The requirements apply for CSI-RS Ês/Iot ≤ XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

## 6.7.12.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 6.7.12.1.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.12.2.1 in TS 38.133 [6].

#### 6.7.12.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA, which supports CSI-RS based SINR measurements.

#### 6.7.12.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 6.7.12.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.6.7.12.1.

#### 6.7.12.1.4 Test description

##### 6.7.12.1.4.1 Initial conditions

Supported test configuration are shown in Table 6.7.12.1.4.1-1.

**Table 6.7.12.1.4.1-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.12.1.4.1-2.

**Table 6.7.12.1.4.1-2: Initial conditions for CSI-SINR intra-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] Clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.12.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in Clause 6.7.12.1.4.3.
2. In this test case all cells are on the same carrier frequency. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for CSI-SINR measurements. The connection setup is done according to the settings in Annex C.1.3.

#### 6.7.12.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 6.7.12.1.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 2 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 6.7.12.0.1.1-1 and Table 6.7.12.0.1.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.12.1.5-1 as appropriate and repeat steps 5-7.

#### 6.7.12.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 6.7.12.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and SINR |

**Table 6.7.12.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.7.12.1.5 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in Clause 6.7.12.0.1.1.

**Table 6.7.12.1.5-1: CSI-SINR Intra frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| CSI-RSSI-Measurement | | | Not Applicable | | | |
| Time offset with Cell 1 | Config 1,2 | µs | - | 2.35 | - | 2.35 |
| | Config 3 | µs | - | 1.17 | - | 1.17 |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| SMTC configuration | Config 1 | | SMTC.2 | | | |
| | Config 2,3 | | SMTC.1 | | | |
| CSI-RS for mobility | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -93 | | -116 | |
| | NR_FDD_FR1_B | | | | -115.5 | |
| | NR_TDD_FR1_C | | | | -115 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -114.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -114 | |
| | NR_FDD_FR1_F | | | | -113.5 | |
| | NR_FDD_FR1_G | | | | -113 | |
| | NR_FDD_FR1_H | | | | -112.5 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_N | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -93 | | Same as Noc for 15 kHz | |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -90 | | -113 | |
| | | NR_FDD_FR1_B | | | | -112.5 | |
| | | NR_TDD_FR1_C | | | | -112 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -111.5 | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -111 | |
| | | NR_FDD_FR1_F | | | | -110.5 | |
| | | NR_FDD_FR1_G | | | | -110 | |
| | | NR_FDD_FR1_H | | | | -109.5 | |
| | | NR_FDD_FR1_N | | | | -106.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| CSI-RSRP Note 3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -88.46 | -90.34 | -120 | -120 |
| | | NR_FDD_FR1_B | | | | -119.5 | -119.5 |
| | | NR_TDD_FR1_C | | | | -119 | -119 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -118.5 | -118.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -118 | -118 |
| | | NR_FDD_FR1_F | | | | -117.5 | -117.5 |
| | | NR_FDD_FR1_G | | | | -117 | -117 |
| | | NR_FDD_FR1_H | | | | -116.5 | -116.5 |
| | | NR_FDD_FR1_N | | | | -113.5 | -113.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -85.46 | -87.34 | -117 | -117 |
| | | NR_FDD_FR1_B | | | | -116.5 | -116.5 |
| | | NR_TDD_FR1_C | | | | -116 | -116 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -115.5 | -115.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | -115 | -115 |
| | | NR_FDD_FR1_F | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_G | | | | -114 | -114 |
| | | NR_FDD_FR1_H | | | | -113.5 | -113.5 |
| | | NR_FDD_FR1_N | | | | -113.5 | -113.5 |
| CSI-SINR Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dB | 0 | -3.19 | -5.46 | -5.46 |
| | | NR_FDD_FR1_B | | | | | |
| | | NR_TDD_FR1_C | | | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | |
| | | NR_FDD_FR1_F | | | | | |
| | | NR_FDD_FR1_G | | | | | |
| | | NR_FDD_FR1_H | | | | | |
| | | NR_FDD_FR1_N | | | | -110.5 | -110.5 |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -57.5 | | -85.51 | |
| | | NR_FDD_FR1_B | | | | -85.01 | |
| | | NR_TDD_FR1_C | | | | -84.51 | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | -84.01 | |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -83.51 |
| | | NR_FDD_FR1_F | | | -83.01 |
| | | NR_FDD_FR1_G | | | -82.51 |
| | | NR_FDD_FR1_H | | | -82.01 |
| | | NR_FDD_FR1_N | | | -79.01 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16MHz | -51.41 | -79.41 |
| | | NR_FDD_FR1_B | | | -78.91 |
| | | NR_TDD_FR1_C | | | -78.41 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -77.91 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -77.41 |
| | | NR_FDD_FR1_F | | | -76.91 |
| | | NR_FDD_FR1_G | | | -76.41 |
| | | NR_FDD_FR1_H | | | -75.91 |
| | | NR_FDD_FR1_N | | | -72.91 |
| Propagation condition | | | - | AWGN | |
| Antenna configuration | | | - | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 6.7.12.2 SA inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing

### 6.7.12.2.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.14.2.1 and 10.1.14.2.2 in TS 38.133 [6].

### 6.7.12.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA, which supports CSI-RS based SINR measurements.

### 6.7.12.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 6.7.12.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.6.7.12.2.

6.7.12.2.4 Test description

6.7.12.2.4.1 Initial conditions

Supported test configurations are shown in Table 6.7.12.2.4.1-1.

**Table 6.7.12.2.4.1-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.12.2.4.1-2.

**Table 6.7.12.2.4.1-2: Initial conditions for CSI-SINR inter-frequency accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] Clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.12.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in Clause 6.7.12.2.4.3.

2. In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for CSI-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.12.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.

2. Set the parameters according to Table 6.7.12.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic MeasurementReport. The CSI-SINR value of Cell 2 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 6.7.12.0.2.1-1 and Table 6.7.12.0.2.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.12.2.5-1 as appropriate and repeat steps 5-7.

#### 6.7.12.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 6.7.12.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-6 with condition gapUE and Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and SINR |

**Table 6.7.12.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 6.7.12.2.5 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in Clause 6.7.12.0.2.1 and 6.7.12.0.2.2

**Table 6.7.12.2.5-1: CSI-SINR Inter frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| OCNG Patterns | | | OP.1 | | | | | | |
| CSI-RSSI-Measurement | | | Not Applicable | | | | | | |
| Time offset with Cell 1 | Config 1,2 | µs | - | 2.35 | - | 2.35 | - | 2.35 | |
| | Config 3 | µs | - | 1.17 | - | 1.17 | - | 1.17 | |
| SMTC configuration | Config 1 | | SMTC.2 | | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | | |
| CSI-RS for mobility | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | | | | |
| | Config 3 | | 30 | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -88 | | -108.5 | | -119.5 | |
| | | NR_FDD_FR1_B | | | | | | -119 | |
| | | NR_TDD_FR1_C | | | | | | -118.5 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -118 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -117.5 | |
| | | NR_FDD_FR1_F | | | | | | -117 | |
| | | NR_FDD_FR1_G | | | | | | -116.5 | |
| | | NR_FDD_FR1_H | | | | | | -116 | |
| | | NR_FDD_FR1_N | | | | | | -113 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1,2 N | | dBm/15kHz | -88 | | -108.5 | | Same as Noc for 15kHz T | |
| | Config 3 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | | -85 | | -105.5 | | -116.5 | |
| | | NR_FDD_FR1_B | | | | | | -116 | |
| | | NR_TDD_FR1_C | | | | | | -115.5 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -115 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -114.5 | |
| | | NR_FDD_FR1_F | | | | | | -114 | |
| | | NR_FDD_FR1_G | | | | | | -114.5 | |
| | | NR_FDD_FR1_H | | | | | | -113 | |
| | | NR_FDD_FR1_N | | | | | | -110 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | 15 | 15 | -4.0 | -4.0 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | | 15 | | -4.0 | |
| CSI-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/SCS | -89.75 | | -93.5 | | -123.5 | |
| | | NR_FDD_FR1_B | | | | | | -123 | |
| | | NR_TDD_FR1_C | | | | | | -122.5 | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | | | -122 | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | | | -121.5 | |
| | | NR_FDD_FR1_F | | | | | | -121 | |
| | | NR_FDD_FR1_G | | | | | | -120.5 | |
| | | NR_FDD_FR1_H | | | | | | -120 | |
| | | NR_FDD_FR1_N | | | | | | -117 | |
| | Config 3 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | | -86.75 | | -90.5 | | -120.5 | |
| | | NR_FDD_FR1_B | | | | | | -120 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_TDD_FR1_C | | | | -119.5 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -119 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -118.5 |
| | | NR_FDD_FR1_F | | | | -118 |
| | | NR_FDD_FR1_G | | | | -117.5 |
| | | NR_FDD_FR1_H | | | | -117 |
| | | NR_FDD_FR1_N | | | | -114 |
| CSI-SINR[Note3] | | NR_FDD_FR1_A NR_TDD_FR1_A [NOTE 6] | dB | -1.75 | 15 | -4.0 |
| | | NR_FDD_FR1_B | | | | |
| | | NR_TDD_FR1_C | | | | |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | |
| | | NR_FDD_FR1_F | | | | |
| | | NR_FDD_FR1_G | | | | |
| | | NR_FDD_FR1_H | | | | |
| | | NR_FDD_FR1_N | | | | |
| Io[Note3] | Config 1,2 | NR_FDD_FR1_A NR_TDD_FR1_A [NOTE 6] | dBm/ 9.36MHz | -57.83 | -65.4 | -90.09 |
| | | NR_FDD_FR1_B | | | | -89.59 |
| | | NR_TDD_FR1_C | | | | -89.09 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -88.59 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -88.09 |
| | | NR_FDD_FR1_F | | | | -87.59 |
| | | NR_FDD_FR1_G | | | | -87.09 |
| | | NR_FDD_FR1_H | | | | -86.59 |
| | | NR_FDD_FR1_N | | | | -83.59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6 | dBm/ 38.16 MHz | -51.73 | -59.3 | -84 |
| | | NR_FDD_FR1_B | | | | -83.5 |
| | | NR_TDD_FR1_C | | | | -83 |
| | | NR_FDD_FR1_D NR_TDD_FR1_D | | | | -82.5 |
| | | NR_FDD_FR1_E NR_TDD_FR1_E | | | | -82 |
| | | NR_FDD_FR1_F | | | | -81.5 |
| | | NR_FDD_FR1_G | | | | -81 |
| | | NR_FDD_FR1_H | | | | -80.5 |
| | | NR_FDD_FR1_N | | | | -77.5 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 6.7.13 to 6.7.16

# 6.7.17 LTM L1-RSRP measurement

## 6.7.17.0 Minimum conformance requirements

### 6.7.17.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of candidate neighbour cell(s) on a frequency in FR1 that is on a different frequency than the serving cell.

The accuracy requirements in Table 6.7.17.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.1 for a corresponding Band for each relevant SSB.

**Table 6.7.17.0.1-1: Inter-frequency L1-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io Note 1 range** |

| | | | NR operating band groups[Note 2] | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±5.0 | ±9.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H, NR_FDD_FR1_N | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19E.1.1 and 10.1.6.

### 6.7.17.0.2 SSB based relative L1-RSRP measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB from one cell on a frequency in FR1 compared to the largest measured value of L1-RSRP among all SSBs measured from another cell on another frequency in FR1.

The accuracy requirements in Table 6.7.17.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.1 for a corresponding Band for each relevant SSB.

**Table 6.7.17.0.2-1: Inter-frequency L1-RSRP relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io[Note 1] range | | | | |
| | | | NR operating band groups[Note 2] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| | | | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ±5.0 | ±9.5 | ≥-3 | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| | | | NR_FDD_FR1_N | -114.5 | -111.5 | N/A | -70 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19E.1.2 and 10.1.6.

## 6.7.17.1 Inter-frequency L1-RSRP accuracy requirements for neighbour cell in FR1

### 6.7.17.1.1 NR SA FR1 Inter-frequency L1-RSRP absolute accuracy requirements for neighbour cell

#### 6.7.17.1.1.1 Test purpose

To verify that the inter-frequency SSB based L1-RSRP absolute measurement accuracy on neighbour cell is within the limits for all bands specified in TS 38.133 [6] clause 10.1.19E.

#### 6.7.17.1.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements with measurement gaps and reports for LTM from release 18 and forward.

#### 6.7.17.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.17.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.17.1.

#### 6.7.17.1.1.4 Test description

##### 6.7.17.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.17.1.1.4.1-1.

**Table 6.7.17.1.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 6.7.17.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 6.7.17.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6.7.17.1.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations in each supported band<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 6.7.17.1.1.4.1-2.

**Table 6.7.17.1.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.7.17.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | -Without LTE link<br>-For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part. | |

1. The general test parameter settings are set up according to Table 6.7.17.1.1.4.1-3.
2. Message contents are defined in clause 6.7.17.1.1.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (Pcell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.

**Table 6.7.17.1.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active cell | | | Cell 1 | |
| Neighbouring cell | | | Cell 2 | Cell 2 is the candidate cell |
| RF Channel Number | | | 1: Cell 1<br>2: Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| reportQuantityRS-Indexes | | | rsrp | |
| maxNrofRS-IndexesToReport | | | 1 | |
| includeBeamMeasurements | | | True | |
| DRX | | | OFF | DRX is not used |
| Time offset between cells | | | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| Gap Pattern Id | | | 0 | |
| Measurement gap offset | | ms | 39 | |
| LTM-CSI-ReportConfig | reportConfigType | | periodic | Periodic L1-RSRP reporting configured |
| | L1-RSRP reporting period | slot | 80 | |
| | nrOfReportedCells | | n1 | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | |
| | spCellInclusion | | N/A | |
| ltm-ConfigComplete | | | True | Candidate cell's configuration is complete configuration |

### 6.7.17.1.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically.

There are two tests in the test case, test 1 and test 2:

- In test 1, test at the highest power level below maximum Io.
- In test 2, test at the lowest power level above minimum SSB_RP.

Measurement gap pattern configuration defined in Table 6.7.17.1.1.4.1-3 is provided.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Test 1 in Table 6.7.17.1.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message to configure periodical measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message periodically including Cell 2 measurement report with SSB index.

6. SS shall transmit an *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.

7. The UE shall transmit *RRCReconfigurationComplete* message.

8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 80 slots.

9. After 10s wait from Step 6, the SS shall check the values in the periodic measurement report. The L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 6.7.17.1.1.5-2 for test configurations 1, 2 and in Table 6.7.17.1.1.5-3 for test configuration 3, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

10. The SS shall continue checking the L1-RSRP report transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

11. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

13. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

    or:

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

14. Set the parameters according to each test in Table 6.7.17.1.1.5-1 as appropriate and repeat steps 3-13.

#### 6.7.17.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 6.7.17.1.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-6 with conditions gapUE and Pattern #0<br>Table H.3.1-7 with conditions INTER-FREQ, SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.7.17.1.1.4.3-2: ReportConfigNR (periodical) (step3)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| rsType | ssb | | |
| reportInterval | ms480 | | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.7.17.1.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-5 with condition SCS15<br>Table H.3.12-9 with conditions FR1, SSB#0, FDD |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-5 with condition SCS15<br>Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS15 |
| Specific message contents exceptiosn for Test Configuration 3 | Table H.3.12-5 with condition SCS30<br>Table H.3.12-9 with conditions FR1, SSB#0, TDD, SCS30 |

### 6.7.17.1.1.5 Test requirement

Table 6.7.17.1.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 6.7.17.1.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB GSCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | 1 | | FDD | | FDD | |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| TDD Configuration | 1 | | N/A | | N/A | |
| | 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2 | | SR.1.1 TDD | - | SR.1.1 TDD | - |
| | 3 | | SR.2.1 TDD | - | SR.2.1 TDD | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | | 3 | | CR.2.1 TDD | - | CR.2.1 TDD | - |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | | 3 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | | 1~3 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| TRS configuration | | 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | | 2 | | TRS.1.1 TDD | - | TRS.1.1 TDD | - |
| | | 3 | | TRS.1.2 TDD | - | TRS.1.2 TDD | - |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | | 1~3 | | SMTC.1 | | SMTC.1 | |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note 2 | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 1,2 | dBm/15kHz | -94.65 | -94.65 | -109 | -117 |
| | NR_FDD_FR1_B | | | | | -108.5 | -116.5 |
| | NR_TDD_FR1_C | | | | | -108 | -116 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -107.5 | -115.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -107 | -115 |
| | NR_FDD_FR1_F | | | | | -106.5 | -114.5 |
| | NR_FDD_FR1_G | | | | | -106 | -114 |
| | NR_FDD_FR1_H | | | | | -105.5 | -113.5 |
| | NR_FDD_FR1_N | | | | | -102.5 | -110.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 3 | | -96 | -96 | -109 | -117 |
| | NR_FDD_FR1_B | | | | | -108.5 | -116.5 |
| | NR_TDD_FR1_C | | | | | -108 | -116 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -107.5 | -115.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -107 | -115 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NR_FDD_FR1_F | | | | | -106.5 | -114.5 |
| | NR_FDD_FR1_G | | | | | -106 | -114 |
| | NR_FDD_FR1_H | | | | | -105.5 | -113.5 |
| | NR_FDD_FR1_N | | | | | -102.5 | -110.5 |
| $N_{oc}$ Note 2 | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -109 | -117 |
| | NR_FDD_FR1_B | | | | | -108.5 | -116.5 |
| | NR_TDD_FR1_C | | | | | -108 | -116 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -107.5 | -115.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -107 | -115 |
| | NR_FDD_FR1_F | | | | | -106.5 | -114.5 |
| | NR_FDD_FR1_G | | | | | -106 | -114 |
| | NR_FDD_FR1_H | | | | | -105.5 | -113.5 |
| | NR_FDD_FR1_N | | | | | -102.5 | -110.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 3 | | -93 | -93 | -106 | -114 |
| | NR_FDD_FR1_B | | | | | -105.5 | -113.5 |
| | NR_TDD_FR1_C | | | | | -105 | -113 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -104.5 | -112.5 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -104 | -112 |
| | NR_FDD_FR1_F | | | | | -103.5 | -111.5 |
| | NR_FDD_FR1_G | | | | | -103 | -111 |
| | NR_FDD_FR1_H | | | | | -102.5 | -110.5 |
| | NR_FDD_FR1_N | | | | | -99.5 | -107.5 |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | 10 | 13 | -2.7 |
| SSB RSRP Note 3 | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 1,2 | dBm/SSB SCS | -84.65 | -84.65 | -96 | -119.7 |
| | NR_FDD_FR1_B | | | | | -95.5 | -119.2 |
| | NR_TDD_FR1_C | | | | | -95 | -118.7 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -94.5 | -118.2 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -94 | -117.7 |
| | NR_FDD_FR1_F | | | | | -93.5 | -117.1 |
| | NR_FDD_FR1_G | | | | | -93 | -116.7 |
| | NR_FDD_FR1_H | | | | | -92.5 | -116.1 |
| | NR_FDD_FR1_N | | | | | -89.5 | -113.2 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 3 | | -82.99 | -82.99 | -92.99 | -116.69 |
| | NR_FDD_FR1_B | | | | | -92.49 | -116.19 |
| | NR_TDD_FR1_C | | | | | -91.99 | -115.69 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -91.49 | -115.19 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -90.99 | -114.69 |
| | NR_FDD_FR1_F | | | | | -90.49 | -114.09 |
| | NR_FDD_FR1_G | | | | | -89.99 | -113.69 |
| | NR_FDD_FR1_H | | | | | -89.49 | -113.09 |
| | NR_FDD_FR1_N | | | | | -86.49 | -110.19 |
| Io Note 3 | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 1,2 | dBm/9.36 MHz | -56.28 | -56.28 | -67.84 | -87.18 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NR_FDD_FR1_B | | | | | -67.34 | -86.68 |
| | NR_TDD_FR1_C | | | | | -66.84 | -86.18 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -66.34 | -85.68 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -65.84 | -85.18 |
| | NR_FDD_FR1_F | | | | | -65.34 | -84.65 |
| | NR_FDD_FR1_G | | | | | -64.84 | -84.18 |
| | NR_FDD_FR1_H | | | | | -64.34 | -83.65 |
| | NR_FDD_FR1_N | | | | | -61.34 | -80.68 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A Note 5 | 3 | dBm/38.16 MHz | -51.53 | -51.53 | -61.73 | -81.08 |
| | NR_FDD_FR1_B | | | | | -61.23 | -80.58 |
| | NR_TDD_FR1_C | | | | | -60.73 | -80.08 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | -60.23 | -79.58 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | -59.73 | -79.08 |
| | NR_FDD_FR1_F | | | | | -59.23 | -78.54 |
| | NR_FDD_FR1_G | | | | | -58.73 | -78.08 |
| | NR_FDD_FR1_H | | | | | -58.23 | -77.54 |
| | NR_FDD_FR1_N | | | | | -55.23 | -74.58 |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | 10 | 13 | -2.7 |
| Propagation condition | | 1~3 | | AWGN | | AWGN | |
| Antenna configuration | | 1~3 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51, and it is not required to run this test on band n51 in this release of the specification.

Each L1-RSRP measurement report of Cell 2 in each test in Table 6.7.17.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.17.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.17.1.1.5-3 for test configuration 3.

**Table 6.7.17.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 30 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 31 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 32 |
| | | Bands NR_FDD_FR1_F | 33 |
| | | Bands NR_FDD_FR1_G | 33 |
| | | Bands NR_FDD_FR1_H | 34 |
| | | Bands NR_FDD_FR1_N | 37 |
| Highest reported value (Cell 2) | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 43 |
| | | Bands NR_FDD_FR1_B | 44 |
| | | Bands NR_TDD_FR1_C | 44 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 45 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 45 |
| | | Bands NR_FDD_FR1_F | 46 |
| | | Bands NR_FDD_FR1_G | 46 |
| | | Bands NR_FDD_FR1_H | 47 |
| | | Bands NR_FDD_FR1_N | 50 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | Bands NR_FDD_FR1_B | 26 |
| | | Bands NR_TDD_FR1_C | 27 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 27 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 28 |
| | | Bands NR_FDD_FR1_F | 28 |
| | | Bands NR_FDD_FR1_G | 29 |
| | | Bands NR_FDD_FR1_H | 29 |
| | | Bands NR_FDD_FR1_N | 32 |
| Highest reported value (Cell 2) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 49 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | Bands NR_FDD_FR1_F | 50 |
| | | Bands NR_FDD_FR1_G | 51 |
| | | Bands NR_FDD_FR1_H | 51 |
| | | Bands NR_FDD_FR1_N | 54 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1. | | | |

**Table 6.7.17.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 63 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | Bands NR_FDD_FR1_B | 34 |
| | | Bands NR_TDD_FR1_C | 34 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 35 |
| | | Bands NR_FDD_FR1_F | 36 |
| | | Bands NR_FDD_FR1_G | 36 |
| | | Bands NR_FDD_FR1_H | 37 |
| | | Bands NR_FDD_FR1_N | 40 |
| Highest reported value (Cell 2) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 46 |
| | | Bands NR_FDD_FR1_B | 47 |
| | | Bands NR_TDD_FR1_C | 47 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 48 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 48 |
| | | Bands NR_FDD_FR1_F | 49 |
| | | Bands NR_FDD_FR1_G | 49 |
| | | Bands NR_FDD_FR1_H | 50 |
| | | Bands NR_FDD_FR1_N | 53 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 29 |
| | | Bands NR_FDD_FR1_B | 29 |
| | | Bands NR_TDD_FR1_C | 30 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 30 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 31 |
| | | Bands NR_FDD_FR1_F | 31 |
| | | Bands NR_FDD_FR1_G | 32 |
| | | Bands NR_FDD_FR1_H | 32 |
| | | Bands NR_FDD_FR1_N | 35 |
| Highest reported value (Cell 2) | 87 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 51 |
| | | Bands NR_FDD_FR1_B | 51 |
| | | Bands NR_TDD_FR1_C | 52 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 52 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 53 |
| | | Bands NR_FDD_FR1_F | 53 |
| | | Bands NR_FDD_FR1_G | 54 |
| | | Bands NR_FDD_FR1_H | 54 |
| | | Bands NR_FDD_FR1_N | 57 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 6.7.17.1.2 Void

## 6.7.18 TDCP amplitude measurement accuracy

### 6.7.18.0 Minimum conformance requirements

#### 6.7.18.0.1 TDCP amplitude measurement accuracy requirements in FR1

[38.133 clause 10.1.42]

The reporting range of TDCP amplitude is defined from 0 to 1. The reporting range of TDCP phase is 0 to 2π. The mapping of measured quantity is defined in Tables 6.7.18.0.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 6.7.18.0.1-1: TDCP phase measurement report mapping**

| Reported value | Measured quantity value |
|---|---|
| TDCP_PH_0 | $0 \le TDCP_PH < \frac{2\pi}{16}$ |
| TDCP_PH_1 | $\frac{2\pi}{16} \le TDCP_PH < \frac{2\pi*2}{16}$ |
| TDCP_PH_2 | $\frac{2\pi*2}{16} \le TDCP_PH < \frac{2\pi*3}{16}$ |
| TDCP_PH_3 | $\frac{2\pi*3}{16} \le TDCP_PH < \frac{2\pi*4}{16}$ |
| TDCP_PH_4 | $\frac{2\pi*4}{16} \le TDCP_PH < \frac{2\pi*5}{16}$ |
| TDCP_PH_5 | $\frac{2\pi*5}{16} \le TDCP_PH < \frac{2\pi*6}{16}$ |
| TDCP_PH_6 | $\frac{2\pi*6}{16} \le TDCP_PH < \frac{2\pi*7}{16}$ |
| TDCP_PH_7 | $\frac{2\pi*7}{16} \le TDCP_PH < \frac{2\pi*8}{16}$ |
| TDCP_PH_8 | $\frac{2\pi*8}{16} \le TDCP_PH < \frac{2\pi*9}{16}$ |
| TDCP_PH_9 | $\frac{2\pi*9}{16} \le TDCP_PH < \frac{2\pi*10}{16}$ |
| TDCP_PH_10 | $\frac{2\pi*10}{16} \le TDCP_PH < \frac{2\pi*11}{16}$ |

| | |
|---|---|
| TDCP_PH_11 | $\frac{2\pi*11}{16} \leq$ TDCP_PH $< \frac{2\pi*12}{16}$ |
| TDCP_PH_12 | $\frac{2\pi*12}{16} \leq$ TDCP_PH $< \frac{2\pi*13}{16}$ |
| TDCP_PH_13 | $\frac{2\pi*13}{16} \leq$ TDCP_PH $< \frac{2\pi*14}{16}$ |
| TDCP_PH_14 | $\frac{2\pi*14}{16} \leq$ TDCP_PH $< \frac{2\pi*15}{16}$ |
| TDCP_PH_15 | $\frac{2\pi*15}{16} \leq$ TDCP_PH $\leq 2\pi$ |

## 6.7.18.1 TDCP amplitude measurement accuracy in EN-DC

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing
- test case applicability is missing

### 6.7.18.1.1 Test purpose

The purpose of this test is to verify that the TRS based TDCP amplitude measurement accuracy is within the specified limits in the test requirements section clause 10.1.42 of TS 38.133 [6]. The cofigurations for the test are specified in Table 6.7.18.1.1-1.

### 6.7.18.1.2 Test applicability

This test applies to all types of NR UE Rel-18 and forward supporting NR EN-DC, which supportsT based SINR measurements.

### 6.7.18.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 6.7.18.0.2.

The normative reference for this requirement is in TS 38.133 [6] A. 6.7.18.

### 6.7.18.1.4 Test description

#### 6.7.18.1.4.1 Initial conditions

The test consists of two tests, Test 1 and Test 2. Each test further consists of two subtests Test 1A, 1B and Test 2A, 2B.

Test 1A: 10 Hz doppler + 15kHz SCS FDD + 20dB SNR

Test 1B: 10 Hz doppler + 30kHz SCS TDD + 20 dB SNR

Test 2A: 300 Hz doppler + 15kHz SCS FDD + 10 dB SNR

Test 2B: 300 Hz doppler + 30kHz SCS TDD + 10 dB SNR

Relevant parameters for each test are provided in the table 6.7.18.1.2-1. UE needs to pass Test 1A, 1B, 2A, 2B.

**Table 6.7.18.1.4-1: Applicable NR configurations for FR1 TRS based TDCP test**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 6.7.18.1.4.1-2.

**Table 6.7.18.1.4.1-2: Initial conditions for CSI-SINR inter-frequency accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, E.1.1, E.1.3.2, Table E.2-1 and TS 38.508-1 [14] Clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 4.7.10.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

### 6.7.18.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 6.7.18.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the TDCP reported index in the periodic MeasurementReport. The TDCP reported index of Cell 2 reported by the UE is compared to the expected TDCP reported index. If the value is outside the limits (determined by Table 6.7.18.0.2.1-1) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 6.7.18.1.5-1 as appropriate and repeat steps 5-7.

### 6.7.18.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

### 6.7.18.1.5 Test Requirements

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in Clause A.3.7.2 of TS 38.133 [6]. The test parameters for the Cell 2 are given in Table 6.7.18.1.5-1. Ampliutude of TDCP is tested by using the parameters in Table 6.7.18.1.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured with 1 TRS set with the TRS resources in the set are configured in adjacent slot. UE is configured to perform L1-RSRP measurement based on the SSB resources 0 and 1.

**Table 6.7.18.1.5-1: FR1 TRS based TDCP test parameters**

| Parameter | Config | Unit | Test 1 (FDD) | | Test 2 (TDD) | |
|---|---|---|---|---|---|---|
| | | | 1A | 1B | 2A | 2B |
| SSB GSCN | 1~4 | | freq1 | | freq1 | |
| Duplex mode | 1,3 | | FDD | | N/A | |
| | 2,4 | | N/A | | TDD | |
| TDD Configuration | 1,3 | | N/A | | N/A | |
| | 2,4 | | N/A | | TDDConf.1.1 | |
| $BW_{channel}$ | 1,3 | MHz | 10: $N_{RB,c}$ = 52 | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2,4 | | N/A | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1,3 | | SR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | 1,3 | | CR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | 1,3 | | CCR.1.1 FDD | | N/A | |
| | 2,4 | | N/A | | CCR.2.1 TDD | |
| SSB configuration | 1,3 | | SSB.3 FR1 | | N/A | |
| | 2,4 | | N/A | | SSB.4 FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| TRS configuration | 1,3 | | TRS.1.5 FDD | | N/A | |
| | 2,4 | | N/A | | TRS.1.5 TDD | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | | SMTC.1 | |
| reportConfigType | 1~4 | | periodic | | periodic | |
| reportQuantity | 1~4 | | ssb-Index-RSRP | | ssb-Index-RSRP | |
| Number of reported RS | 1~4 | | 2 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ | dBm/15k Hz | 1 | -98 | | -98 | |
| | | 2 | | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | | -98 | |
| | | 2 | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | TBD | | TBD | |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 20 | 10 | 20 | 10 |
| SSB_RP | 1,4 | | -78 | -88 | -78 | -88 |
| Propagation condition | 1~4 | | TDL-A 30ns 10 Hz | TDL-A 30ns 300 Hz | TDL-A 30ns 10Hz | TDL-A 30ns 300 Hz |
| Antenna configuration | 1~4 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

For Test 1A, the reported TDCP index shall be smaller than or equal to 6 for the 80% of the times over repeated tests

For Test 1B: the reported TDCP index shall be smaller than or equal to 5 for the 80% of the times over repeated tests

For Test 2A: the reported TDCP index shall be larger than 8 for the 80% of the times over repeated tests

For Test 2B: the reported TDCP index shall be larger than 6 for the 80% of the times over repeated tests

# 7 NR standalone with at least one NR cell in FR2

## 7.0 General

This section contains test scenarios for NR standalone. This configuration is also known as NR/5GC. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

## 7.1 RRC_IDLE state mobility

### 7.1.1 NR cell re-selection

#### 7.1.1.0 Minimum conformance requirements

##### 7.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within $T_{detect,NR_Intra}$ when that $T_{reselection} = 0$. An intra-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-1, table 4.2.2.3-2, table 4.2.2.3-3, table 4.2.2.3-4 or table 4.2.2.3-5 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS38.304 [1] within $T_{evaluate,NR_Intra}$ when $T_{reselection} = 0$ as specified in table 7.1.1.0.1-1, table 7.1.1.0.1-2, table 7.1.1.0.1-3, table 7.1.1.0.1-4 or table 7.1.1.0.1-5 provided that

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them.
        - the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and non-zeroa-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE neither configured with *highSpeedMeasFlag-r16* nor *highSpeedMeasFlagFR2-r17*, $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,\ NR_intra}$ are specified in Table 7.1.1.0.1-1. For UE configured with *highSpeedMeasFlag-r16*, $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,\ NR_intra}$ are specified in Table 7.1.1.0.1-2. For FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17*, $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,\ NR_intra}$ are specified in Table 7.1.1.0.1-3.

For UE not configured with eDRX_IDLE cycle, $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ are specified in Table 7.1.1.0.1-1, 7.1.1.0.1-2 and 7.1.1.0.1-3.

For UE configured with eDRX_IDLE cycle, $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ are specified in Table 7.1.1.0.1-4 and Table 7.1.1.0.1-5 for FR1 and FR2 respectively, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ when multiple PTWs are used.

The requirements in Table 7.1.1.0.1-2 apply only when the UE supports *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16*. For UE neither supporting either *measurementEnhancement-r16* nor *intraNR-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 7.1.1.0.1-2.

**Table 7.1.1.0.1-1: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$**

| DRX cycle length [s] | Scaling Factor (N1) | | | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|---|
| | FR1 | FR2-1 Note1 | FR2-2 Note2 | | | |
| 0.32 | 1 | 8 | 12 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 | | 5 | 8 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 6 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 5 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |

Note 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.

Note 2: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length.

Note 3: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra}$ is expected.

**Table 7.1.1.0.1-2: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ for UE configured with *highSpeedMeasFlag-r16* ( FR1)**

| DRX cycle length [s] | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 2.56 x M2 (8 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Note 1: when SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2

Note 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16.*

**Table 7.1.1.0.1-3: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ for UE configured with *highSpeedMeasFlagFR2-r17* ( FR2)**

| DRX cycle length [s] | Scaling Factor (N1) | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|---|
| 0.32 | $N2^{Note2}$ | 2.56 x N1 x M2 (8 x N1 x M2) | 0.32 x N1 x M3 (1 x N1 x M3) | 0.96 x N1 x M4 (3 x N1 x M4) |
| 0.64 | 5 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2<br>Note 2: N2 = 2 when [*highSpeedMeasFlagFR2-r17*] = [set1]; N2 = 6 when [*highSpeedMeasFlagFR2-r17*] = [set2]. | | | | |

**Table 7.1.1.0.1-4: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ for UE configured with eDRX_IDLE cycle ( FR1)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 2.56 | - | - | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| 5.12 | - | - | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 | - | - | 235.52 (23) | 10.24 (1) | 20.48 (2) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥[1.28] ([1]) | $eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ (23) | 0.32 x M2 (1 x M2) | 0.64 x M2 (2 x M2) |
| | 0.64 | ≥[1.28] ([1]) | | 0.64 (1) | 1.28 (2) |
| | 1.28 | ≥[2.56] ([2]) | | 1.28 (1) | 2.56 (2) |
| | 2.56 | ≥[5.12] ([4]) | | 2.56 (1) | 5.12 (2) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>Note 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].<br>Note 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56s, 5.12s and 10.24s. Otherwise, number of DRX cycles.<br>Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{\text{Tevaluate,NR_Intra} * \text{DRX_cycle}}{1.28} \right\rceil * 1.28$.<br>Note 5: M2 = 2 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. | | | | | | |

**Table 7.1.1.0.1-5: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ for UE configured with eDRX_IDLE cycle (FR2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 4) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 4) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles or eDRX cycles Note 4) |
|---|---|---|---|---|---|---|
| 2.56 | - | - | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | - | - | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10.24 | - | - | 3 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥5.12 (4) | 8 | $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1) | 0.32 x N1 (1 x N1) | 0.64 x N1 (2 x N1) |
| | 0.64 | ≥6.4 (5) | 5 | | 0.64 x N1 (1 x N1) | 1.28 x N1 (2 x N1) |
| | 1.28 | ≥10.24 (8) | 4 | | 1.28 x N1 (1 x N1) | 2.56 x N1 (2 x N1) |
| | 2.56 | ≥15.36 (12) | 3 | | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |
| NOTE 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.<br>NOTE 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>NOTE 3: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].<br>NOTE 4: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56s, 5.12s and 10.24s. Otherwise, number of DRX cycles.<br>NOTE 5: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra*DRX_cycle}{1.28} \right\rceil * 1.28$.<br>NOTE 6: When eDRX=20.48s and DRX=0.32s, UE is allowed to perform cell evaluation within PTW in every 2 eDRX cycles. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

### 7.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.For a UE configured with *highSpeedMeasInterFreq-r17*, and configured with relaxed measurement criterion (*lowMobilityEvaluation* or both *lowMobilityEvaluation* and *cellEdgeEvaluation*),

- if the relaxed measurement criteria in section 4.2.2.9.2 of TS 38.133 [6] are fulfilled, it is up to UE implementation whether to apply the relaxed measurements requirements specified in clause 4.2.2.10.2 of TS 38.133 [6] or high-speed requirements specified in this clause
- otherwise, high-speed requirements specified in this clause shall be applied

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [30] within $K_{carrier} * T_{detect,NR_Inter} + K_{carrier_HST} * T_{detect,NR_Inter}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5dB in FR2 for reselections based on ranking or 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 and 4dB in FR2 for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133 [6] for a corresponding Band.

The parameter $K_{carrier}$ is the number of NR inter-frequency carriers which are not configured with *highSpeedMeasInterFreq-r17* for FR1 or *highSpeedMeasFlagFR2-r17* for FR2 indicated by the serving cell. The parameter $K_{carrier_HST}$ is the number of NR inter-frequency carriers which are configured with *highSpeedMeasInterFreq-r17* for FR1 or*highSpeedMeasFlagFR2-r17* for FR2 indicated by the serving cell. The parameter $K_{carrier}$ for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are not configured with *highSpeedMeasInterFreq-r17* for FR1 or *highSpeedMeasFlagFR2-r17*for FR2. The parameter $K_{carrier_HST}$ for a UE configured with idle mode CA measurements (while T331 is running), is the

combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are configured with *highSpeedMeasInterFreq-r17* for FR1 or *highSpeedMeasFlagFR2-r17* for FR2.

Note: combined total number means that if a carrier is an inter-frequency carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133[6] for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE not configured with eDRX_IDLE cycle shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_HST} * T_{measure,NR_Inter_HST}$ (see table 4.2.2.4-1 and see table 4.2.2.4-2 of TS 38.133 [6]) if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17* in FR1; or table 4.2.2.4-2a of TS 38.133 [6] if UE declares support of idle mode inter-frequency measurement enhancement when configured with*highSpeedMeasFlagFR2-r17*in FR2;else see table 4.2.2.4-1 of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

A UE not configured with eDRX_IDLE cycle shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_HST} * T_{measure,NR_Inter_HST}$ (see table 4.2.2.4-1, table 4.2.2.4-2 if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17* in FR1; or table 4.2.2.4-2a if UE declares support of idle mode inter-frequency measurement enhancement when configured with*highSpeedMeasFlagFR2-r17*in FR2;else see table 4.2.2.4-1) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

A UE configured with eDRX_IDLE cycle shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter}$ (see table 4.2.2.4-3 and table 4.2.2.4d-4) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE configured with eDRX_IDLE cycle shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE not configured with eDRX_IDLE cycle shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier} * T_{evaluate,NR_Inter} + K_{carrier_HST} * T_{evaluate,NR_Inter_HST}$ when $T_{reselection} = 0$ as specified in table 4.2.2.4-1, 4.2.2.4-2 of TS 38.133 [6] if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17*in FR1; or table 4.2.2.4-2a of TS 38.133 [6] if UEdeclares support of idle mode inter-frequency measurement enhancement when configured with*highSpeedMeasFlagFR2-r17*in FR2;else in table 4.2.2.4-1 of TS 38.133 [6]), provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  when *rangeToBestCell* is not configured:

- the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.

- when *rangeToBestCell* is configured:

  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

    - if there are multiple such cells, the cell has the highest rank among them

    - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or

- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or

- 4dB in FR1 or 4dB in FR2 for SS-RSRQ reselections based on absolute priorities.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE configured with eDRX_IDLE cycle shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [1] within $K_{carrier} * T_{evaluate,NR_Inter}$ when $T_{reselection} = 0$ as specified in table 4.2.2.4-3 and table 4.2.2.4-4 of TS 38.133 [6], provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  - when *rangeToBestCell* is not configured:

    - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.

  - when *rangeToBestCell* is configured:

    - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

      - if there are multiple such cells, the cell has the highest rank among them

      - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or

- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or

- 4dB in FR1 or 4dB in FR2 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 and Table 4.2.2.4-2 of TS 38.133 [6] under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where

  $T_{SMTC_intra}$ is the periodicity of the SMTC configured for the intra-frequency carrier if no identified intra-frequency cell is in the PCI list of *smtc2-LP* on this intra-frequency carrier; $T_{SMTC_intra}$ is the periodicity of the *smtc2-LP* configured for the intra-frequency carrier if at least one identified intra-frequency cell is in the PCI list of *smtc2-LP* on this intra-frequency carrier. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed for $T_{SMTC_intra}$. If the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra}$ is expected.

  - $T_{SMTC_inter}$ is the actual SMTC periodicity used by the inter-frequency cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the inter-frequency carrier is assumed for $T_{SMTC_inter}$. If the actual SSB transmission periodicity is greater than the SMTC configured for the inter-frequency carrier, longer $T_{detect, NR_inter}$ is expected.

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion [1].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

#### 7.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

##### 7.1.1.0.3.1 Introduction

This clause contains the requirements for measurements on intra-frequency NR cells when Srxlev $\leq S_{IntraSearchP}$ or Squal $\leq S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],

- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],

- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

##### 7.1.1.0.3.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- $T_{detect,NR_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

##### 7.1.1.0.3.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criteria and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- $T_{detect,NR_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

##### 7.1.1.0.3.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and

- has also fulfilled both criteria, and

- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet $T_{detect,NR_Intra,}$ $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ as defined in Table 4.2.2.3-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.9.

#### 7.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR_Inter} + T_{SI-NR}$ in RRC_IDLE state.

##### 7.1.1.0.4.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4. 9.2 in TS 38.304 [30],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4. 9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

##### 7.1.1.0.4.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [13] and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

When $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- $T_{detect,NR_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].
- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

When $Srxlev > S_{nonIntraSearchP}$ and $Squal > S_{nonIntraSearchQ}$ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $K2*T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133[6].

##### 7.1.1.0.4.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *cellEdgeEvaluation* [13] criterion, and UE has fulfilled or
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then te requirements defined in clause 4.2.2.4 apply for this clause except that:

- $T_{detect,NR_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority}$_search where $T_{higher_priority_search}$ is described in clause 4.2.2.7

7.1.1.0.4.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and
- Has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$ as defined in Table 4.2.2.4-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.10.

## 7.1.1.1 NR SA FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC1, PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC1 and PC3.

### 7.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.3.

### 7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.1.

### 7.1.1.1.4 Test description

#### 7.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.1.4.1-1.

**Table 7.1.1.1.4.1-1: Supported test configurations for NR SA FR2 cell re-selection**

| Configuration | Description |
|---|---|
| 7.1.1.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.1-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.1.4.1-2.

**Table 7.1.1.1.4.1-2: Initial conditions for NR SA FR2 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.1.4.1-3.

2. Message contents are defined in clause 7.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.1.4.1-3: General test parameters for NR SA FR2 cell re-selection**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell2 | |
| | Neighbour cells | | 1, 2 | Cell1 | |
| Final condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cell | | 1, 2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | PC2, PC3, PC4 | s | 1, 2 | 135 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| | PC1 | | | 265 | |
| T3 | PC2, PC3, PC4 | s | 1, 2 | 35 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| | PC1 | | | 65 | |

### 7.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 7.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 130 seconds for PC2, PC3, PC4 and within 258 seconds for PC1 from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.1.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 27 seconds for PC2, PC3, PC4 and within 53 seconds for PC1 from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.1.4.3-1A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | | |
|---|---|---|---|---|
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | | |
| cellSelectionInfo SEQUENCE { | | | | |
| q-RxLevMin | PC3 | -60 | Actual value is -60*2 = -120dBm | 7.1.1.1-1 |
| | | -58 | Actual value is -58*2 = -116dBm | 7.1.1.1-2 |
| | PC1 | -51 | Actual value is -51*2 = -102dBm | 7.1.1.1-1 |
| | | -49 | Actual value is -49*2 = -98dBm | 7.1.1.1-2 |
| } | | | | |
| } | | | | |

**Table 7.1.1.1.4.3-1B: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | | |
|---|---|---|---|---|
| **Information Element** | | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | | |
| q-RxLevMin | PC3 | -60 | Actual value is -60*2 = -120dBm | 7.1.1.1-1 |
| | | -58 | Actual value is -58*2 = -116dBm | 7.1.1.1-2 |
| | PC1 | -51 | Actual value is -51*2 = -102dBm | 7.1.1.1-1 |
| | | -49 | Actual value is -49*2 = -98dBm | 7.1.1.1-2 |
| s-IntraSearchP | PC3 | 25 | Actual value is 25*2 = 50dB | |
| | PC1 | 31 | Actual value is 31*2 = 62dB | |
| } | | | | |
| } | | | | |

**Table 7.1.1.1.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

7.1.1.1.5 Test requirement

Tables 7.1.1.1.4.1-3 and 7.1.1.1.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 7.1.1.1.5-1: Cell specific test parameters for NR SA FR2 cell re-selection**

| **Parameter** | **Unit** | **Test config.** | **Cell 1** | | | **Cell 2** | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| | | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| | | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| | | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SSB configuration | | | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
| | | | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern | | | 1, 2 | OP.4 | | | OP.4 | | |
| Initial DL BWP configuration | | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated | | | 1, 2 | 66 | | | 66 | | |
| Initial UL BWP configuration | | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | PC3 | dBm/SCS | 1 | -120 Note 6 | | | -120 Note 6 | | |
| | | | 2 | -117 Note 6 | | | -117 Note 6 | | |
| | PC1 | | 1 | -101 Note 6 | | | -101 Note 6 | | |
| | | | 2 | -98 Note 6 | | | -98 Note 6 | | |
| Pcompensation | | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_ reselection_quality_measurement | | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | | 1, 2 | Setup 1 defined in A. 9.1 | | | Setup 1 defined in A. 9.1 | | |
| Beam assumption Note 4 | | | 1,2 | Rough | | | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | | dB | 1 | 7.56 | -3.34 | 1.61 | - infinity | 1.61 | -3.34 |
| | | | 2 | | | | | | |
| $N_{oc}$ Note2 | | dBm/SCS | 1 | -93 | | | | | |
| | | | 2 | -90 | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | 1 | -102 | | | | | |
| | | | 2 | | | | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1 | 8 | -2.9 | 2.05 | - infinity | 2.05 | -2.9 |
| | | | 2 | | | | | | |
| SS-RSRP Note3 | PC3 | dBm/SCS | 1 | -85 | -95.9 | -90.9 | - infinity | -90.9 | -95.9 |
| | | | 2 | -82 | -92.9 | -87.9 | - infinity | -87.9 | -92.9 |
| | PC1 | | 1 | -85 | -95.5 | -90.5 | - infinity | -90.5 | -95.5 |
| | | | 2 | -82 | -92.5 | -87.5 | - infinity | -87.5 | -92.5 |
| Io | | dBm/95.04 MHz | 1 | -60.53 | -67.37 | -65.01 | -69.17 | -65.01 | -67.37 |
| | | | 2 | -57.52 | -64.39 | -62.33 | -66.16 | -62.33 | -64.39 |
| Treselection | | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | PC3 | dB | 1, 2 | 50 | | | 50 | | |
| | PC1 | | | 62 | | | 62 | | |
| Propagation Condition | | | 1, 2 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra}$ + $T_{SI-NR}$

$T_{detect,NR_Intra}$ =

256 s for PC1, and

128 s for PC2, PC3, PC4; as specified in TS 38.133 [6] clause 4.2.2.3.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of

257.28 seconds for PC1, and

129.28 seconds for PC2, PC3, PC4 in this test case (note: this gives a total of 129.28 seconds but the test allows 130 seconds for PC2, PC3, PC4 and 258 seconds for PC1).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra}$ + $T_{SI-NR}$

$T_{evaluate,NR_Intra}$ =

51.2 s for PC1 and

25.6 s for PC2, PC3, PC4; as specified in TS 38.133 [6] clause 4.2.2.3.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of

52.48 seconds for PC1

26.88 seconds for PC2, PC3, PC4 in this test case (note: this gives a total of 26.88 seconds but the test allows 27 seconds for PC2, PC3, PC4 and 53 seconds for PC1).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

### 7.1.1.2 NR SA FR2-FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.4.

#### 7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.2.

#### 7.1.1.2.4 Test description

##### 7.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.2.4.1-1.

**Table 7.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection**

| Configuration | Description for serving cell | Description for target cell |
|---|---|---|
| 7.1.1.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.2.4.1-2.

**Table 7.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.2.4.1-3.
2. Message contents are defined in clause 7.1.1.2.4.3.
3. There are two NR carriers and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

**Table 7.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
| | Neighbour cell | | 1, 2 | Cell1 | |
| T1 end condition | Active cell | | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| | Neighbour cells | | 1, 2 | Cell2 | |
| T3 end condition | Active cell | | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| | Neighbour cell | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |

| | | | | |
|---|---|---|---|---|
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DRX cycle length | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2 | Not configured | |
| T1 | s | 1, 2 | 35 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2 | 95 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 7.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 7.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Void.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

5. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 27 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 87 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

13. Repeat step 3-12 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1 for NR Cell 1 |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.2.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 7.1.1.2.4.3-3: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -62*2 = -140dBm | 7.1.1.2-1 and Cell 1 |
| | -68 | Actual value is -62*2 = -136dBm | 7.1.1.2-2 and Cell 1 |
| | -62 | Actual value is -62*2 = -124dBm | 7.1.1.2-1 and Cell 2 |
| | -60 | Actual value is -62*2 = -120dBm | 7.1.1.2-2 and Cell 2 |
| } | | | |
| } | | | |

**Table 7.1.1.2.4.3-4: SIB2(Cell2)**

| Derivation Path: Table H.2.2-1 with condition NR Cell 2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 31 | Actual value is 31*2 = 62dBm | |
| threshServingLowP | 31 | Actual value is 31*2 = 62dBm | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

**Table 7.1.1.2.4.3-5: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140dBm | 7.1.1.2-1 |
| | -68 | Actual value = -68*2 = -136dBm | 7.1.1.2-2 |
| threshX-HighP | 16 | Actual value is 16*2 = 32dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.1.1.2.4.3-6: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -62 | Actual value = -62*2 = -124dBm | 7.1.1.2-1 |
| | -60 | Actual value = -60*2 = -120dBm | 7.1.1.2-2 |
| threshX-LowP | 9 | Actual value = 9*2 = 18dBm | |
| } | | | |
| } | | | |
| } | | | |

### 7.1.1.2.5 Test requirement

Tables 7.1.1.2.4.1-3 and 7.1.1.2.5-1 define the primary level settings including test tolerances for inter-frequency NR cell re-selection test case.

**Table 7.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern | | 1, 2 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated | | 1, 2 | 66 | | | 66 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -124 Note 6 | | |
| | | 2 | -137 | | | -121 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_ reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | 1, 2 | Setup 1 defined in A. 9.1 | | | Setup 1 defined in A. 9.1 | | |
| Beam assumption Note 4 | | 1,2 | Rough | | | | | |
| $\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5 | dB | 1 | 10.06 | 10.06 | 7.56 | -3.34 | -infinity | 8.06 |
| | | 2 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | | | |
| | | 2 | -90 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | | | |
| | | 2 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 10.5 | 10.5 | 8 | 2.9 | -infinity | 8.5 |
| | | 2 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5 | -82.5 | -85 | 95.9 | -infinity | 84.5 |
| | | 2 | -79.5 | -79.5 | -82 | -92.9 | -infinity | -91.5 |
| Io | dBm/95.04 MHz | 1 | -53.11 | -53.11 | -55.34 | -62.18 | -63.98 | -54.91 |
| | | 2 | -53.11 | -53.11 | -55.34 | -62.18 | -63.98 | -54.91 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 62 Note 6 | | |
| $Thresh_{x,highP}$ | dB | 1, 2 | 32 Note 6 | | | 48 | | |
| $Thresh_{serving,lowP}$ | dB | 1, 2 | 44 | | | 62 Note 6 | | |
| $Thresh_{x,lowP}$ | dB | 1, 2 | 50 | | | 18 Note 6 | | |
| Propagation Condition | | 1, 2 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility on cell 2.

The cell re-selection delay to a higher priority cell test requirement in this case is expressed as:

Cell re-selection delay to a higher priority cell = $T_{higher_priority_search} + T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$

$T_{higher_priority_search}$ = 60 s, as specified in TS 38.133 [6] clause 4.2.2.7;

$T_{evaluate,\ NR_inter}$ = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a higher priority cell shall be less than a total of 86.88 seconds in this test case (note: this gives a total of 86.88 seconds but this test allows 87 seconds)

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility on cell 1.

The cell re-selection delay to a lower priority cell test requirement in this case is expressed as:

Cell re-selection delay to a lower priority cell = $T_{evaluate, NR_inter} + T_{SI-NR}$

$T_{evaluate, NR_inter}$ = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a lower priority cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but this test allows 27 seconds)

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

### 7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

#### 7.1.1.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

#### 7.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.3.

#### 7.1.1.3.4 Test description

##### 7.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.3.4.1-1.

**Table 7.1.1.3.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 7.1.1.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.3-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.3.4.1-2.

**Table 7.1.1.3.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.3.4.1-3.

2. Message contents are defined in clause 7.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.3.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase |
| | Neighbour cells | | 1, 2 | Cell2 | |
| T1 end condition | Active cell | | 1, 2 | Cell2 | The UE reselects to cell 2 during T1 period |
| | Neighbour cells | | 1, 2 | Cell1 | |
| Final condition | Active cell | | 1, 2 | Cell1 | The UE reselects to cell 1 during T2 period |
| | Neighbour cells | | 1,2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 100 | |
| T2 | | s | 1, 2 | 100 | |

### 7.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.3.5-1;
- *cellEdgeEvaluation* [2] is not configured;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.1.1.3.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.3.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.3.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 7.1.1.3.4.3-2A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.3-1 |

| | | | |
|---|---|---|---|
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.3-2 |
| } | | | |
| } | | | |

**Table 7.1.1.3.4.3-3: SIB2**

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.3-1 |
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.3-2 |
| s-IntraSearchP | 25 | Actual value is 25*2 = 50dB | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB6 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

7.1.1.3.5 Test requirement

Tables 7.1.1.3.4.1-3 and 7.1.1.3.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

**Table 7.1.1.3.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | SR.3.1 TDD | |
| | | 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| | | 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| SSB configuration | | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| OCNG Pattern | | 1, 2 | OP.4 | | OP.4 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | -120 Note 6 | |
| | | 2 | -117 Note 6 | | -117 Note 6 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $S_{SearchDeltaP}$ | dB | 1, 2 | 6 | | 6 | |
| $T_{SearchDeltaP}$ | s | 1,2 | 5 | | 5 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5 | dB | 1 | -3.34 | 1.61 | 1.61 | -3.64 |
| | | 2 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | |
| | | 2 | -90 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | |
| | | 2 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | -2.9 | 2.05 | 2.05 | -2.9 |
| | | 2 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -95.9 | -90.9 | -90.9 | -95.9 |
| | | 2 | -92.9 | -87.9 | -87.9 | -92.9 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -67.37 | -65.01 | -65.01 | -67.37 |
| | | 2 | -64.36 | -62.00 | -62.00 | -64.36 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | 50 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI\text{-}NR}$

$T_{evaluate,NR_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

## 7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 7.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

### 7.1.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

### 7.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.4.

### 7.1.1.4.4 Test description

#### 7.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.4.4.1-1.

**Table 7.1.1.4.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 7.1.1.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.4-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.4.4.1-2.

**Table 7.1.1.4.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.4.4.1-3.

2. Message contents are defined in clause 7.1.1.4.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.4.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase |
| | Neighbour cells | | 1, 2 | Cell2 | |
| T1 end condition | Active cell | | 1, 2 | Cell2 | The UE reselects to cell 2 during T1 period |
| | Neighbour cells | | 1, 2 | Cell1 | |
| Final condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cells | | 1,2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 100 | |
| T2 | | s | 1, 2 | 100 | |

### 7.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;
- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.4.5-1;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.1.1.4.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.4.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.4.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 7.1.1.4.4.3-2A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.4-1 |
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.4-2 |
| } | | | |
| } | | | |

**Table 7.1.1.4.4.3-3: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.4-1 |
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.4-2 |
| s-IntraSearchP | 25 | Actual value is 25*2 = 50dB | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | | | |
| s-SearchThresholdP-r16 | 4 | Actual value is 4*2 = 8dBm | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

### 7.1.1.4.5 Test requirement

Tables 7.1.1.4.4.1-3 and 7.1.1.4.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

**Table 7.1.1.4.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | SR.3.1 TDD | |
| | | 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| | | 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| SSB configuration | | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| OCNG Pattern | | 1, 2 | OP.4 | | OP.4 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | -120 Note 6 | |
| | | 2 | -117 Note 6 | | -117 Note 6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot\,\mathrm{BB}}$ Note 5 | dB | 1 | -3.34 | 1.61 | 1.61 | -3.34 |
| | | 2 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | |
| | | 2 | -90 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | |
| | | 2 | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | -2.90 | 2.05 | 2.05 | -2.90 |
| | | 2 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -95.9 | -90.9 | -90.9 | -95.9 |
| | | 2 | -92.9 | -87.9 | -87.9 | -92.9 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -67.37 | -65.01 | -65.01 | -67.37 |
| | | 2 | -64.36 | -62.00 | -62.00 | -64.36 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 |
| $S_{SearchThresholdP}$ | | 1, 2 | 8 Note 6 | 8 Note 6 | 8 Note 6 | 8 Note 6 |
| SintrasearchP | dB | 1, 2 | 50 | | 50 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

### 7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

#### 7.1.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

#### 7.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.5.

#### 7.1.1.5.4 Test description

##### 7.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.5.4.1-1.

**Table 7.1.1.5.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 7.1.1.5-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.5-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.5.4.1-2.

**Table 7.1.1.5.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.5.4.1-3.

2. Message contents are defined in clause 7.1.1.5.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.5.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell2 | The UE camps on cell2 and fulfils low mobility (*lowMobilityEvalutation* [2]) criterion. |
| | Neighbour cell | | 1, 2 | Cell1 | |
| T1 final condition | Active cell | | 1, 2 | Cell1 | The UE reselects to low priority cell1 during T1 |
| | Neighbour cell | | 1, 2 | Cell2 | |
| T2 final condition | Active cell | | 1, 2 | Cell2 | The UE reselects to high priority cell2 during T2 |
| | Neighbour cell | | | Cell1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |
| SMTC configuration | | | 1, 2 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 85 | T1 needs to be long enough to allow cell re-selection to already known cell1 |
| T2 | | s | 1, 2 | 85 | T2 needs to be long enough to allow cell re-selection to already known cell2 |

#### 7.1.1.5.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.5.5-1;
- *cellEdgeEvaluation* [2] is not configured;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.5.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.5.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.5.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 7.1.1.5.4.3-2A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -62*2 = -140dBm | 7.1.1.5-1 and Cell 1 |
| | -68 | Actual value is -62*2 = -136dBm | 7.1.1.5-2 and Cell 1 |
| | -62 | Actual value is -62*2 = -124dBm | 7.1.1.5-1 and Cell 2 |
| | -60 | Actual value is -62*2 = -120dBm | 7.1.1.5-2 and Cell 2 |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 7.1.1.5.4.3-3: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 31 | Actual value is 31*2 = 62dBm | Cell 2 |
| threshServingLowP | 31 | Actual value is 31*2 = 62dBm | Cell 2 |
| cellReselectionPriority | 4 | | Cell 1 |
| | 5 | | Cell 2 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB12 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 7.1.1.5.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140dBm | 7.1.1.2-1 |
| | -68 | Actual value = -68*2 = -136dBm | 7.1.1.2-2 |
| threshX-HighP | 16 | Actual value is 16*2 = 32dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.1.1.5.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -62 | Actual value = -62*2 = -124dBm | 7.1.1.2-1 |
| | -60 | Actual value = -60*2 = -120dBm | 7.1.1.2-2 |
| threshX-LowP | 9 | Actual value = 9*2 = 18dBm | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

7.1.1.5.5 Test requirement

Tables 7.1.1.5.4.1-3 and 7.1.1.5.5-1 define the primary level settings including test tolerances for inter-frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

**Table 7.1.1.5.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | -124 Note6 | |
| | | 2 | -137 | | -121 Note6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1, 2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | 10.06 | 7.56 | -3.34 | 8.06 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | -93 | |
| | | 2 | -90 | | -90 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -102 | | -102 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 10.5 | 8 | -2.9 | 8.5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5 | -85 | -95.9 | -84.5 |
| | | 2 | -79.5 | -82 | -92.9 | -81.5 |
| Io | dBm/95.04 MHz | 1 | -53.11 | -55.34 | -62.18 | -54.91 |
| | | 2 | -53.11 | -55.34 | -62.18 | -54.91 |
| TreselectionNR | s | 1, 2 | 0 | | 0 | |
| SnonintrasearchP | dB | 1, 2 | 50 | | Not sent | |
| $S_{SearchDeltaP}$ | dB | 1, 2 | 12 Note6 | | 12 Note6 | |
| $T_{SearchDeltaP}$ | s | 1, 2 | 5 | | 5 | |
| $Thresh_{x,high}$ | dB | 1, 2 | 32 Note6 | | 48 | |
| $Thresh_{serving,low}$ | dB | 1, 2 | 44 | | 62 Note6 | |
| $Thresh_{x,low}$ | dB | 1, 2 | 50 | | 18 Note6 | |
| Propagation Condition | | 1, 2 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 5: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |
| Note 6: | Including the test tolerance given in Annex F. |

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$

Where:

$T_{evaluate, NR_inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling low mobility criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

### 7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

#### 7.1.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

#### 7.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.6.

#### 7.1.1.6.4 Test description

##### 7.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.6.4.1-1.

**Table 7.1.1.6.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Configuration | Description |
|---|---|
| 7.1.1.6-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.6-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.6.4.1-2.

**Table 7.1.1.6.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.6.4.1-3.
2. Message contents are defined in clause 7.1.1.6.4.3.
3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.6.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell2 | The UE camps on cell2 and fulfils not-at-cell edge (*cellEdgeEvaluation* [2]) criterion. |
| | Neighbour cell | | 1, 2 | Cell1 | |

| | | | | | |
|---|---|---|---|---|---|
| T1 final condition | Active cell | | 1, 2 | Cell1 | The UE reselects to low priority cell1 during T1 |
| | Neighbour cell | | 1, 2 | Cell2 | |
| T2 final condition | Active cell | | 1, 2 | Cell2 | The UE reselects to high priority cell2 during T2 |
| | Neighbour cell | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |
| SMTC configuration | | | 1, 2 | SMTC pattern 1 | |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 85 | T1 needs to be long enough to allow cell re-selection to already known cell. |
| T2 | | s | 1, 2 | 85 | T2 needs to be long enough to allow cell re-selection to already known cell. |

#### 7.1.1.6.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;
- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.6.5-1;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.6.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.6.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.6.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 7.1.1.6.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 7.1.1.6.4.3-2A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -62*2 = -140dBm | 7.1.1.6-1 and Cell 1 |
| | -68 | Actual value is -62*2 = -136dBm | 7.1.1.6-2 and Cell 1 |
| | -62 | Actual value is -62*2 = -124dBm | 7.1.1.6-1 and Cell 2 |
| | -60 | Actual value is -62*2 = -120dBm | 7.1.1.6-2 and Cell 2 |
| } | | | |
| } | | | |

**Table 7.1.1.6.4.3-3: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 31 | Actual value is 31*2 = 62dBm | Cell 2 |
| threshServingLowP | 31 | Actual value is 31*2 = 62dBm | Cell 2 |
| cellReselectionPriority | 4 | | Cell 1 |
| | 5 | | Cell 2 |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | | | |
| s-SearchThresholdP-r16 | 18 | Actual value = 18*2 = 36dB | Cell 1 |
| | 6 | Actual value = 6*2 = 12dB | Cell 2 |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 7.1.1.6.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140dBm | 7.1.1.6-1 |
| | -68 | Actual value = -68*2 = -136dBm | 7.1.1.6-2 |
| threshX-HighP | 16 | Actual value is 16*2 = 32dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.1.1.6.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -62 | Actual value = -62*2 = -124dBm | 7.1.1.6-1 |
| | -60 | Actual value = -60*2 = -120dBm | 7.1.1.6-2 |
| threshX-LowP | 9 | Actual value = 9*2 = 18dBm | |
| } | | | |
| } | | | |
| } | | | |

7.1.1.6.5 Test requirement

Tables 7.1.1.6.4.1-3 and 7.1.1.6.5-1 define the primary level settings including test tolerances for inter-frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

**Table 7.1.1.6.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | -124 Note 6 | |
| | | 2 | -137 | | -121 Note 6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1, 2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | 10.06 | 7.56 | -3.34 | 8.06 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | -93 | |
| | | 2 | -90 | | -90 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -102 | | -102 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 10.5 | 8 | -2.9 | 8.5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5 | -85 | -95.9 | -84.5 |
| | | 2 | -79.5 | -82 | -92.9 | -81.5 |
| Io | dBm/95.04 MHz | 1 | -53.11 | -55.34 | -62.18 | -54.91 |
| | | 2 | -53.11 | -55.34 | -62.18 | -54.91 |
| $S_{SearchThresholdP}$ | | 1, 2 | 35 | 35 | 12 Note 6 | 12 Note 6 |
| TreselectionNR | s | 1, 2 | 0 | | 0 | |
| SnonintrasearchP | dB | 1, 2 | 50 | | Not sent | |
| $Thresh_{x,high}$ | dB | 1, 2 | 32 Note 6 | | 48 | |
| $Thresh_{serving,low}$ | dB | 1, 2 | 44 | | 62 Note 6 | |
| $Thresh_{x,low}$ | dB | 1, 2 | 50 | | 18 Note 6 | |
| Propagation Condition | | 1, 2 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 5: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |
| Note 6: | Including the test tolerance given in Annex F. |

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$

Where:

$T_{evaluate, NR_inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling not-at-cell edge criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

### 7.1.1.7 NR SA FR2 cell re-selection for power class 6 UE configured with *highSpeedMeasFlagFR2-r17*

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC6
- This test case is incomplete for Test frequency f > 40.8 GHz
- Test tolerance and measurement uncertainty analysis are missing

#### 7.1.1.7.1 Test Purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.3 for FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17*.

#### 7.1.1.7.2 Test Applicability

This test applies to all types of NR UE power class 6 release 17 onwards that supports *highSpeedMeasFlagFR2-r17*.

#### 7.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses 4.2.2.3 and A.7.1.1.7.

#### 7.1.1.7.4 Test description

##### 7.1.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.7.4.1-1.

**Table 7.1.1.7.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for PC6**

| Configuration | Description |
|---|---|
| 7.1.1.7-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.1.1.7-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.7.4.1-2.

**Table 7.1.1.7.4.1-2: Initial conditions for NR SA FR2 cell re-selection for PC6**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.7.4.1-3.

2. Message contents are defined in clause 7.1.1.7.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.1.1.7.4.1-3: General test parameters for intra-frequency NR cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell2 | |
| | Neighbour cell | | 1, 2 | Cell1 | |
| Final condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cell | | 1, 2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |

| | | | | |
|---|---|---|---|---|
| Time offset between cells | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DRX cycle length | s | 1, 2 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2 | Not configured | |
| *highSpeedMeasFlagFR2-r17* | | | Set 1 | |
| T1 | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 1, 2 | 10 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2 | 5 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 7.1.1.7.4.2 Test Procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 7.1.1.7.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.7.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 10 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.7.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 5 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a.Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
    Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.7.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.7.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-169 in 38.508-1 [14] with condition R17 HST FR2 |

**Table 7.1.1.7.4.3-1A: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.7-1 |
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.7-2 |
| } | | | |
| } | | | |

**Table 7.1.1.7.4.3-1B: SIB2 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120dBm | 7.1.1.7-1 |
| | -58 | Actual value is -58*2 = -116dBm | 7.1.1.7-2 |
| s-IntraSearchP | 25 | Actual value is 25*2 = 50dB | |
| } | | | |
| } | | | |

**Table 7.1.1.7.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| } | | | |

**Table 7.1.1.7.4.3-3: *HighSpeedConfigFR2*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-62C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| HighSpeedConfigFR2-r17 ::= SEQUENCE { | | | |
| highSpeedMeasFlagFR2-r17 | Set1 | | |
| } | | | |

### 7.1.1.7.5 Test Requirements

Tables 7.1.1.7.4.1-3 and 7.1.1.7.5-1 define the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 7.1.1.7.5-1: Cell specific test parameters for NR cell re-selection for PC6**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| | | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| | | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| | | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration | | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
| | | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern | | 1, 2 | OP.4 | | | OP.4 | | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1, 2 | 66 | | | 66 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -138 | | | -138 | | |
| | | 2 | -135 | | | -135 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 8 | -3 | 1.5 | -infinity | 1.5 | -3 |
| | | 2 | | | | | | |
| Beam assumption[Note 4] | | 1,2 | Rough | | | | | |
| $N_{oc}$ [Note2] | dBm/SCS | 1 | -93 | | | | | |
| | | 2 | -90 | | | | | |
| $N_{oc}$ [Note2] | dBm/15 kHz | 1 | -102 | | | | | |
| | | 2 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | dB | 1 | 8 +TT | -3 + TT | 1.5 + TT | -infinity | 1.5 + TT | -3 + TT |
| | | 2 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -85+TT | -96+TT | -91.5+TT | -infinity | -91.5+TT | -96+TT |
| | | 2 | -82+TT | -93+TT | -88.5+TT | -infinity | -88.5+TT | -93+TT |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -59.37+TT | -63.40+TT | -62.47+TT | -64.01 | -62.47+TT | -63.40+TT |
| | | 2 | -57.18+TT | -62.86+TT | -61.67+TT | -64.01+TT | -61.67+TT | -62.86+TT |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition | | 1,2 | AWGN | | | AWGN 19444Hz | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra} + T_{SI-NR}$

$T_{detect,NR_Intra}$ = 5.12 s; as specified in table 7.1.1.0.1-3 (TS 38.133 [6] clause 4.2.2.3).

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

The cell re-selection delay to a newly detectable cell shall be less than a total of 6.4 s in this test case (note: this gives a total of 6.4 seconds, but the test allows 7 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 1.84 s; as specified in table 7.1.1.0.1-3 (TS 38.133 [6] clause 4.2.2.3).

$T_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

The cell re-selection delay to an already detected cell shall be less than a total of 3.2 seconds in this test case (note: this gives a total of 3.2 seconds, but the test allows 4 seconds).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 7.1.1.8 NR SA FR2 inter-frequency cell re-selection for power class 6 UE configured with *highSpeedMeasFlagFR2-r17*

Editor's Note: This test case is incomplete for the following configurations:

- Test tolerance and measurement uncertainty analysis are missing

### 7.1.1.8.1 Test Purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE that supports Idle mode inter-frequency measurement enhancement for HST in FR2 and configured with*highSpeedMeasFlagFR2-r17* as specified in TS 38.133 [6] clause 4.2.2.4.

### 7.1.1.8.2 Test Applicability

This test applies to all types of NR UE power class 6 release 18 onwards that support *highSpeedMeasFlagFR2- r17*.

### 7.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses 4.2.2.4 and A.7.1.1.8.

### 7.1.1.8.4 Test description

#### 7.1.1.8.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.8.4.1-1.

**Table 7.1.1.8.4.1-1: Supported test configurations**

| Configuration | Description for serving cell | Description for target cell |
|---|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.8.4.1-2.

**Table 7.1.1.8.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.3.2, table E.5-1 and TS 38.508-1 [14] clause 4.3.1.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.1.1.8.4.1-3.
2. Message contents are defined in clause 7.1.1.8.4.3.
3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

**Table 7.1.1.8.4.1-3: General test parameters for FR2 inter-frequency NR cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1. |
| | Neighbour cell | | 1, 2 | Cell1 | |
| T1 end condition | Active cell | | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T1. |
| | Neighbour cells | | 1, 2 | Cell2 | |
| T3 end condition | Active cell | | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3. |
| | Neighbour cell | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells are assumed. |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |
| SMTC configuration | | | 1, 2 | SMTC.1 | SMTC is set with 20ms periodicity on both frequencies. |
| DRX cycle length | | s | 1, 2 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211[7] clause 6.3.3.2. |
| rangeToBestCell | | | 1, 2 | Not configured | |
| highSpeedMeasFlagFR2-r17 | | | 1, 2 | Set2 | Set2 deployment is configured and the UE FR2 scaling factor is considered as N1 = 6. |
| T1 | | s | 1, 2 | 10 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 70 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 7.1.1.8.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 7.1.1.8.5-1 T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.8.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.8.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 12. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 12.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

14. Repeat step 3-12 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 7.1.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.1.1.8.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1 for NR Cell 1 |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-169 in 38.508-1 [14] with condition R17 HST FR2 |

**Table 7.1.1.8.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 149 | | |
| } | | | |

**Table 7.1.1.8.4.3-3: *HighSpeedConfigFR2*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-62C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| HighSpeedConfigFR2-r17 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| highSpeedMeasFlagFR2-r17 | Set2 | | |
| } | | | |

**Table 7.1.1.8.4.3-4: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -70*2 = -140dBm | 7.1.1.8-1 and Cell 1 |
| | -69 | Actual value is -69*2+1 = -137dBm | 7.1.1.8-2 and Cell 1 |
| | -62 | Actual value is -62*2 = -124dBm | 7.1.1.8-1 and Cell 2 |
| | -60 | Actual value is -60*2 = -120dBm | 7.1.1.8-2 and Cell 2 |
| } | | | |
| } | | | |

**Table 7.1.1.8.4.3-5: SIB2(Cell2)**

| Derivation Path: Table H.2.2-1 with condition NR Cell 2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 31 | Actual value is 31*2 = 62dBm | |
| threshServingLowP | 31 | Actual value is 31*2 = 62dBm | |
| } | | | |
| } | | | |

**Table 7.1.1.8.4.3-6: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140dBm | 7.1.1.8-1 |
| | -68 | Actual value = -68*2+1 = -137dBm | 7.1.1.8-2 |
| threshX-HighP | 16 | Actual value is 16*2 = 32dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.1.1.8.4.3-7: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -62 | Actual value = -62*2 = -124dBm | 7.1.1.8-1 |

| | | | |
|---|---|---|---|
| | -60 | Actual value = -60*2 = -120dBm | 7.1.1.8-2 |
| threshX-LowP | 9 | Actual value = 9*2 = 18dBm | |
| } | | | |
| } | | | |
| } | | | |

7.1.1.8.5 Test requirement

Tables 7.1.1.8.4.1-3 and 7.1.1.8.5-1 define the primary level settings including test tolerances for inter-frequency NR cell re-selection test case.

**Table 7.1.1.8.5-1: Cell specific test parameters for FR2 inter-frequency NR cell re-selection test case in AWGN**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -140 | | |
| | | 2 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| Beam assumption[Note 4] | | 1,2 | Rough | | | Rough | | |
| $\hat{E}_s / I_{ot}$ BB [Note 5] | dB | 1 | 9.95 | 9.95 | 7.45 | -11.05 | infinity | 7.95 |
| | | 2 | | | | | | |
| $N_{oc}$ [Note2] | dBm/SCS | 1 | -93 | | | -93 | | |
| | | 2 | -90 | | | -90 | | |
| $N_{oc}$ [Note2] | dBm/15 kHz | 1 | -102 | | | -102 | | |
| | | 2 | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 10.5+TT | 10.5+TT | 8+TT | -10.5+TT | infinity | 8.5+TT |
| | | 2 | | | | | | |
| SS-RSRP [Note3] | dBm/SCS | 1 | -82.5+TT | -82.5+TT | -85+TT | -103.5+TT | infinity | -84.5+TT |
| | | 2 | -79.5+TT | -79.5+TT | -82+TT | -100.5+TT | infinity | -81.5+TT |
| Io | dBm/95.04 MHz | 1, 2 | -53.11+TT | -53.11+TT | -55.34+TT | -63.61+TT | -63.98+TT | -54.91+TT |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2 | 48 | | | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2 | 44 | | | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2 | 50 | | | 50 | | |

| | | | | |
|---|---|---|---|---|
| Propagation Condition | | 1, 2 | AWGN | AWGN with 9722 Hz |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 2.

Cell re-selection delay to a higher priority cell = $T_{higher_priority_search} + T_{evaluate,\ NR_inter_HST} + T_{SI\text{-}NR}$

$T_{higher_priority_search}$ = 60 s, as specified in TS 38.133 [6] clause 4.2.2.7 of 38.133[6]

$T_{evaluate,\ NR_inter_HST}$ = 6 s, as specified in Table 7.1.1.0.2-2a in clause 4.2.2.4 of 38.133[6]

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a higher priority cell shall be less than a total of 68 seconds in this test case (note: this gives a total of 67.28 seconds but this test allows 68 seconds)

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to a lower priority cell test requirement in this case is expressed as:

Cell re-selection delay to a lower priority cell = $T_{evaluate,\ NR_inter_HST} + T_{SI\text{-}NR}$,

$T_{evaluate,\ NR_inter_HST}$ = 6 s, as specified in Table 7.1.1.0.2-2a in clause 4.2.2.4 of 38.133[6]

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a lower priority cell shall be less than a total of 8 seconds in this test case (note: this gives a total of 7.28 seconds but this test allows 8 seconds)

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

# 7.2 RRC_INACTIVE state mobility

## 7.2.1 Small Data Transmission

### 7.2.1.0 Minimum conformance requirements

#### 7.2.1.0.1 Minimum conformance requirements for CG-SDT TA validation

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available $N_{TA}$ value as specified in subclause 7.1.2 of TS 38.133 [6]) the serving

cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration (see TS 38.331 [13]).

When *cg-SDT-RSRP-ChangeThreshold* (see TS 38.331 [13]) is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 of TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available $N_{TA}$ value as specified in subclause 7.1 of TS 38.133 [6] provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 of TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 7.2.1.0.1-1 are met for FR2-1.

**Table 7.2.1.0.1-1 Valid measurement for FR2-1**

| Measurement | FR2-1 |
|---|---|
| $RSRP_1$ | (T1 – max(480ms, 8*SMTC periodicity)) ≤ T1' ≤ (T1 + max(480ms, 8*SMTC periodicity)) |
| $RSRP_2$ | (T2 – max(480ms, 8*SMTC periodicity)) ≤ T2' ≤ T2 |

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when
  - *RRCRelease* with CG-SDT configuration (see TS 38.331 [13]) is received
  - the latest TA is received if TA is received while in RRC_INACTIVE state.
- T1' is the time when the UE has completed $RSRP_1$.
- T2 is the time when the UE performs TA validation as defined in clause 5.27.2 of TS 38.321 [12] for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- $T_{DRX}$ is the DRX cycle length in ms.
- M1 is the scaling factor as defined in clause 4.2.2.2 of TS 38.133 [6].

The normative reference for this requirement is TS 38.133 [6] clause 5.5.2 and 5.5.3.

## 7.2.1.1 TA Validation for CG-SDT in FR2

Editor's note: This test case is incomplete. The following aspects are remaining

- Some parameters in brackets- TT analysis is missing
- Annex F

### 7.2.1.1.1 Test Purpose

The purpose of this test is to verify that the UE correctly performs TA validation for CG-SDT. This test will partly verify the TA validation requirements in clause 5.5.3 of TS 38.133 [6].

### 7.2.1.1.2 Test Applicability

This test applies to all types of NR UE from Release 17 onwards that supports transmission of data and/or signalling over allowed radio bearers in RRC_INACTIVE state via configured grant type 1 (i.e., CG-SDT), as specified in TS 38.331 [13].

#### 7.2.1.1.3 Minimum Conformance Requirements

The minimum conformance requirements are specified in clause 7.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.2.1.1.

#### 7.2.1.1.4 Test Description

##### 7.2.1.1.4.1 Initial conditions

This test can be run in the configuration defined in Table 7.2.1.1.4.1-1.

**Table 7.2.1.1.4.1-1: Supported test configurations for FR2 PCell**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 7.2.1.1-1 | 1 | TDD, SSB SCS 120 kHz, data SCS 120kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.2.1.1.4.1-2.

**Table 7.2.1.1.4.1-2: Initial conditions for TA Validation for CG-SDT in FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration from Table 7.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.2.1.1.4.1-3.
2. Message contents are defined in clause 7.2.1.1.4.3.
3. There is only one NR Cell (Cell 1) specified in the test, configured as PCell in FR2. The Cell 1 is configured according to the settings in Annex C.1.1 and C.1.2.

**Table 7.2.1.1.4.1-3: General test parameters for TA validation for CG-SDT in FR2**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 66 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 DD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.X |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz |
| PRACH Configuration | Config 1 | | Table A.3.8.3.4 [6] |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |

| | | |
|---|---|---|
| Correlation Matrix and Antenna Configuration | | 2x2 Low |
| DRX | s | 0.64 |
| cg-SDT-RSRP-ThresholdSSB | dBm | -110 |
| cg-SDT-RSRP-ChangeThreshold | dB | 8 |
| cg-SDT-TimeAlignmentTime | | infinity |
| CG-SDT resource period | ms | 320 |
| T1 | s | 0.8 |
| T2 | s | 0.96 |
| T3 | s | 3.04 |
| T4 | s | 1.54 |
| T5 | s | 1.76 |
| T6 | s | 4.58 |

### 7.2.1.1.4.2 Test procedure

The test consists of a single cell (Cell 1), which is the active NR cell configured as PCell in FR2 and includes two sub-tests. Sub-test#1 is for testing valid TA where UE can initiate CG-SDT transmission and Sub-test#2 is for testing invalid TA where UE does not initiate CG-SDT transmission. Subtest#2 is only tested if Sub-test#1 is passed. For each sub-test, the DUT is configured with CG-SDT configurations when entering RRC_INACTIVE state. Sub-test#1 consists of four successive time periods, with time duration of T1, T2, T3, and T4 respectively. Sub-test#2 consists of two successive time periods, with time duration of T5 and T6respectively. Figure 7.2.1.1.4.2-1 shows the variation of the RSRP level in the active cell over the duration of Sub-test#1, and Figure 7.2.1.1.4.2-2 shows the variation of the RSRP level over the duration of Sub-test#2.

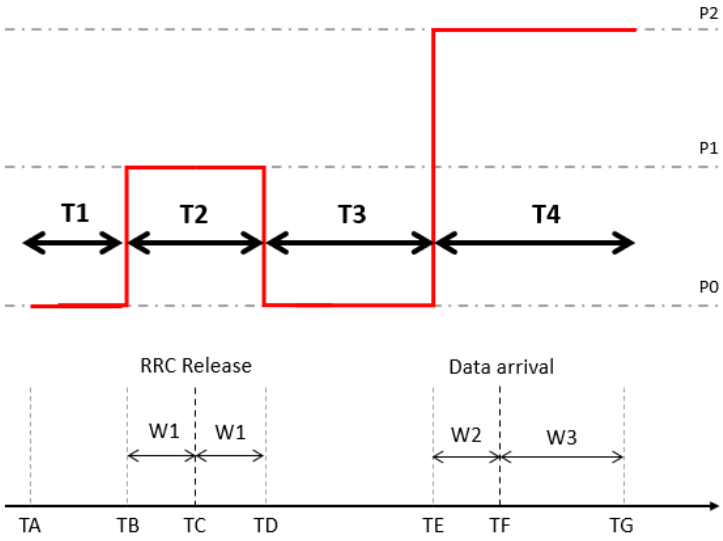



**Figure 7.2.1.1.4.2-1: RSRP variation for TA validation for CG-SDT Sub-test#1**

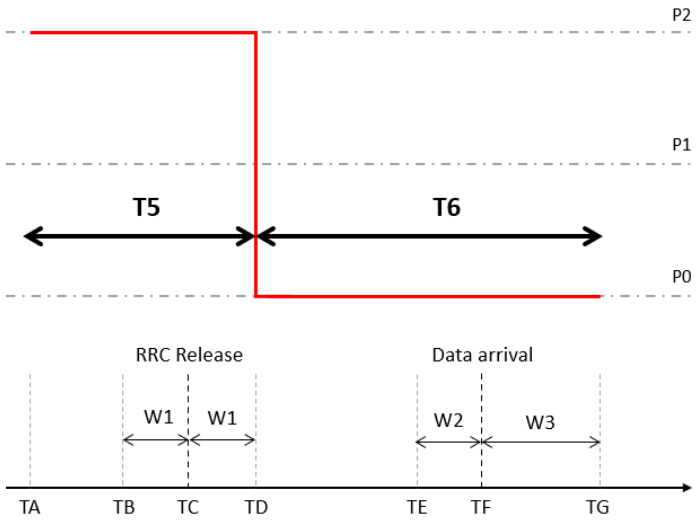



**Figure 7.2.1.1.4.2-2: RSRP variation for TA validation for CG-SDT Sub-test#2**

The derivation of supplementary timeline events is given in Table 7.2.1.1.4.2-1.

**Table 7.2.1.1.4.2-1: Derivation of Supplementary Timeline Events**

| Time Period | Unit | Test configuration | Value | Derivation |
|---|---|---|---|---|
| W1 | ms | 1 | 480 | Test configuration |
| W2 | ms | 1 | 480 | Test configuration |
| W3 | ms | 1 | 1060 | Test configuration |
| **Subtest#1** | | | | |
| TAtoTB | ms | 1 | [800] | TAtoTB = T1 |
| TBtoTC | ms | 1 | 480 | TBtoTC = W1 |
| TCtoTD | ms | 1 | 480 | TCtoTD = W1 |
| TDtoTE | ms | 1 | [3040] | TDtoTE = T3 |
| TEtoTF | ms | 1 | 480 | TEtoTF = W2 |
| TFtoTG | ms | 1 | 1060 | TFtoTG = W3 |
| IP PDU Delay (T_delay_modeB) | ms | 1 | [4000] | Test configuration for step 5 & 16 |
| **Subtest#2 (to be used only if Subtest#1 is passed)** | | | | |
| TAtoTB | ms | 1 | [800] | TAtoTB = T5 – TBtoTC – TCtoTD = T5 – 2*W1 |
| TBtoTC | ms | 1 | 480 | TBtoTC = W1 |
| TCtoTD | ms | 1 | 480 | TCtoTD = W1 |
| TDtoTE | ms | 1 | [3040] | TDtoTE = T6 – TEtoTF – TFtoTG = T6 – W2 - W3 |
| TEtoTF | ms | 1 | 480 | TEtoTF = W2 |
| TFtoTG | ms | 1 | 1060 | TFtoTG = W3 |
| IP PDU Delay (T_delay_modeB) | ms | 1 | [4000] | Test configuration for step 5 & 16 |
| Note 1: These derivations are useful to understand different timeline events other than T1, T2, T3, T4, T5 and T6. Calculations are informative. | | | | |

1. Ensure the UE is fully synchronized to PCell (Cell 1), be registered to the cell and is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (Table 4.5.1-1).

2. Set the parameters according to Table 7.2.1.1.5-1.

3. The test starts at time-point TA before which SS sets the transmit power to P0. Sub-test#1 starts (see Figure 7.2.1.1.4.2-1).

4. At time-point TB, the SS changes the power level from P0 to P1.

5. Between time-points TB and TC, SS sends CLOSE UE TEST LOOP message, containing UE test loop mode B indication and the configuration for T_delay_modeB timer, to the UE.

6. UE closes the test loop mode B and sends CLOSE UE TEST LOOP COMPLETE message to the SS.

7. At time point TC, the SS sends an SDAP PDU and RRCRelease message with CG-SDT configuration to the UE. The UE buffers the received SDAP SDU (IP PDU), starts T_delay_modeB timer and enters RRC_INACTIVE state.

8. At time-point TD, the SS changes the power level from P1 to P0.

9. At time-point TE, the SS changes the power level from P0 to P2.

10. At time-point TF, the T_delay_modeB timer expires which trigger UL data arrival at UE lower layer.

11. After time point TF, SS observes whether UE transmits with CG-SDT no later than TG.

12. Check 1: If UE transmits an RRCResumeRequest and the looped back SDAP SDU in a CG PUSCH occasion occurring anywhere from time-points TF to TG, declare Sub-test#1 as passed.

13. If Sub-test#1 is passed in Step 12, go to Step 14 else declare the test iteration verdict as ‘FAIL’ and go to Step 26. Sub-test#1 ends.

14. After time point TG, SS initiates the generic procedure given in Table 4.5.4.2-3 (Steps 1-8) of TS 38.508-1 [14] and brings the UE from RRC_INACTIVE to RRC_CONNECTED state.

15. SS sends OPEN UE TEST LOOP message to the UE.

16. UE sends OPEN UE TEST LOOP COMPLETE message to the SS.

17. Sub-test#2 starts; SS sets the transmit power to P2 (see Figure 7.2.1.1.4.2-2) and this time is considered as time-point TA for Sub-test#2. From time-point TA to time-point TD, power level is fixed at P2.

18. Between the time-points TB and TC of Sub-test#2, SS sends CLOSE UE TEST LOOP message, containing UE test loop mode B indication and the configuration for T_delay_modeB timer, to the UE.

19. UE closes the test loop mode B and sends CLOSE UE TEST LOOP COMPLETE message to the SS.

20. At time-point TC, the SS sends an SDAP PDU and RRCRelease message with CG-SDT configuration to UE. The UE buffers the received SDAP SDU (IP PDU), starts T_delay_modeB timer and enters in RRC_INACTIVE state.

21. At time-point TD, the SS changes the power level from P2 to P0.

22. At time-point TF, the T_delay_modeB timer expires which trigger UL data arrival at UE lower layer.

23. After time point TF, SS observes whether UE transmits with CG-SDT no later than TG.

24. Check 2: If UE transmits an RRCResumeRequest and the looped back SDAP SDU in a CG PUSCH occasion occurring anywhere from time-points TF to TG, Sub-test#2 is failed else Sub-test#2 is passed. Sub-test#2 ends.

25. If Sub-test#2 is passed, declare the test iteration verdict as ‘PASS’ else ‘FAIL’.

26. After time point TG, SS initiates the generic procedure given in Table 4.5.4.2-3 (Steps 1-8) of TS 38.508-1 [14] and brings the UE from RRC_INACTIVE to RRC_CONNECTED state.

27. SS sends OPEN UE TEST LOOP message to the UE.

28. UE opens the test loop and sends OPEN UE TEST LOOP COMPLETE message to the SS.

29. Repeat steps 1-28 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 7.2.1.1.4.3-1: *SIB1* (All steps, clause 7.2.1.1.4.2)**

| Derivation Path: TS 38.508-1 [14] table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| sdt-ConfigCommon-r17 SEQUENCE { | | | |
| sdt-RSRP-Threshold-r17 | Not present | | |
| sdt-LogicalChannelSR-DelayTimer-r17 | sf512 | | |
| sdt-DataVolumeThreshold-r17 | byte100 | | |
| t319a-r17 | ms4000 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.2.1.1.4.3-2: CLOSE UE TEST LOOP (Step 5 and 16, clause 7.2.1.1.4.2)**

| Derivation path: 38.508-1 [14] Table 4.7A-3 condition UE test loop mode B | | |
|---|---|---|
| **Information Element** | **Value/remark** | **Comment** |
| UE test loop mode B_Enhanced LB setup | | |
| IP PDU delay | 0 0 0 0 0 1 0 0 | T_delay_modeB duration in seconds (4 seconds) |

**Table 7.2.1.1.4.3-3: *RRCRelease* (Steps 5 and 16, clause 7.2.1.1.4.2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 with condition NR_RRC_INACTIVE and SDT | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| suspendConfig SEQUENCE { | | | |
| sdt-Config-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| sdt-MAC-PHY-CG-Config-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| pusch-Config-r17 CHOICE { | | | |
| setup | PUSCH-Config | Derivation Path: TS 38.508-1 [14], Table 4.6.3-118 | |
| } | | | |
| configuredGrantConfigToAddModList-r17 SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig { | | | |
| ConfiguredGrantConfig | ConfiguredGrantConfig | Table 7.2.1.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-DL-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| pdcch-Config-r17 CHOICE { | | | |
| setup | PDCCH-Config | Derivation Path: TS 38.508-1 [14], Table 4.6.3-95 | |
| } | | | |
| pdsch-Config-r17 CHOICE { | | | |

| | | | |
|---|---|---|---|
| setup | PDSCH-Config | Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | |
| } | | | |
| } | | | |
| } | | | |
| cg-SDT-TimeAlignmentTimer-r17 | infinity | Time Alignment Timer value | |
| cg-SDT-RSRP-ThresholdSSB-r17 | 46 | (IE value – 156) dBm = - 110 dBm | |
| cg-SDT-TA-ValiditationConfig-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cg-SDT-RSRP-ChangeThreshold-r17 | [dB8] | [8] dB | |
| } | | | |
| } | | | |
| cg-SDT-CS-RNTI-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.2.1.1.4.3-4: *ConfiguredGrantConfig* (Table 7.2.1.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-26, condition CG_Config_Type1 | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| ConfiguredGrantConfig ::= SEQUENCE { | | | |
| periodicity | Sym2560x14 | 320ms | SCS120 |
| rrc-ConfiguredUplinkGrant SEQUENCE{ | | | |
| frequencyDomainAllocation | BIT STRING (SIZE(18) | Equals to NBWPsize * (NBWPsize – LRB + 1) + (NBWPsize -1 - RBstart), where LRB = 24 PRB, RBstart = 0, NBWPsize is the size [PRBs] of the carrier bandwidth and contained in TS.38.508-1 [14] clause 6.2.3.1 | SCS15 AND CBW5, SCS30 AND CBW10 |
| | BIT STRING (SIZE(18) | Equal to NBWPsize * (LRB-1) + RBstart), where LRB = 24 PRB, RBstart = 0, NBWPsize is the size [PRBs] of the carrier bandwidth and contained in TS.38.508-1 [14] clause 6.2.3.1 | |
| dmrs-SeqInitialization | 0 | | |
| mcsAndTBS | 0 | | |
| } | | | |
| } | | | |
| Note : Configured UL grant for CG-SDT is 888 bits ($L_{RBs}$ & $I_{MCS}$ as per 38.523-3[3] annex B) is chosen to enable UE to transmit RRCResumeRequest and Loop backed RLC PDU in a MAC PDU ( 97 bytes for Loop backed RLC PDU + 2 bytes for MAC Sub Header + 6 bytes for RRCResumeRequest message + 2 bytes for MAC Sub Header + 4 bytes for BSR and Padding ) | | | |

**Table 7.2.1.1.4.3-5: *RRCResumeRequest* (Steps 10 and 20, clause 7.2.1.1.4.2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCResumeRequest ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| rrcResumeRequest SEQUENCE { | | | |
| resumeCause | mo-data | | |
| } | | | |
| } | | | |

7.2.1.1.5 Test Requirements

Tables 7.2.1.1.4.1-3 and 7.2.1.1.5-1 define the general parameters and cell specific parameters for NR SA FR2 CG-SDT TA validation test.

**Table 7.2.1.1.5-1: Cell specific test parameters TA validation for CG-SDT in FR2**

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| AoA setup | | | Setup 1 defined in A.3.15 | | | | | |
| Assumption for UE beams Note 4 | | | Rough | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| $N_{oc}$ | Config 1 | dBm/15kHz | -100 + TT | | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -100 + TT | | | | | |
| $\hat{E}_s / I_{ot}$ | Config 1 | dB | [0] + TT | [13] + TT | [0] + TT | [24.5] + TT | [24.5] + TT | [0] + TT |
| $\hat{E}_s / N_{oc}$ | Config 1 | dB | [0] + TT | [13] + TT | [0] + TT | [24.5] + TT | [24.5] + TT | [0] + TT |
| SS-RSRP | Config 1 | dBm/SCS | [-100] + TT | [-87] + TT | [-100] + TT | [-75.5] + TT | [-75.5] + TT | [-100] + TT |
| Io | Config 1 | dBm/95.04 MHz | [-68] + TT | [-57.8] + TT | [-68] + TT | [-46.50] + TT | [-46.50] + TT | [-68] + TT |
| Propagation condition | | | AWGN | | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

The UE behaviour in each test during time durations shall be as follows:

During Sub-test#1, UE shall transmit UL data with CG-SDT within 1060ms after time point TF.

During Sub-test#2, after passing Sub-test#1, UE shall not transmit UL data with CG-SDT.

The rate of correct events observed during repeated tests shall be at least 90%.

# 7.3 RRC_CONNECTED state mobility

## 7.3.1 Handover

### 7.3.1.0 Minimum conformance requirements

#### 7.3.1.0.1 Minimum conformance requirements for NR FR2 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ ms from the end of the last TTI containing the RRC command:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.4.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = N* $T_{rs}$ ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = N*3* $T_{rs}$ ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = $T_{rs}$ for both known and unknown target cell.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.4.

#### 7.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ ms from the end of the last TTI containing the RRC command:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.5.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then $T_{search}$ = 0 ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = N*3* $T_{rs}$ ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up 40ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = $T_{rs}$ for both known and unknown target cell.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.5.

#### 7.3.1.0.3 Minimum conformance requirements for NR FR1 – NR FR2 DAPS handover

An FR1-FR2 DAPS handover is synchronous if it meets the conditions in table 7.3.1.0.3-1, otherwise it is asynchronous

**Table 7.3.1.0.3-1: Sync condition for FR1-FR2 DAPS handover**

| Frequency Range of the pair of carriers | Maximum receive timing difference between source and target cell (μs) for sync DAPS handover | Maximum transmit timing difference between source and target cell (μs)Note 1 sync DAPS handover |
|---|---|---|
| Between FR1 and FR2 | 25 | 26.1 |

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover1}$ ms from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{RRC_procedure}$ is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

$T_{search}$, $T_{IU}$, $T_{processing}$, $T_{\Delta}$ and $T_{margin}$ are defined in clause 6.1.1.5.2 of 38.133 [6].

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within $D_{handover2}$.

$$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$$

Where:

$T_{RRC_procedure}$ is the RRC procedure delay as specified in clause 12 in TS 38.331 [13].

$T_{interrupt2}$ is defined in clause 6.1.3.4.2 of 38.133 [6].

During $D_{handover1}$, the UE is allowed an interruption of up to $T_{interrupt1}$ on source cell.

For FR1-to-FR2 inter-band handover, $T_{interrupt1}$ is specified in Table 7.3.1.0.3-2.

**Table 7.3.1.0.3-2: $T_{interrupt1}$ for FR1-to-FR2 inter-band DAPS HO**

| $\mu$ | NR slot length (ms) of source cell | $T_{interrupt1}$ (slots) | |
|---|---|---|---|
| | | Sync | Async |
| 0 | 1 | 1 | 2 |
| 1 | 0.5 | 2 | 3 |
| 2 | 0.25 | 5 | 5 |

During $D_{handover2}$, the UE is allowed an interruption of up to $T_{interrupt2}$ on target cell.

For FR1-to-FR2 inter-band handover, $T_{interrupt2}$ is specified in Table 7.3.1.0.3-3.

**Table 7.3.1.0.3-3: $T_{interrupt2}$ for FR1-to-FR2 inter-band DAPS HO**

| $\mu$ | NR slot length (ms) of target cell | $T_{interrupt2}$ (slots) | |
|---|---|---|---|
| | | Sync | Async |
| 2 | 0.25 | 5 | 5 |
| 3 | 0.125 | 9 | 9 |

The normative reference for this requirement is TS 38.133 [6] clause 6.1.3.4.

### 7.3.1.1 NR SA FR1-FR2 Inter-frequency handover; unknown target cell

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- Test Tolerances are missing
- Connection diagram may require updates for FR1+FR2 scenarios

#### 7.3.1.1.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-frequency handover requirements specified in 38.133 [6] clause 6.1.1.5.

#### 7.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR1 and SA FR2.

#### 7.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.1.

#### 7.3.1.1.4 Test description

##### 7.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.1.4.1-1.

**Table 7.3.1.1.4.1-1: NR SA FR1-FR2 Test configurations for Inter-frequency handover**

| Config | Description |
|---|---|
| 7.3.1.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.1.4.1-2

**Table 7.3.1.1.4.1-2: NR SA FR1-FR2 Initial conditions for Inter-frequency handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.1.1.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.1.4.1-3.

**Table 7.3.1.1.4.1-3: NR SA FR1-FR2 General test parameters for Inter-frequency handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤10 | |

### 7.3.1.1.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.1.4.1-3 and Table 7.3.1.1.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.1.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 572 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.1.1.4.3-1: NR SA FR1-FR2 Common exception messages for Inter-frequency handover**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

### 7.3.1.1.5 Test requirements

Table 7.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.1.1.5-1: NR SA FR1-FR2 Cell specific test parameters for Inter-frequency handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | | N/A | | Rough | |
| AoA setup | | | NA | | Setup 1 as defined in clause A.9 | |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | TDD | |
| | Config 2,3 | | TDD | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | | TDDConf.3.1 | |
| | Config 2 | | TDDConf.1.1 | | TDDConf.3.1 | |
| | Config 3 | | TDDConf.2.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1 | | 52 | | 66 | |
| | Config 2 | | 52 | | 66 | |
| | Config 3 | | 106 | | 66 | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | SR.3.1 TDD | |
| | Config 2 | | SR.1.1 TDD | | SR.3.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | CR.3.1 TDD | |
| | Config 2 | | CR.1.1 TDD | | CR.3.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.3.1 TDD | |
| Control Channel RMC | Config 1 | | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | Config 2 | | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.3.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | SSB.3 FR2 | |
| | Config 3 | | SSB.2 FR1 | | SSB.3 FR2 | |
| SMTC configuration | Config 1,2 | | SMTC.1 | | SMTC.1 | |
| | Config 3 | | SMTC.2 | | SMTC.1 | |
| SMTC configuration | Config 1,2 | | SMTC.1 | | SMTC.1 | |
| | Config 3 | | SMTC.2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | 120 kHz | |
| | Config 3 | | 30 kHz | | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | 120 kHz | |
| | Config 3 | | 30 kHz | | 120 kHz | |
| PRACH configuration | | | PRACH.1 FR1 | | PRACH.1 FR2 | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | TRS.2.1 TDD | |
| | Config 2 | | TRS.1.1 TDD | | TRS.2.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | | N/A | | TCI.State.2 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | DLBWP.0.1 | |

| | | | | | |
|---|---|---|---|---|---|
| | Dedicated DL BWP | | DLBWP.1.1 | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Link only, see clause A.6A | -104.7+TT | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | | -95.7+TT | |
| | Config 3 | | | -95.7+TT | |
| $\hat{E}_s / I_{ot}$ | | dB | | -Infinity | 10+TT |
| $\hat{E}_s / N_{oc}$ | | dB | | -Infinity | 10+TT |
| Io Note3 | Config 1,2 | dBm/ BW | | -66.7+TT | -56.3+TT |
| | Config 3 | dBm/ BW | | -66.7+TT | -56.3+TT |
| Propagation condition | | - | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 572 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 562 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.5.2 of 38.133 [6].

This gives a total of 572 ms.

## 7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.3.1.2.1 Test purpose

To verify the requirement for the NR FR2 intra-frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

#### 7.3.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

#### 7.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.2.

#### 7.3.1.2.4 Test description

##### 7.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.2.4.1-1.

**Table 7.3.1.2.4.1-1: NR SA FR2 Test configurations for Intra-frequency handover**

| Config | Description |
|---|---|
| 7.3.1.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.2.4.1-2

**Table 7.3.1.2.4.1-2: NR SA FR2 Initial conditions for Intra-frequency handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.1.2.4.3.
2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.1.2.4.1-3.

**Table 7.3.1.2.4.1-3: NR SA FR2 General test parameters for Intra-frequency handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤10 | |

#### 7.3.1.2.4.2 Test procedure

The test scenario comprises of one FR2 RF channel with two intra-frequency NR cells. NR Cell 1 is the source PCell and NR Cell 2 is the target PCell. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.2.4.1-3 and Table 7.3.1.2.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.2.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 232 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.1.2.4.3-1: NR SA FR2 Common exception messages for Intra-frequency handover**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

### 7.3.1.2.5 Test requirements

Table 7.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.1.2.5-1: NR SA FR2 Cell specific test parameters for Intra-frequency handover**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | Rough | | Rough | |

| | | | | | | |
|---|---|---|---|---|---|---|
| AoA setup | | | Setup 1 as defined in clause A.9 | | | |
| NR RF Channel Number | | | **1** | | **1** | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | | 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | | | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 6 | -1.8 | -Infinity | 0 |
| $\hat{E}_s / N_{oc}$ | | dB | 6 | 6 | -Infinity | 7 |
| Io Note3 | | dBm/ BW | -59.7 | -56.7 | -59.7 | -56.7 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 232 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 222 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 232 ms.

### 7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.3.1.3.1 Test purpose

To verify the requirement for the NR FR2-NR FR2 inter-frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

#### 7.3.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

#### 7.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.3.

#### 7.3.1.3.4 Test description

##### 7.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.3.4.1-1.

**Table 7.3.1.3.4.1-1: NR SA FR2-FR2 Test configurations for Inter-frequency handover**

| Config | Description |
|---|---|
| 7.3.1.3-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.3.4.1-2

**Table 7.3.1.3.4.1-2: NR SA FR2-FR2 Initial conditions for Inter-frequency handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.1.3.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.3.4.1-3.

**Table 7.3.1.3.4.1-3: NR SA FR2-FR2 General test parameters for Inter-frequency handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤10 | |

### 7.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on one FR2 carrier and NR Cell 2 is the target PCell on another FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.3.4.1-3 and Table 7.3.1.3.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.3.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 552 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.1.3.4.3-1: NR SA FR2-FR2 Common exception messages for Inter-frequency handover**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

7.3.1.3.5 Test requirements

Table 7.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.1.3.5-1: NR SA FR2-FR2 Cell specific test parameters for Inter-frequency handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | | Rough | | Rough | |
| AoA setup | | | Setup 1 as defined in clause A.9 | | | |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | | 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | 5 | 5 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 5 | 5 | -Infinity | 5 |
| Io[Note3] | Config 1,2 | dBm/BW | -60.5 | -60.5 | -66.7 | -60.5 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 552 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 542 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 552 ms.

### 7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
- MU and TT analysis is incomplete for test frequency f > 40.8 GHz
- Connection diagram may require updates for FR1+FR2 scenarios
- MU and TT analysis is incomplete for UE power class other than PC3.

#### MU and TT analysis is incomplete for UE power class other than PC3.7.3.1.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency synchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

#### 7.3.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-frequency DAPS handover.

#### 7.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.4.

#### 7.3.1.4.4 Test description

##### 7.3.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.4.4.1-1.

**Table 7.3.1.4.4.1-1: NR SA FR1-FR2 synchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 7.3.1.4-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.4-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.4-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.4.4.1-2

**Table 7.3.1.4.4.1-2: Initial conditions for NR SA FR1-FR2 synchronous DAPS handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.1.4.4.3.
2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.1.4.4.1-3 below, with A4-Threshold modified by Test Tolerance.

**Table 7.3.1.4.4.1-3: General test parameters for NR SA FR1-FR2 synchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A4-Threshold | | dBm | -120 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | µs | 33 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | <5 | |
| T3 | | s | <0.5 | |
| T4 | | ms | $10+T_{interrupt2}$ | $T_{interrupt2}$ as defined in 38.133 [6] Table 6.1.3.4.2-2 for synchronous DAPS HO |
| T5 | | ms | 100 | |

### 7.3.1.4.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.4.4.1-3 and Table 7.3.1.4.4.1-4 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

Before the start of T2, the UE is configured with event A4 triggered measurement reporting on target carrier and measurement gaps (gap pattern ID # 0). From start of T2, the Cell 2 becomes detectable. The UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A4, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends

a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A4 triggered measurement reporting on the inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively.

7. UE shall transmit a *MeasurementReport* message triggered by Event A4.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *reconfigurationWithSync* message the SS shall switch the power settings from T2 to T3 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 92 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts when the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *daps-SourceRelease-r16 = true*.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

14. When T4 expires, T5 starts.

15. If

    a) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

b) The UE doesn't send periodical CSI report during entire time period T5.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.1.4.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.3.1.4.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 7.3.1.4.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.1.4.4.3-2: ServingCellConfig (Table 7.3.1.4.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 7.3.1.4.4.3-3: MeasConfig (Table 7.3.1.4.4.3-1)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(-120) specified in Table H.3.1-4AA | Acutal value of A4-threshold is -120dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.1.4.4.3-4: MeasurementReport (Step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults specified in Table H.3.1-7 with condition INTER-FREQ | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.1.4.4.3-5: RRCReconfiguration (Step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A with Condition RBConfig_NoKeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | Table 7.3.1.4.4.3-6 | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table 7.3.1.4.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.1.4.4.3-6: RadioBearerConfig (Table 7.3.1.4.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod { | 1 entry | | |
| DRB-ToAddMod[1] SEQUENCE { | | entry 1 | |
| drb-Identity | DRB-Identity using condition DRBn | DRB #n is a DRB established before DAPS HO.<br><br>Actual value of n is left to TE implementation | |
| daps-Config-r16 | true | | |
| } | | | |
| } | | | |
| securityConfig | Not present | | |
| } | | | |

**Table 7.3.1.4.4.3-7: CellGroupConfig (Table 7.3.1.4.4.3-6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | PhysCellId for Cell 2 | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.1.4.4.3-8: RRCReconfiguration (Step 12)**

| |
|---|
| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource |

### 7.3.1.4.5 Test requirements

Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.3.1.4.5-1: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 1 in FR1)**

| Parameter | | Unit | Cell 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| NR RF Channel Number | | | 1 | | | | |
| Duplex mode | Config 1 | | FDD | | | | |
| | Config 2,3 | | TDD | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | |
| | Config 2 | | TDDConf.1.1 | | | | |
| | Config 3 | | TDDConf.2.1 | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | |
| DRx Cycle | | ms | Not Applicable | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | |
| | Config 2 | | SR.1.1 TDD | | | | |
| | Config 3 | | SR2.1 TDD | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | |
| | Config 2 | | CR.1.1 TDD | | | | |
| | Config 3 | | CR2.1 TDD | | | | |
| OCNG Patterns | | | OP.1 | | | | |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | | | | |
| | Config 2 | | CSI-RS.1.1 TDD | | | | |
| | Config 3 | | CSI-RS.2.1 TDD | | | | |
| reportConfigType | | | periodic | | | | |
| reportQuantity | | | cri-RI-PMI-CQI | | | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | | | |
| | Config 3 | | 10 | | | | |
| CSI reporting offset | Config 1,2 | slot | 3 | | | | |
| | Config 3 | | 5 | | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | |
| | Config 3 | | SSB.2 FR1 | | | | |
| SMTC Configuration | Config 1,2 | | SMTC.1 | | | | |
| | Config 3 | | SMTC.2 | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | |
| | Config 3 | | 30 kHz | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | |
| | Config 3 | | 30 kHz | | | | |
| PRACH configuration | | | FR1 PRACH configuration 2 | | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | | |
| | Dedicated DL BWP | | DLBWP.1.3 | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | |

| | | | |
|---|---|---|---|
| | Dedicated UL BWP | | ULBWP.1.3 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | NA<br>Link only, see clause A.3.7A |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | |
| | Config 3 | | |
| $\hat{E}_s / I_{ot}$ | | dB | |
| $\hat{E}_s / N_{oc}$ | | dB | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | |
| | Config 3 | dBm/ 38.16MHz | |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 7.3.1.4.5-2: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 2 in FR2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| Assumption for UE beams Note 6 | | | Rough | |
| AoA setup | | | Setup 1 as defined in clause A.9 | |
| NR RF Channel Number | | | 2 | |
| Duplex mode | Config 1,2,3 | | TDD | |
| TDD configuration | Config 1,2,3 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1,2,3 | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | Config 1,2,3 | MHz | 100: $N_{RB,c}$ = 66 | |
| TRS configuration | Config 1,2,3 | | TRS.2.1 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 | | SR3.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 | | CR3.1 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| SSB Configuration | Config 1,2,3 | | SSB.1 FR2 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 | | CSI-RS.3.1 TDD | |
| SMTC Configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PRACH configuration | | | FR2 PRACH configuration 2 | |
| TCI configuration | | | CSI-RS.Config.0 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |

| | | | | |
|---|---|---|---|---|
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | -104.7 |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | -95.7 |
| $\hat{E}_s / I_{ot}$ | | dB | -Infinity | 10 |
| $\hat{E}_s / N_{oc}$ | | dB | -Infinity | 10 |
| Io Note3 | | dBm/ 95.04MHz | -66.7 | -55.4 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The interruption on Cell 1 shall not exceed $T_{interrupt1}$ as defined in TS 38.133 [6] Table 6.1.3.4.2-1 for synchronous DAPS HO. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{search}$ = 0 ms for known target cell, is the the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

$T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{processing}$ = 40 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{\Delta}$ = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{margin}$ = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 92 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from Cell 1 and Cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{interrupt2}$ = 1.125 ms for sync intra-frequency DAPS handover, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.1.2.2;

This gives a total of 11.125 ms.

UE shall not report CSI to Cell 1 during T5.

## 7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
- MU and TT analysis is incomplete for test frequency f > 40.8 GHz
- MU and TT analysis is incomplete for UE power class other than PC3.
- Connection diagram may require updates for FR1+FR2 scenarios

### 7.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency asynchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

### 7.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting inter-frequency asynchronous DAPS handover and supporting different SCSs in source PCell and inter-frequency target PCell in DAPS handover.

### 7.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.5.

### 7.3.1.5.4 Test description

#### 7.3.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.5.4.1-1.

**Table 7.3.1.5.4.1-1: NR SA FR1-FR2 asynchronous DAPS handover test configurations**

| Config | Description |
|---|---|
| 7.3.1.5-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.5-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.1.5-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.5.4.1-2

**Table 7.3.1.5.4.1-2: Initial conditions for NR SA FR1-FR2 asynchronous DAPS handover**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | [A.3.3.3.1-1] | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.1.5.4.3.
2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.1.5.4.1-3 below, with A4-Threshold modified by Test Tolerance.

**Table 7.3.1.5.4.1-3: General test parameters for NR SA FR1-FR2 asynchronous DAPS handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A4-Threshold | | dBm | -120 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | µs | 62.5 | Asynchronous cells |
| T1 | | s | 5 | |
| T2 | | s | <5 | |
| T3 | | s | <0.5 | |
| T4 | | ms | $10+T_{interrupt2}$ | $T_{interrupt2}$ as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO. |
| T5 | | ms | 100 | |

### 7.3.1.5.4.2 Test procedure

Same test procedure as described in clause 7.3.1.4.4.2.

### 7.3.1.5.4.3 Message contents

Same message contents as described in clause 7.3.1.4.4.3.

### 7.3.1.5.5 Test requirements

Table 7.3.1.5.5-1 and Table 7.3.1.5.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.3.1.5.5-1: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 1 in FR1)**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2,3 | | TDD | |
| TDD configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | |

| | | | |
|---|---|---|---|
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| DRX Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2 | slot | 5 |
| | Config 3 | | 10 |
| CSI reporting offset | Config 1,2 | slot | 3 |
| | Config 3 | | 5 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1,2 | | SMTC.1 |
| | Config 3 | | SMTC.2 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz |
| | Config 3 | | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH configuration | | | FR1 PRACH configuration 2 |
| BWP | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.3 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.3 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | NA<br>Link only, see clause A.3.7A |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | |
| | Config 3 | | |
| $\hat{E}_s / I_{ot}$ | | dB | |
| $\hat{E}_s / N_{oc}$ | | dB | |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | |
| | Config 3 | dBm/ 38.16MHz | |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 7.3.1.5.5-2: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 2 in FR2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 - T5 |
| Assumption for UE beams Note 6 | | | Rough | |
| AoA setup | | | Setup 1 as defined in clause A.9 | |
| NR RF Channel Number | | | 2 | |
| Duplex mode | Config 1,2,3 | | TDD | |
| TDD configuration | Config 1,2,3 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1,2,3 | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | Config 1,2,3 | MHz | 100: $N_{RB,c}$ = 66 | |
| TRS configuration | Config 1,2,3 | | TRS.2.1 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 | | SR.3.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 | | CR.3.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 | | CSI-RS.3.1 TDD | |
| SSB Configuration | Config 1,2,3 | | SSB.1 FR2 | |
| SMTC Configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PRACH configuration | | | FR2 PRACH configuration 2 | |
| TCI configuration | | | CSI-RS.Config.0 | |
| BWP | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.3 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | -104.7 |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | -95.7 |
| $\hat{E}_s / I_{ot}$ | | dB | -Infinity | 10 |
| $\hat{E}_s / N_{oc}$ | | dB | -Infinity | 10 |
| Io Note3 | | dBm/ 95.04MHz | -66.7 | -55.4 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| | |
|---|---|
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0 dBi gain antenna at the centre of the quiet zone. |
| Note 6: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. |

Same Test requirements as described in clause 7.3.1.4.5.

## 7.3.2 RRC connection mobility control

### 7.3.2.1 RRC re-establishment

#### 7.3.2.1.0 Minimum conformance requirements

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re\text{-}establish_delay} = T_{UE_re\text{-}establish_delay} + T_{UL_grant}$$

$T_{UL_grant}$: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [13] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re\text{-}establish_delay} = 50ms + T_{identify_intra_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR,i} + T_{SI\text{-}NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in table 6.2.1.2.1-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in table 6.2.1.2.1-2.

$T_{SMTC}$: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2*, $T_{smtc}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{SI\text{-}NR}$ = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [13] for the target NR cell.

$T_{PRACH}$ = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{PRACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$N_{freq}$: It is the total number of NR frequencies to be monitored for RRC re-establishment; $N_{freq}$ = 1 if the target intra-frequency NR cell is known, else $N_{freq}$ = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

**Table 7.3.2.1.0-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | $T_{identify_intra_NR}$ (ms) | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x $T_{SMTC}$) | MAX (800 ms, 10 x $T_{SMTC}$) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 80 x $T_{SMTC}$)) |
| < -8 | FR1 | N/A | 800[Note1] |
| < -8 | FR2 | N/A | 3520[Note1] |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC}$ > 20 ms and serving cell SSB Ês/Iot < [-8] dB. | | | |

**Table 7.3.2.1.0-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | $T_{identify_inter_NR,\ i}$ (ms) | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x $T_{SMTC,\ i}$) | MAX (800 ms, 13 x $T_{SMTC,\ i}$) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 104 x $T_{SMTC,\ i}$)) |
| < -8 | FR1 | N/A | 800[Note1] |
| < -8 | FR2 | N/A | 4000[Note1] |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1.

### 7.3.2.1.1 NR SA FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.3.2.1.1.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

#### 7.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.1

7.3.2.1.1.4 Test description

7.3.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.1.4.1-2. Test environment parameters are given in Table 7.3.2.1.1.4.1-3.

**Table 7.3.2.1.1.4.1-1: Intra-frequency RRC re-establishment in FR2 supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

**Table 7.3.2.1.1.4.1-2: General test parameters for Intra-frequency RRC re-establishment in FR2**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell1 | |
| | Neighbour cells | | 1 | Cell2 | |
| Final condition | Active cell | | 1 | Cell2 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| SMTC configuration | | | 1 | SMTC.1 | |
| DRX cycle length | | s | 1 | OFF | |
| PRACH configuration | | | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | | s | 1 | 5 | |
| T2 | | s | 1 | 4.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3 | | s | 1 | 5 | |

**Table 7.3.2.1.1.4.1-3: Test Environment Intra-frequency RRC re-establishment in FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 7.2.3 and 4.4.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.3.2.1.1.4.3.

2. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

#### 7.3.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.3.2.1.1.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 9840 ms (=4840ms + 5 s) from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.2.1.1.4.3-1: Common Exception messages for NR intra-frequency RRC re-establishment test case in FR2**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-9 with condition SSB RLM |

**Table 7.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 7.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

7.3.2.1.1.5 Test requirement

Table 7.3.2.1.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 4 | | | Rough | | | Rough | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1 | 66 | | | 66 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| AoA setup | | 1 | Setup 1 | | | Setup 1 | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | -0.12 | -infinity | -infinity | -3.46 | 2 | 2 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -104.7 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -95.7 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | -infinity | -infinity | 2 | 2 | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -91.7 | -infinity | -infinity | -93.7 | -93.7 | -93.7 |
| Io | dBm/95.04 MHz | 1 | -59.64 | -62.59 | -62.59 | -59.94 | -62.59 | -62.59 |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 in Annex B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from moment UE declares RLF, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra-frequency cell shall be less than 5 s, allow 9.84 s (4.84 s + 5 s) from the beginning of T2 in the test case The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

##### 7.3.2.1.2.1 Test purpose

The purpose of this test is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

##### 7.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

##### 7.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.2

##### 7.3.2.1.2.4 Test description

###### 7.3.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.2.4.1-2. Test environment parameters are given in Table 7.3.2.1.2.4.1-3.

**Table 7.3.2.1.2.4.1-1: Inter-frequency RRC re-establishment in FR2 supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

**Table 7.3.2.1.2.4.1-2: General test parameters for Inter-frequency RRC re-establishment in FR2**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell1 | |
| | Neighbour cells | | 1 | Cell2 | |
| Final condition | Active cell | | 1 | Cell2 | |
| RF Channel Number | | | 1 | 1, 2 | |
| Time offset between cells | | | 1 | 3 µs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| SMTC configuration | | | 1 | SMTC.1 | |
| DRX cycle length | | s | 1 | OFF | |
| PRACH configuration | | | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | | s | 1 | 5 | |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1 | 4.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133) |
| T3 | s | 1 | 6 | |

**Table 7.3.2.1.2.4.1-3: Test Environment Inter-frequency RRC re-establishment in FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table FFS and TS 38.508-1 [14] clause 7.2.3 and 4.4.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.3.2.1.2.4.3
2. There are two cells on two NR carriers specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.
3. The AoA setup for this test is Setup 1 as defined in clause A.9

### 7.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.3.2.1.2.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.2.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.2.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 6 seconds from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.2.4.3 Message contents

**Same message content as in 7.3.2.1.1.4.3. Table 7.3.2.1.2.4.3-1: Void**

**Table 7.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 7.3.2.1.2.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

7.3.2.1.2.5 Test requirement

Table 7.3.2.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.2.1.2.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 4 | | | Rough | | | Rough | | |
| AoA setup | | 1 | Setup 3 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 5+TT | -infinity | -infinity | -infinity | -infinity | 8+TT |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98+TT | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -89+TT | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 5+TT | -infinity | -infinity | -infinity | -infinity | 8+TT |
| SS-RSRP Note3 | dBm/SCS | 1 | -84+TT | -infinity | -infinity | -infinity | -infinity | -81+TT |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Io | dBm/95.04 MHz | 1 | -53.82+TT | -infinity | -infinity | -infinity | -infinity | -51.37 +TT |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter-frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

### 7.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 7.3.2.1.3.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits, and to verify the requirements in TS 38.133 [6] clause 6.2.1

#### 7.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.3

#### 7.3.2.1.3.4 Test description

##### 7.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 7.3.2.1.3.4.1-1.

**Table 7.3.2.1.3.4.1-1: Supported test configurations for NR SA FR2 RRC re-establishment without serving cell timing**

| Config | Description |
|---|---|
| 7.3.2.1.3-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Configure the test requirement and the DUT according to the parameters in Table 7.3.2.1.3.4.1-2.

**Table 7.3.2.1.3.4.1-2: Initial conditions for NR SA FR2 RRC re-establishment without serving cell timing**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 7.2.3 and 4.4.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.3.2.1.3.4.1-3.
2. Message contents are defined in clause 7.3.2.1.3.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.3.2.1.3.4.1-3: General test parameters for NR SA FR2 RRC re-establishment without serving cell timing**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell1 | |
| | Neighbour cells | | 1 | Cell2 | |
| Final condition | Active cell | | 1 | Cell2 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 µs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| SMTC configuration | | | 1 | SMTC pattern 1 | |
| DRX cycle length | | s | 1 | OFF | |
| PRACH configuration index | | | 1 | PRACH.1 FR2 | |
| T1 | | s | 1 | 5 | |
| T2 | | s | 1 | 10.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | | s | 1 | 5 | |

### 7.3.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.3.2.1.3.5-1. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.3.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.3.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 5 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and on the UE) or switch off and on the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.2.1.3.4.3-1: Common Exception messages for NR SA FR2 RRC re-establishment without serving cell timing**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.5-9 with condition SSB RLM |

**Table 7.3.2.1.3.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms6000 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 7.3.2.1.3.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

7.3.2.1.3.5 Test requirement

Table 7.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR2 RRC re-establishment without serving cell timing tests.

**Table 7.3.2.1.3.5-1: Cell specific test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 4 | | | Rough | | | Rough | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| AoA setup | | 1 | Setup 1 defined in A. 9 | | | Setup 1 defined in A.9 | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -95.7 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -104.7 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -90.7 | -infinity | -infinity | -infinity | -infinity | -90.7 |
| Io | dBm/95.04 MHz | 1 | -60.52 | -66.71 | -60.52 | -60.52 | -66.71 | -60.52 |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra-frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq}$ = 1

$T_{identify_intra_NR}$ = 3520 ms

$T_{SI}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

## 7.3.2.2 Random access

### 7.3.2.2.0 Minimum conformance requirements

#### 7.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the

received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

#### 7.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

### 7.3.2.2.1 NR SA FR2 contention based random access

Editor's note: This test case is incomplete for Test 2, 3 and 7. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- This test case has testability issues due to low uplink level for absolute uplink power and unapplicable requirement for relative uplink power, and therefore testing of Test 2, 3 and 7 is not recommended.

#### 7.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 7.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.1.

#### 7.3.2.2.1.4 Test description

##### 7.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.1.4.1-1.

**Table 7.3.2.2.1.4.1-1: Contention based random access test in FR2 for NR standalone supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.3.2.2.1-1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.1.4.1-2.

**Table 7.3.2.2.1.4.1-2: Test Environment for Contention based random access test in FR2 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.1.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 7.3.2.2.1.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 7.3.2.2.1.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.1.5-1 and 7.3.2.2.1.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

#### 7.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

**Table 7.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | FR2 |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| | | | |
| } | | | |

**Table 7.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | FR2 |
| msg1-FDM | one | | FR2 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -100 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 7.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | 20 + $\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

7.3.2.2.1.5 Test requirement

Table 7.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.1.5-3, 7.3.2.2.1.5-4 and 7.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 7.3.2.2.1.5-1: General test parameters for contention based random access test in FR2 for NR Standalone**

| **Parameter** | | **Unit** | **Test-1** | **Comments** |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR2 | As defined in clause A.3.2 |
| CSI-RS for tracking | Config 1 | | TRS.2.1 TDD | |
| Duplex Mode for Cell 1 | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | As defined in clause A.1.5 |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | As defined in clause A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1 | | SR.3.1 TDD | As defined in clause A.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | As defined in clause A.1.2 |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 + $\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |

| | | | |
|---|---|---|---|
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| PRACH Configuration | | PRACH.1 FR2 | As defined in A.7.2, with exceptions as defined below |
| *rsrp-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.

Note 4: The $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 7.3.2.2.1.5-2: OTA-related test parameters for contention based random access test in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.

Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

**Table 7.3.2.2.1.5-3: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 7.3.2.2.1.5-4: Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | PRACH (dB) |
|---|---|---|
| Measured power of both PRACHs being compared > ($P_{max}^{Note1}$ – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ ($P_{max}^{Note1}$ – 6dB) | | ± (6+FFS) |
| Note 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 7.3.2.2.1.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 7.3.2.2.2 NR SA FR2 non-contention based random access

Editor's note: This test case is incomplete for Test 3 and 4. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- This test case has testability issues due to low uplink level for absolute uplink power and unapplicable requirement for relative uplink power, and therefore testing of Test 3 and 4 is not recommended.

#### 7.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 7.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports csi-RS-CFRA-ForHO.

#### 7.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.2.

#### 7.3.2.2.2.4 Test description

##### 7.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.2.4.1-1.

**Table 7.3.2.2.2.4.1-1: Non-Contention based random access test in FR2 for NR standalone supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.3.2.2.2-1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as ($RSRP_{_REP}$ – RSRP_76), where $RSRP_{_REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.2.4.1-2.

**Table 7.3.2.2.2.4.1-2: Test Environment for Non-Contention based random access test in FR2 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.2.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.2.2.2.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 7.3.2.2.2.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Ensure the UE will choose SSB with index 0 to complete this procedure.

2. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3

   6.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

7.1. Repeat steps 1-3.

7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

#### 7.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

**Table 7.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ra-ContentionResolutionTimer | Not present | | |
| rsrp-ThresholdSSB | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| | | | |
| } | | | |

**Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF CFRA-SSB-Resource { | 2 entries | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | | |
| ssb[2] | 1 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 40 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.2.2.2.4.3-4: RACH-ConfigGeneric for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | FR2 |
| msg1-FDM | one | | FR2 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -100 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 7.3.2.2.2.4.3-5: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |

| | | | |
|---|---|---|---|
| ss-PBCH-BlockPower | 20 +$\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

**Table 7.3.2.2.2.4.3-6: CellGroupConfig for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicated CHOICE { | | | |
| uplink | RACH-ConfigDedicated for Non-Contention Based Random Access | Table 7.3.2.2.2.4.3-3 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |

### 7.3.2.2.2.5 Test requirement

Table 7.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.2.5-3, 7.3.2.2.2.5-4 and 7.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 7.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR2 | SSB.1 FR2 | As defined in A.3.2 |
| CSI-RS Configuration | Config 1 | | N/A | CSI-RS.3.1 TDD | As defined in A.1.4 |
| Duplex Mode for Cell 2 | Config 1 | | TDD | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | TDDConf.3.1 | As defined in A.1.5 |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 24 | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | OP.3 | As defined in A.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 | | SR3.1 TDD | SR3.1 TDD | As defined in A.1.1. |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH_DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | dB | | | |
| ss-PBCH-BlockPower | dBm/ SCS | +20 +$\Delta_{UL}$ | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| PRACH Configuration | | PRACH.2 FR2 | PRACH.3 FR2 | As defined in A.7.2, with exceptions as defined below. |
| rsrp-ThresholdSSB | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| preambleReceivedTargetPower | dBm | -100 | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
Note 4: The $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 7.3.2.2.2.5-2: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| AoA setup | | | Setup 1 | Setup 1 | As defined in A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | -80.6 | |
| | Es/$Iot_{BB}$ | dB | 21.09 | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | -95.0 | |
| | Es/$Iot_{BB}$ | dB | 6.69 | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

**Table 7.3.2.2.2.5-3: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 7.3.2.2.2.5-4: Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | PRACH (dB) |
|---|---|---|
| Measured power of both PRACHs being compared > ($P_{max}$ Note1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either PRACHs being compared ≤ ($P_{max}$ Note1 – 6dB) | | ± (6+FFS) |
| Note 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 7.3.2.2.2.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 7.3.2.2.3 NR SA FR2 2-step contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for $T_e$ Timing error are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 7.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 7.3.2.2.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting twoStepRACH-r16.

#### 7.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.3.

#### 7.3.2.2.3.4 Test description

##### 7.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.3.4.1-1.

**Table 7.3.2.2.3.4.1-1: 2-step contention based random access test in FR2 for NR standalone supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 7.3.2.2.3-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.3.4.1-2.

**Table 7.3.2.2.3.4.1-2: Test Environment for 2-step RACH contention based random access test in FR2 for NR standalone**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.3.4.1-1. | |
| Propagation conditions | No interference | As specified in Annex C.2.1. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | FFS | | |

1. Message contents are defined in clause 7.3.2.2.3.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

#### 7.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.3.5-1 and 7.3.2.2.3.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA

   4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

   5.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble of MsgA.

   5.4 The System Simulator shall transmit a MsgB containing fallbackRAR message with a Random Access Preamble identifier matching the transmitted MsgA PRACH after 3 MsgA transmissions have been received by the System Simulator.

   5.5 As the received Random Access Response MsgB with a fallbackRAR contains Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

#### 7.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.2.2.3.4.3-1: *FrequencyInfoUL-SIB* for 2-step contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

**Table 7.3.2.2.3.4.3-2: RACH-ConfigCommon for 2-step contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE { | oneFourth, n48 | | |
| one | n4 | | FR2 |
| } | | | |
| msgA-CB-PreamblesPerSSB-PerSharedRO-r16 | oneFourth, n48 | | |
| msgA-SSB-SharedRO-MaskIndex-r16 | Not present | | |
| groupB-ConfiguredTwoStepRA-r16 | Not present | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | Not present | | |
| msgA-TransMax-r16 | N8 | | |
| msgA-RSRP-Threshold-r16 | RSRP_69 +$\Delta_{DL}$ | | |
| msgA-RSRP-ThresholdSSB-r16 | RSRP_69 +$\Delta_{DL}$ | | |
| msgA-SubcarrierSpacing-r16 | 120 kHz | | |
| msgA-RestrictedSetConfig-r16 | Not present | | |
| ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE { | | | |
| ra-Prioritization-r16 | RA-Prioritization | | |
| ra-PrioritizationForAI-r16 | '10'B | | |
| } | | | |
| ra-ContentionResolutionTimer-r16 | sf32 | | |
| } | | | |

**Table 7.3.2.2.3.4.3-3: RACH-ConfigGeneric for 2-step contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 190 | | |
| msgA-RO-FDM-r16 | four | | |
| msgA-RO-FrequencyStart-r16 | 0 | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -100 | | |
| msgB-ResponseWindow-r16 | sl10 | | |
| preambleTransMax-r16 | n10 | | |
| } | | | |

**Table 7.3.2.2.3.4.3-4: *ServingCellConfigCommonSIB* for 2-step contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | 20 +$\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

**Table 7.3.2.2.3.4.3-5: MsgA-PUSCH-Config for 2-step contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-81B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MsgA-PUSCH-Resource-r16 ::= SEQUENCE { | | | |
| msgA-MCS | 1 | | |
| nrofSlotsMsgA-PUSCH | 1 | | |
| nrofMsgA-PO-PerSlot | 1 | | |
| msgA-PUSCH-TimeDomainOffset | 1 | | |
| msgA-PUSCH-TimeDomainAllocation-r16 | 3 | Equivalent to PUSCH start symbol = 0 and allocation length = 10 | |
| mappingTypeMsgA-PUSCH | typeA | | |
| nrofPRBs-PerMsgA-PO | 2 | | |
| nrofMsgA-PO-FDM | One | | |
| msgA-DMRS-AdditionalPosition | pos1 | | |
| msgA-PUSCH-NrofPorts | 1 | | |
| msgA-DeltaPreamble | 3 | | |
| msgA-Alpha | alpha1 | | |
| deltaMCS | Disabled | | |
| } | | | |

### 7.3.2.2.3.5 Test requirement

Table 7.3.2.2.3.5-2 defines the primary level settings for 2-step contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.3.5-3, 7.3.2.2.3.5-4 and 7.3.2.2.3.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 7.3.2.2.3.5-1: General test parameters for 2-step contention based random access test in FR2 for NR Standalone**

| **Parameter** | | **Unit** | **Test-1** | **Comments** |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR2 | As defined in A.3.2 |
| Duplex Mode for Cell 1 | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | As defined in A.1.5 |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OCNG pattern 1 | As defined in A.2.1 |
| PDSCH Reference Channel Note 2 | Config 1 | | SR.3.1 TDD | As defined in A.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH_DMRS | dB | | |
| ss-PBCH-BlockPower | dBm/ SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| MsgA Configuration | | FR2 MsgA configuration 1 | As defined in A.7.2, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| preambleReceivedTargetPower | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The $\Delta_{UL}$ value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.
Note 4: The $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 7.3.2.2.3.5-2: OTA-related test parameters for 2-step contention based random access test in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 2b | As defined in clause A.9.2.2 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

Test 1: Correct behaviour when transmitting MsgA

- The MsgA with preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [3], where $\mu$ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [3], where $\mu$ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

**Table 7.3.2.2.3.5-3: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 7.3.2.2.3.5-4: Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | MsgA (dB) |
|---|---|---|
| Measured power of both MsgAs being compared > ($P_{max}$ Note1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |
| Measured power of either MsgAs being compared ≤ ($P_{max}$ Note1 – 6dB) | | ± (6+FFS) |
| Note 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 7.3.2.2.3.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 7.3.2.2.4 NR SA FR2 2-step non-contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for $T_e$ Timing error are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 7.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

#### 7.3.2.2.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting twoStepRACH-r16.

#### 7.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.7.3.2.2.4.

#### 7.3.2.2.4.4 Test description

##### 7.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.4.4.1-1.

**Table 7.3.2.2.4.4.1-1: 2-step non-contention based random access test in FR2 for NR standalone supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 7.3.2.2.4-1 | 1 | NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | | |

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of $\Delta_{DL}$ and $\Delta_{UL}$ according to the following principles:

With the UE configured to report SS-RSRP, the $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, $\Delta_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.4.4.1-2.

**Table 7.3.2.2.4.4.1-2: Test Environment for 2-step RACH non-dsscontention based random access test in FR2 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.2.4.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | FFS | | |

1. Message contents are defined in clause 7.3.2.2.4.4.3.
2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

#### 7.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.3.2.2.4.5-1 and 7.3.2.2.4.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing containing fallbackRAR with a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 MsgA transmissions have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in clause 7.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window in RACH-ConfigGenericTwoStepRA.

   6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.4.5.

#### 7.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.2.2.4.4.3-1: *FrequencyInfoUL-SIB* for 2-step non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | Not present | | |
| } | | | |

**Table 7.3.2.2.4.4.3-2: RACH-ConfigCommon for 2-step non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-SSB-SharedRO-MaskIndex-r16 | Not present | | |
| groupB-ConfiguredTwoStepRA-r16 | Not present | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | Not present | | |
| msgA-TransMax-r16 | N8 | | |
| msgA-RSRP-Threshold-r16 | RSRP_69 +$\Delta_{DL}$ | | |
| msgA-RSRP-ThresholdSSB-r16 | RSRP_69 +$\Delta_{DL}$ | | |
| msgA-SubcarrierSpacing-r16 | 120 kHz | | |
| msgA-RestrictedSetConfig-r16 | Not present | | |
| ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE { | | | |
| ra-Prioritization-r16 | RA-Prioritization | | |
| ra-PrioritizationForAI-r16 | '10'B | | |
| } | | | |
| ra-ContentionResolutionTimer-r16 | Not present | | |
| } | | | |

**Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 2 entries | | |
| ssb[1] | 0 | | |
| ssb[2] | 1 | | |
| ra-PreambleIndex[1] | 50 | | Subtest 1 |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 50 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_69 +$\Delta_{DL}$ | $\Delta_{DL}$ is derived from the downlink calibration process | Subtest 2 |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.2.2.4.4.3-3: RACH-ConfigGeneric for 2-step non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 190 | | |
| msgA-RO-FDM-r16 | four | | |
| msgA-RO-FrequencyStart-r16 | 0 | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -100 | | |
| msgB-ResponseWindow-r16 | sl10 | | |
| preambleTransMax-r16 | n10 | | |
| } | | | |

**Table 7.3.2.2.4.4.3-4: *ServingCellConfigCommonSIB* for 2-step non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | 20 +$\Delta_{UL}$ | $\Delta_{UL}$ is derived from the uplink calibration process | |
| } | | | |

**Table 7.3.2.2.4.4.3-5: MsgA-PUSCH-Config for 2-step non-contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-81B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MsgA-PUSCH-Resource-r16 ::= SEQUENCE { | | | |
| msgA-MCS | 1 | | |
| nrofSlotsMsgA-PUSCH | 1 | | |
| nrofMsgA-PO-PerSlot | 1 | | |
| msgA-PUSCH-TimeDomainOffset | 1 | | |
| msgA-PUSCH-TimeDomainAllocation-r16 | 3 | Equivalent to PUSCH start symbol = 0 and allocation length = 10 | |
| mappingTypeMsgA-PUSCH | typeA | | |
| nrofPRBs-PerMsgA-PO | 2 | | |
| nrofMsgA-PO-FDM | One | | |
| msgA-DMRS-AdditionalPosition | pos1 | | |
| msgA-PUSCH-NrofPorts | 1 | | |
| msgA-DeltaPreamble | 3 | | |
| msgA-Alpha | alpha1 | | |
| deltaMCS | Disabled | | |
| } | | | |

#### 7.3.2.2.4.5 Test requirement

Table 7.3.2.2.4.5-2 defines the primary level settings for 2-step non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.4.5-3, 7.3.2.2.4.5-4 and 7.3.2.2.4.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 7.3.2.2.4.5-1: General test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR2 | As defined in clause A.3.10 |
| Duplex Mode for Cell 1 | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OP.3 | As defined in clause A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1 | | SR3.1 TDD | As defined in clause A.3.1.1. |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | |
| ss-PBCH-BlockPower | | dBm/ SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| MsgA Configuration | | | FR2 MsgA configuration 2 | As defined in A.3.20.3, with exceptions as defined below. |
| msgA-RSRP-ThresholdSSB | | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| msgA-PreambleReceivedTargetPower | | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{MsgA0}$ -1), where $P_{MsgA0}$ is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.

Note 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 7.3.2.2.4.5-2 OTA-related test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in clause A.9.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |
| Note 1: No artificial noise is applied in this test.<br>Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | |

Test 1: Correct behaviour when transmitting MsgA

- The MsgA with preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [3], where $\mu$ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [3], where $\mu$ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

**Table 7.3.2.2.4.5-3: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± FFS dB |

**Table 7.3.2.2.4.5-4: Relative power tolerance Test requirements**

| Measured power | Power step ΔP (dB) | MsgA (dB) |
|---|---|---|
| Measured power of both MsgAs being compared > ($P_{max}$ Note1 – 6dB) | 2 ≤ ΔP < 3 | ± (4+FFS). |

| | | |
|---|---|---|
| Measured power of either MsgAs being compared ≤ ($P_{max}^{Note1}$ – 6dB) | | ± (6+FFS) |
| Note 1: $P_{max}$ is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band. | | |

**Table 7.3.2.2.4.5-5: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 120 | 224+[48]*$T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 7.3.2.3 RRC connection release with redirection

### 7.3.2.3.0 Minimum conformance requirements

#### 7.3.2.3.0.1 Minimum conformance requirements for FR2-FR2 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB_RP and SSB Ês/Iot according to 38.133 [6] Annex B.2.5 for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 7.3.2.3.0.1-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and $T_{meas}$ is the measurement time due to cell selection criteria evaluation.

$T_{SI\text{-}NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. $T_{SI\text{-}NR}$ = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

$T_{RACH}$: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in TS 38.211 [7] Table 6.3.3.2-4 for FR2.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with $T_{rs}$ = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

**Table 7.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| Frequency range (FR) of target NR cell | $T_{identify\text{-}NR}$ |
|---|---|
| FR1 | MAX (680 ms, [11] x $T_{rs}$) |

| | |
|---|---|
| FR2 | MAX (880 ms, 8x[11] x $T_{rs}$) |
| Note : If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.3.2.1.

### 7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR-to-NR requirements specified in clause 7.2.3.2.0.

#### 7.3.2.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting SA FR2.

#### 7.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.7.3.2.3.1.

#### 7.3.2.3.1.4 Test description

##### 7.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.3.1.4.1-1.

**Table 7.3.2.3.1.4.1-1: Test configurations for NR SA FR2-FR2 RRC connection release with redirection**

| Configuration | Description |
|---|---|
| 7.3.2.3.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.3.1.4.1-2.

**Table 7.3.2.3.1.4.1-2: Initial conditions for NR SA FR2-FR2 RRC connection release with redirection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.2.3.1.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.2.3.1.4.1-3.

**Table 7.3.2.3.1.4.1-3: General test parameters for NR SA FR2-FR2 RRC connection release with redirection**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 3.2 | |

### 7.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant in which the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.2.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.

5. If the UE transmits the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T2 expires, the UE shall be switched off. The SS shall then set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for the next iteration of the test procedure loop. Afterwards the UE shall be switched on. Go to step 1.

7. Repeat step 2-6 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 7.3.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.2.3.1.4.3-1: RRCRelease (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR | Frequency of Cell 2 | |
| ssbSubcarrierSpacing | kHz120 | | |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.2.3.1.4.3-2: SIB2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionInfoCommon SEQUENCE { | | | |
| rangeToBestCell | Not present | | |
| } | | | |

7.3.2.3.1.5 Test requirement

Table 7.3.2.3.1.5-1 defines the primary level settings for NR SA FR2-FR2 RRC connection release with redirection.

**Table 7.3.2.3.1.5-1: Cell specific test parameters for NR SA FR2-FR2 RRC connection release with redirection**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | | Rough | | Rough | |
| AoA setup | | | Setup 1 as defined in clause A.9 | | | |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | | 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | | | SMTC.1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | -95.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 5 | 5 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 5 | 5 | -Infinity | 5 |
| Io[Note3] | | dBm/BW | -60.5 | -60.5 | -66.7 | -60.5 |
| Propagation condition | | - | AWGN | | AWGN | |
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | | |
| Note 5: | As observed with 0 dBi gain antenna at the centre of the quiet zone | | | | | |
| Note 6: | Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR}$ = 1760 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

$T_{RACH}$ = 10 ms in the test.

This gives a total of 3160 ms.

## 7.3.2.4 LTM PDCCH-order Random Access

### 7.3.2.4.0 Minimum conformance requirements

#### 7.3.2.4.0.1 Minimum conformance requirements for TBD

TBD

The normative reference for this requirement is TS 38.133 [6] clause TBD.

### 7.3.2.4.1 NR SA FR2 PDCCH-order RACH on neighbour cell when RACH BW is within active BWP

Editor's Note: This test case is incomplete in following aspects:

Test applicability is missing

Message contents are TBD

Test procedure is missing

TT analysis is missing.

#### 7.3.2.4.1.1 Test purpose

This test is to verify the requirement for the PDCCH-ordered RACH to an intra-frequency candidate cell for LTM. The test will partly verify the interruption requirements specified in TS 38.133 [6] clause 8.2.2.2.20.

#### 7.3.2.4.1.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards supporting PDCCH-ordered RACH to an intra-frequency candidate cell.

The test consists of 2 tests, and UE is required to pass one among Test 1 and Test 2.

TBD

#### 7.3.2.4.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.4.0.1.

The normative reference for this requirement is TS 38.133 [6] A.7.3.2.4.1.

#### 7.3.2.4.1.4 Test description

##### 7.3.2.4.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.4.1.4.1-1.

**Table 7.3.2.4.1.4.1-1: Test configurations for TBD**

| Configuration | Description |
|---|---|
| 7.3.2.4.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.4.1.4.1-2.

**Table 7.3.2.4.1.4.1-2: Initial conditions for TBD**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.2.4.1.4.3.
2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.2.4.1.4.1-3.

**Table 7.3.2.4.1.4.1-3: General test parameters for TBD**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Initial conditions | Active cell | | Cell 1 | | |
| | Neighbouring cell | | Cell 2 | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 1 | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | 0 | | |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |

| | | | | | |
|---|---|---|---|---|---|
| DRX | | | OFF | | DRX is not used |
| Time offset between cells | | | 0.3 μs | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | Same as Cell 1 |
| | PRACH configuration | | FR2 PRACH configuration 5 | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | |
| | n-TimingAdvanceOffset | Tc | N/A | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | As specified in clause A.3.16B. Configured for early TCI state activation. |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | As specified in clause A.3.16B. Configured for early TCI state activation. |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | | |
| T2 | | s | ≤0.5 | | |

7.3.2.4.1.4.2 Test procedure

TBD

7.3.2.4.1.4.3 Message contents

TBD

7.3.2.4.1.5 Test requirement

Table 7.3.2.4.1.5-1 defines the primary level settings for TBD.

**Table 7.3.2.4.1.5-1: Cell specific test parameters for TBD**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | | Rough | | Rough | |
| AoA setup | | | Setup 1 as defined in A.3.15 | | | |
| NR RF Channel Number | | | **1** | | **1** | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{PRB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{PRB,c}$ = 66 | | | |
| Data PRBs allocated | | | 66 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | | | |
| PRACH configuration | | | FR2 PRACH configuration 6 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuraiton | Initial DL BWP | | DLBWP.0.1 | | | |

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104.7+TT | | -104.7+TT | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7+TT | | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.8+TT | | 0+TT | |
| $\hat{E}_s / N_{oc}$ | | dB | 6+TT | | 7+TT | |
| SSB_RP | | dBm/SCS | -89.7+TT | | -88.7+TT | |
| Io Note3 | | dBm/ 95.04 MHz | -56.7+TT | | -56.7+TT | |
| Propagation condition | | - | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall transmit the PRACH to Cell 2 in the first available PRACH occasion after $N_{T,2}$ + 0.25 ms + $T_{\text{SSB}}$ from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall be back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: $N_{T,2} + T_{\text{BWPswitchDelay}} + \Delta_{\text{Delay}} + T_{\text{switch}} + T_{\text{SSB}} + \Delta_{\text{RF/BB preparation}}$, where:

- $N_{T,2}$ is a time duration of $N_2$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming $\mu$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in table 6.4-1 in 38.214 [26].
- $T_{\text{BWPswitchDelay}} = 0$, $T_{\text{switch}} = 0$, $\Delta_{\text{RF/BB preparation}} = 0$
- $\Delta_{\text{Delay}} = 0.25$ ms
- $T_{\text{SSB}} = T_{\text{first-SSB_RACH}} + T_{\text{SSB-proc}}$, where $T_{\text{first-SSB_RACH}}$ is first SSB occasion, after 1 slot from the end of the slot of the PDCCH, and $T_{\text{SSB-proc}}$ = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and *N* symbols from the last or first symbol of PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=4. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB of Cell 2.

- The $N_{TA_offset}$ value (in $T_c$ units) is 13792.
- The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in table 7.1.2-1.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

#### 7.3.2.4.2 NR SA FR2 PDCCH-order RACH on inter-frequency neighbour cell

Editor's Note: This test case is incomplete in following aspects:

TBD in the test case requirement, RAN4 dependant

Test applicability is missing

Message contents are TBD

Test procedure is missing

TT analysis is missing.

##### 7.3.2.4.2.1 Test purpose

This test is to verify the requirement for PDCCH-order RACH on neighbour cell. The test will partly verify the interruption requirements specified in TS 38.133 [6] clause TBD

##### 7.3.2.4.2.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards supporting *rach-EarlyTA-Measurement-r18*, *pdcch-RACH-PrepTimeList-r18* and *pdcch-RACH-SwitchingTimeList-r18*.

##### 7.3.2.4.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause TBD.

The normative reference for this requirement is TS 38.133 [6] A.7.3.2.4.2.

##### 7.3.2.4.2.4 Test description

###### 7.3.2.4.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.4.2.4.1-1.

**Table 7.3.2.4.2.4.1-1: Test configurations for TBD**

| Configuration | Description |
|---|---|
| 7.3.2.4.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Candidate cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.4.2.4.1-2.

**Table 7.3.2.4.2.4.1-2: Initial conditions for TBD**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.2.4.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.2.4.2.4.3.
2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.2.4.2.4.1-3.

**Table 7.3.2.4.2.4.1-3: General test parameters for TBD**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Initial conditions | Active cell | | Cell 1 | | |
| | Neighbouring cell | | Cell 2 | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 1 | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | 0 | | |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | OFF | | DRX is not used |
| | | | | | |
| Time offset between cells | | | 0.3 μs | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | Same as Cell 1 |
| | PRACH configuration | | FR2 PRACH configuration 5 | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | |
| | n-TimingAdvanceOffset | Tc | N/A | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | As specified in clause A.3.16B. Configured for early TCI state activation. |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | As specified in clause A.3.16B. Configured for early TCI state activation. |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 0.3 | | |
| T2 | | s | ≤0.5 | | |

7.3.2.4.2.4.2 Test procedure

TBD

7.3.2.4.2.4.3 Message contents

TBD

7.3.2.4.2.5 Test requirement

Table 7.3.2.4.2.5-1 defines the primary level settings for TBD.

**Table 7.3.2.4.2.5-1: Cell specific test parameters for TBD**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | Rough | | Rough | |
| AoA setup | | Setup 1 as defined in A.3.15 | | | |
| NR RF Channel Number | | **1** | | **1** | |
| Duplex mode | | TDD | | | |

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{PRB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{PRB,c}$ = 66 | | | |
| Data PRBs allocated | | | 66 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | | | |
| PRACH configuration | | | FR2 PRACH configuration 6 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuraiton | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104.7+TT | | -104.7+TT | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7+TT | | -95.7+TT | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.8+TT | | 0+TT | |
| $\hat{E}_s / N_{oc}$ | | dB | 6+TT | | 7+TT | |
| SSB_RP | | dBm/SCS | -89.7+TT | | -88.7+TT | |
| Io Note3 | | dBm/ 95.04 MHz | -56.7+TT | | -56.7+TT | |
| Propagation condition | | - | AWGN | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall transmit the PRACH to Cell 2 in the first available PRACH occasion after $N_{T,2}$ + 0.25 ms + $T_{SSB}$ from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall be back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: $N_{T,2} + T_{\text{BWPswitchDelay}} + \Delta_{\text{Delay}} + T_{\text{switch}} + T_{\text{SSB}} + \Delta_{\text{RF/BB preparation}}$, where:

- $N_{T,2}$ is a time duration of $N_2$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming $\mu$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in table 6.4-1 in 38.214 [26].

- $T_{\mathrm{BWPswitchDelay}}$= 0, $T_{\mathrm{switch}}$= 0, $\Delta_{\mathrm{RF/BB\ preparation}}$= 0
- $\Delta_{\mathrm{Delay}}$= 0.25 ms
- $T_{\mathrm{SSB}} = T_{\mathrm{first-SSB_RACH}} + T_{\mathrm{SSB-proc}}$, where $T_{\mathrm{first-SSB_RACH}}$ is first SSB occasion, after 1 slot from the end of the slot of the PDCCH, and $T_{\mathrm{SSB-proc}}$ = 2 ms, which is the time for SSB processing.

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and *N* symbols from the last or first symbol of PRACH occasion as defined in TS 38.213 [8] Clause 8.1, where N=4. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB of Cell 2.

- The $N_{TA_offset}$ value (in $T_c$ units) is 13792.
- The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in TS 38.133 [6] Table 7.1.2-1.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

## 7.3.3 Conditional handover

### 7.3.3.0 Minimum conformance requirements

#### 7.3.3.0.1 Minimum conformance requirements for NR FR2 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

The NES-based conditional handover delay requirements shall apply if UE receives a RRC message implying conditional handover before receiving the NES indication in DCI 2-9 command.,

UE is not expected to receive a NES indication in DCI 2-9 command before receiving a RRC message implying NES-based conditional handover. When UE receives a RRC message implying NES-based conditional handover but no NES indication in DCI 2-9 command, no NES-based conditional handover requirement is applied. The NES indication is specified in clause [5.5.4] in TS 38.331[13].

[TS 38.133, clause 6.1.4.4.2]

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a handover to a target cell and interruption time starts.

For conditional intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

For conditional inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$ defined in TS 38.133 [6] clause 9.3.4 or clause 9.3.9..

For NES-based conditional intra-frequency handover:

- If UE successfully decodes DCI 2-9 command occurs earlier than the time at the end of $T_{Event_DU}$ + $T_{identify_intra_with_index}$ or $T_{Event_DU}$ + $T_{identify_intra_without_index}$, then the measurement time delay equal to $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$

- If UE successfully decodes DCI 2-9 command occurs later than the time at the end of $T_{Event_DU}$ + $T_{identify_intra_with_index}$ or $T_{Event_DU}$ + $T_{identify_intra_without_index}$, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until UE successfully decodes DCI 2-9 command.

For NES-based conditional inter-frequency handover:

- If UE successfully decodes DCI 2-9 command occurs earlier than the time at the end of $T_{Event_DU}$ + $T_{identify_inter_with_index}$ or $T_{Event_DU}$ + $T_{identify_inter_without_index}$, then the measurement time delay equal to $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$

- If UE successfully decodes DCI 2-9 command occurs later than the time at the end of $T_{Event_DU}$ + $T_{identify_inter_with_index}$ or $T_{Event_DU}$ + $T_{identify_inter_without_index}$, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until UE successfully decodes DCI 2-9 command.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover.

For conditional handover, it starts after UE realizes the condition of CHO is met and identity of the target cell is determined.

For NES-based conditional handover,

- It starts after UE realizes the condition of CHO is met and identity of the target cell is determined provided that UE has already successfully decoded DCI 2-9.

- Otherwise, it starts after UE successfully decodes DCI 2-9.

And $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1.4.4.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}\ \text{ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

#### 7.3.3.0.2 Minimum conformance requirements for NR FR2 inter-frequency conditional handover

Same as 7.3.3.0.1.

#### 7.3.3.0.3 Minimum conformance requirements for NR FR2 – NR FR1 inter-frequency conditional handover

The requirements defined in clause 6.3.3.0.2 applies assuming inter-frequency handover and:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 40ms.

#### 7.3.3.0.4 Minimum conformance requirements for NR-DC conditional handover including target MCG and target SCG

[TS 38.133, clause 6.1.6.2]

The requirements in this clause are applicable to conditional handover with target SCG from NR-DC to NR-DC. The requirements in this clause are only applicable to:

- FR1-FR2 NR-DC to FR1-FR2 NR-DC.

This clause defines requirements for the delay within which the UE shall be able to handover from NR cell to NR cell and change NR PSCell in the meantime.

When the UE receives a RRC message implying conditional handover including target MCG in FR1 and target SCG in FR2,

- The UE shall be ready to start the transmission of the new uplink PRACH channel of the target PCell within $D_{CHOwithPSCell_PCell}$ ms from the end of the last TTI containing the RRC command, and

- The UE shall be capable of transmitting PRACH preamble towards the target PSCell no later than $D_{CHOwithPSCell_PSCell}$ ms from the end of the last TTI containing the RRC command.

Where:

- $D_{CHOwithPSCell_PCell}$ equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.6.2.1 in TS 38.133 [6].

- $D_{CHOwithPSCell_PSCell}$ is the PSCell change in clause 6.1.6.2.2 in TS 38.133 [6]

[TS 38.133, clause 6.1.6.2.1] CHO with PSCell – PCell handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel of the target PCell within $D_{CHOwithPSCell_PCell}$ seconds from the end of the last TTI containing the RRC command.

$D_{CHOwithPSCell_PCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{processing} + T_{IU} + T_{\Delta} + T_{margin} + T_{CHO_execution}$

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurement time stated in clause 6.1.4.2.2 in TS 38.133 [6].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period.

For FR1-FR2 NR-DC to FR1-FR2 NR-DC, Tprocessing = 30 ms if SMTC of the target unknown PSCell is configured in *targetcellSMTC-SCG-r16* but not configured in *reconfigurationWithSync*. Otherwise, Tprocessing = 25 ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell stated in clause 6.1.4.2.4 in TS 38.133 [6].

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell stated in clause 6.1.4.2.4 in TS 38.133 [6].

$T_{margin}$ is time for SSB post-processing stated in clause 6.1.4.2.4 in TS 38.133 [6].

$T_{CHO_execution}$ is the conditional execution preparation time in clause 6.1.4.2.3 in TS 38.133 [6].

[38.133, clause 6.1.6.2.2] CHO with PSCell – PSCell change delay

The requirements in this section shall apply for PSCell change during handover with PSCell from NR-DC to NR-DC.

When handover with PSCell from NR-DC to NR-DC is commanded, the PSCell change time shall be less than $D_{HOwithPSCell_PSCell}$:

- $D_{CHOwithPSCell_PSCell} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ ms

Where:

- $T_{RRC_delay}$ $T_{Event_DU}$ $T_{measure}$ $T_{CHO_execution}$ are the same as defined in clause 6.1.6.2.1 in TS 38.133 [6]. $T_{search_PSCell}$, $T_{\Delta_PSCell}$ and $T_{PSCell_DU}$ are the same as defined in clause 6.1.5.4.2 in TS 38.133 [6].

- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period.

For FR1-FR2 NR-DC to FR1-FR2 NR-DC, Tprocessing = 30 ms if SMTC of the target unknown PSCell is configured in *targetcellSMTC-SCG-r16* but not configured in *reconfigurationWithSync*. Otherwise, Tprocessing = 25 ms.

- $T_{search_PCell_Conditional}$ is the time for obtaining the timing reference of target PCell. If SMTC of the target unknown PSCell is configured in *targetcellSMTC-SCG-r16* but not configured in *reconfigurationWithSync*, $T_{search_PCell_Conditional} = T_{\Delta} + T_{margin}$, where $T_{\Delta}$ and $T_{margin}$ are specified in clause 6.1.5.4.1 in TS 38.133 [6]. Otherwise, $T_{search_PCell_Conditional} = 0$ ms.

The $T_{rs}$ definition from clause 8.9.2 in TS 38.133 [6] is modified as following for requirements in this section:

- $T_{rs}$ is the SMTC periodicity of the target NR cell if target PSCell is unknown and SMTC configuration of target unknown PSCell is present in either *targetcellSMTC-SCG-r16* or *reconfigurationWithSync*, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

PSCell known and unknown condition is as defined in clause 8.9.2 in TS 38.133 [6].

#### 7.3.3.0.5 Minimum conformance requirements for NR-DC conditional handover including target MCG and candidate SCG

[TS 38.133, clause 6.1.7.2]

The requirements in this clause are applicable to conditional handover including target MCG in FR1 and candidate SCG for CPC in FR2 NR-DC. The requirements in this clause are applicable to:

- FR1-FR2 NR-DC to FR1-FR2 NR-DC.

When the UE receives a RRC message implying conditional handover including target MCG and candidate SCG for CPC

the UE shall be ready to start the transmission of the new uplink PRACH channel of the target PCell within $D_{CHOwithCPC_PCell}$ ms from the end of the last TTI containing the RRC command and

the UE shall be capable of transmitting of the new uplink PRACH channel of the target PSCell within $D_{CHOwithCPC_PSCell}$ ms from the end of the last TTI containing the RRC command.

Where:

- $D_{CHOwithCPC_PCell}$ is the PCell conditional handover delay stated in clause 6.1.7.2.1 in TS 38.133 [6].
- $D_{CHOwithCPC_PSCell}$ is the PSCell conditional change delay stated in clause 6.1.7.2.2 in TS 38.133 [6].

CHO with PSCell – The PCell conditional handover delay can be expressed as specified in clause 6.1.7.2.1 of TS 38.133 [6]:

$D_{CHOwithCPC_PCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PCell} + T_{PCell_DU} + 2$ ms

- $T_{RRC_delay}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13] for processing the RRC command.
- $T_{Event_DU}$ in PCell and PSCell handover delay requirement is the delay uncertainty which is the time from when the UE successfully decodes the RRC command for CHO including target MCG and candidate SCG for CPC until conditions exist at the measurement reference point which will trigger the CHO with CPC.
- $T_{measure_PCell}$ is the time for the UE to measure and realize the condition for CHO is fulfilled. $T_{measure_PCell}$ equals to the measurements time stated in clause 6.1.7.2.1.1 in TS 38.133 [6].
- $T_{measure_PSCell}$ is the time for the UE to measure and realize the condition for conditional PSCell change is fulfilled. $T_{measure_PSCell}$ equals to the measurements time stated in clause 6.1.7.2.2.1 in TS 38.133 [6].
- $T_{UE_preparation}$ is the UE preparation time for conditional handover with conditional PSCell change and starts at simultaneous execution of PCell handover and PSCell change to a target PCell and a target PSCell respectively after UE realizes the conditions of conditional PCell handover and conditional PSCell change are met and identities of the target PCell and PSCell are determined. $T_{UE_preparation}$ is up to 10 ms.
- $T_{processing}$ is the SW processing time needed by UE, including RF warm up period.

For FR1-FR2 NR-DC to FR1-FR2 NR-DC, $T_{processing}$ = 25 ms

- $T_{\Delta_PCell}$ is time for fine time tracking and acquiring full timing information of the target PCell. $T_{\Delta_PCell} = 1*T_{rs}$ ms.
- $T_{rs}$ is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in handover message, otherwise, $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.
- $T_{PCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PCell. $T_{PCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in table 8.1-1 of TS 38.213 [8].

CHO with PSCell – The PSCell conditional change delay can be expressed as follows as specified in clause 6.1.7.2.2 of TS 38.133 [6]:

$D_{CHOwithCPC_PSCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ ms

- $T_{RRC_delay}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13] for processing the RRC command.
- $T_{Event_DU}$ in PCell and PSCell handover delay requirement is the delay uncertainty which is the time from when the UE successfully decodes the RRC command for CHO including target MCG and candidate SCG for CPC until conditions exist at the measurement reference point which will trigger the CHO with CPC.
- $T_{measure_PCell}$ is the time for the UE to measure and realize the condition for CHO is fulfilled. $T_{measure_PCell}$ equals to the measurements time stated in clause 6.1.7.2.1.1 in TS 38.133 [6].
- $T_{measure_PSCell}$ is the time for the UE to measure and realize the condition for conditional PSCell change is fulfilled. $T_{measure_PSCell}$ equals to the measurement time stated in clause 6.1.7.2.2.1 in TS 38.133 [6].
- $T_{UE_preparation}$ is the UE preparation time for conditional handover with conditional PSCell change and starts at simultaneous execution of PCell handover and PSCell change to a target PCell and a target PSCell respectively after UE realizes the conditions of conditional PCell handover and conditional PSCell change are met and identities of the target PCell and PSCell are determined. $T_{UE_preparation}$ is up to 10 ms.
- $T_{processing}$ is as specified in clause 6.1.7.2.1 in TS 38.133 [6].
- $T_{\Delta_PSCell}$ is time for fine time tracking and acquiring full timing information of the target PSCell. $T_{\Delta_PSCell} = 1*T_{rs}$ ms.
- $T_{rs}$ is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell change message, otherwise, $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.
- $T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

### 7.3.3.1 NR SA FR2 conditional handover

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.3.3.1.1 Test purpose

To verify the requirement for the NR FR2 intra-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

#### 7.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

#### 7.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.1.

7.3.3.1.4 Test description

7.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.1.4.1-1.

**Table 7.3.3.1.4.1-1: NR SA FR2 conditional handover test configurations**

| Config | Description |
|---|---|
| 7.3.3.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.1.4.1-2

**Table 7.3.3.1.4.1-2: Initial conditions for NR SA FR2 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.3.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 7.3.3.1.4.1-3: General test parameters for NR SA FR2 conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset for condition | | dBm | -2 Note 1 | Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger. |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | |

#### 7.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.1.4.1-3 and 7.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than $T_{RRC}$ ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.1.5-1. T2 starts.

7. If

   a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

      - $X = 8 \cdot T_{interrupt}$ for test configuration 7.3.3.1-1

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.3.1.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.3.3.1.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 7.3.3.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.1.4.3-2: MeasConfig (Table 7.3.3.1.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 7.3.3.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.3.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 7.3.3.1.4.3-3: MeasObjectNR (Table 7.3.3.1.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 7.3.3.1.4.3-4: ReportConfigNR (Table 7.3.3.1.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -4 | actuall value = -4*0.5 = -2dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.1.4.3-5: ConditionalReconfiguration (Table 7.3.3.1.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 7.3.3.1.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

7.3.3.1.5 Test requirements

Table 7.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.3.1.5-1: Cell specific test parameters for NR SA FR2 conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| AoA setup | | | Setup 1 as defined in clause A.9 | | | |
| Assumption for UE beams Note 6 | | | Rough | | | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| CORESET Reference Channel | | | CR3.1 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.1 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| TCI configuration | | | CSI-RS.Config.0 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -106.2 Note 7 | | -106.2 Note 7 | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -97.2 | | -97.2 | |
| Ês/Iot$_{BB}$ Note9 | | dB | 4.69 | -5.44 | -Infinity | 3.73 |
| $\hat{E}_s / N_{oc}$ | | dB | 6 | 6 | -Infinity | 11 |
| Io Note3 | Config 1 | dBm/ BW | -61.21 | -55.73 | -61.21 | -55.73 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: Including test tolerance given in Annex F.1.3.2.
Note 8: Es/Iot, SSB_RP and Io levels have been derived from other parameters for infomation purposes. They are not settable parameters themseleves.

| | |
|---|---|
| Note 9: | Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [3] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor $\Delta_{MBS}$ specified in TS 38.101-2 [3] Table 6.2.1.3-4. |

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 1600 ms for power class 1 UE and 1080ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 1672 ms for power class 1 UE and 1152 ms for power class 2/3/4 UE.
The interruption during T2 shall not exceed $T_{interrupt}$ = 62ms.

## 7.3.3.2 NR SA FR2-FR2 conditional handover

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Some test parameters are still FFS

### 7.3.3.2.1 Test purpose

To verify the requirement for the NR FR2 inter-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

### 7.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

### 7.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.2.

### 7.3.3.2.4 Test description

#### 7.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.2.4.1-1.

**Table 7.3.3.2.4.1-1: NR SA FR2-FR2 conditional handover test configurations**

| Config | Description |
|---|---|
| 7.3.3.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.2.4.1-2

**Table 7.3.3.2.4.1-2: Initial conditions for NR SA FR2-FR2 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.3.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 7.3.3.2.4.1-3: General test parameters for NR SA FR2-FR2 conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset for handover condition | | dB | FFS | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤7 | |

### 7.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carriers and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.2.4.1-3 and 7.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than $T_{RRC}$ ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.2.5-1. T2 starts.

7. If

   c) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   d) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = 8 \cdot T_{interrupt}$ for test configuration 7.3.3.2-1

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.3.2.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.3.3.2.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 7.3.3.2.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.2.4.3-2: MeasConfig (Table 7.3.3.2.4.3-1)**

| Derivation Path: Table H.3.1-2 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 7.3.3.2.4.3-3 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 7.3.3.2.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.3.3.2.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0 | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 7.3.3.2.4.3-3: MeasObjectNR-f1 (Table 7.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 1 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 7.3.3.2.4.3-4: MeasObjectNR-f2 (Table 7.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 2 | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 7.3.3.2.4.3-5: ReportConfigNR (Table 7.3.3.2.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | FFS | | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.2.4.3-6: ConditionalReconfiguration (Table 7.3.3.2.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 7.3.3.2.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

7.3.3.2.5 Test requirements

Table 7.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.3.2.5-1: Cell specific test parameters for NR SA FR2-FR2 conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| AoA setup | | | Setup 1 as defined in clause A.9 | | | |
| Assumption for UE beams[Note 6] | | | Rough | | | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| Gap pattern ID | | | gp0 | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| CORESET Reference Channel | | | CR3.1 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.1 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| TCI configuration | | | CSI-RS.Config.0 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -95.7 | | -95.7 | |
| | Config 3 | | -95.7 | | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | 5 | 5 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 5 | 5 | -Infinity | 5 |
| Io[Note3] | Config 1,2 | dBm/BW | -60.5 | -60.5 | -66.7 | -60.5 |
| | Config 3 | dBm/BW | -60.5 | -60.5 | -66.7 | -60.5 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

| | |
|---|---|
| Note 5: | As observed with 0 dBi gain antenna at the centre of the quiet zone |
| Note 6: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 6720 ms for power class 1 UE and 4160 ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - $T_{\Delta}$ = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 6792 ms for power class 1 UE and 4232 ms for power class 2/3/4 UE.

The interruption during T2 shall not exceed $T_{interrupt}$ = 62ms.

## 7.3.3.3 NR SA FR2 intra-frequency NES triggering conditional handover

### 7.3.3.3.1 Test purpose

This test is to verify the requirement for the NR FR2 intra-frequency NES triggering conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

### 7.3.3.3.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards and supporting NES triggering conditional handover.

### 7.3.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.3.

### 7.3.3.3.4 Test description

#### 7.3.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.3.4.1-1.

**Table 7.3.3.3.4.1-1: test configurations**

| Config | Description |
|---|---|
| 7.3.3.3-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.3.4.1-2

**Table 7.3.3.3.4.1-2: Initial conditions for intra-frequency NES triggering conditional handover**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.3.3.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.3.3.4.1-3 below.

**Table 7.3.3.3.4.1-3: General test parameters for NES triggering Intra-frequency conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset for condition | | dBm | -2 Note 1 | Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger. |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤2 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | |

### 7.3.3.3.4.2 Test procedure

At the start of time duration T1, the UE may not have any timing information of Cell 2. The UE is configured with a NES-based condition implying handover to cell 2 firstly, during T1, at a time earlier than $T_{RRC}$ before the beginning of T2 and then configured with DCI 2-9 with NES-mode indication during T2. No interruption shall be observed in time period T1,

From start of T2, the Cell 2 becomes detectable and NES-based event is fulfilled. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisfied. The UE shall send PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.
2. Set the parameters according to T1 in Table 7.3.3.3.5-1. T1 starts.
3. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedback sent by the UE.
4. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

5. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure NES-based CHO execution condition for the UE.

6. The UE shall transmit an *RRCReconfigurationComplete* message.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.3.5-1. T2 starts.

8. The SS shall transmit DCI 2-9 command of '1' value for indicating NES-specific CHO execution condition.

9. If the UE transmits the PRACH preambles to Cell 2 less than 1672 ms for PC1 or 1152 ms for PC3 from the beginning of time period T2, and the interruption during T2 is no longer than 62ms, then the number of successful test iterations is increased by one. Otherwise, the number of failure test iterations is increased by one.

10. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

11. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

12. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.3.3.4.3 Message contents

Same as in clause 6.3.3.6.4.3.

### 7.3.3.3.5 Test requirements

Table 7.3.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.3.3.5-1: Cell specific test parameters for intra-frequency NES triggering conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| AoA setup | | | Setup 1 as defined in clause A.3.15 | | | |
| Assumption for UE beams[Note 6] | | | Rough | | | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| CORESET Reference Channel | | | CR3.1 TDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB.1 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| TCI configuration | | | CSI-RS.Config.0 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -106.2 | | -106.2 | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -97.2 | | -97.2 | |
| $\hat{E}_s/I_{ot_{BB}}$ Note 8 | | dB | 4.69 | -5.44 | -Infinity | 3.73 |
| $\hat{E}_s/N_{oc}$ | | dB | 6 | 6 | -Infinity | 11 |
| Io Note3 | Config 1 | dBm/BW | -61.21 | -55.73 | -61.21 | -55.73 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [19] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor $\Delta_{MBS}$ specified in TS 38.101-2 [19] Table 6.2.1.3-4.

$T_{RRC} + T_{Event_DU}$ occurs during T1 as the NES triggering handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.
The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ =1600+62+10=1672 ms (power class 1) or 1080+62+10 =1152 (power classes 2,3 and 4) from the start of T2 and the interruption during T2 shall not exceed $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ =40+20+2 = 62ms excluding any transmissions which do not occur due to scheduling restrictions.

The rate of correct handovers observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 7.3.3.4 NR SA FR2-FR1 inter-frequency NES triggering conditional handover

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- NR FR1 - FR2 OTA testability is still FFS.

### 7.3.3.4.1 Test purpose

To verify the requirement for the NR FR2 inter-frequency NES triggering conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

### 7.3.3.4.2 Test applicability

This test applies to all types of NR UE from Release 18 onwards and supporting NES triggering conditional handover.

### 7.3.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.4.

7.3.3.4.4 Test description

7.3.3.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.4.4.1-1.

**Table 7.3.3.4.4.1-1: test configurations**

| Config | Description |
|---|---|
| 7.3.3.4-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.4.4.1-2

**Table 7.3.3.4.4.1-2: Initial conditions for inter-frequency NES triggering conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.3.4.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.3.4.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 7.3.3.4.4.1-3: General test parameters for inter-frequency NES triggering conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset in condition | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 3 | |

7.3.3.4.4.2 Test procedure

At the start of time duration T1, the UE may not have any timing information of Cell 2. The UE is configured with a NES-based condition implying handover to cell 2 firstly, during T1, at a time earlier than $T_{RRC}$ before the beginning of T2 and then configured with DCI 2-9 with NES-mode indication 950 ms from the start of T2. UE is expected to decode the DCI command 2-9 later than the time when the NES condition is considered met. No interruption shall be observed in time period T1,

From start of T2, the Cell 2 becomes detectable and NES-based event is fulfilled. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition and starts handover procedure when the DCI command is received. The UE shall send PRACH to Cell 2 less than $T_{measure}$ + $T_{CHO_execution}$ + $T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.4.5-1. T1 starts.

3. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedback sent by the UE.

4. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

5. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure NES-based CHO execution condition for the UE.

6. The UE shall transmit an *RRCReconfigurationComplete* message.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.4.5-1. T2 starts.

8. The SS shall transmit DCI 2-9 command of '1' value for indicating NES-specific CHO execution condition 950 ms from the start of T2.

9. If the UE transmits the PRACH preambles to Cell 2 less than 1022 ms from the beginning of time period T2, and the interruption during T2 is no longer than 62ms, then the number of successful test iterations is increased by one. Otherwise, the number of failure test iterations is increased by one.

10. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

11. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

12. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.3.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.3.3.4.4.3-1: RRCReconfiguration (Step 4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.3.3.4.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 7.3.3.4.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.4.4.3-2: MeasConfig (Table 7.3.3.4.4.3-1)**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | entry 1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with Condition INTRA-FREQ MO | | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 7.3.3.4.4.3-3 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 7.3.3.4.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.3.3.4.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.3.3.4.4.3-4 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | |
| MeasIdToAddMod[1] SEQUENCE { | | | |
| measId | 2 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 7.3.3.4.4.3-3: MeasObjectNR (Table 7.3.3.4.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of the SSB associated to inter-frequency neighbour cell | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 7.3.3.4.4.3-4: ReportConfigNR (Table 7.3.3.4.4.3-2)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 0 | actuall value = -2*0 = 0dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| nesEvent-r18 | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.3.4.4.3-5: ConditionalReconfiguration (Table 7.3.3.4.4.3-1)**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 1 entry | | |
| MeasId[1] | 1 | The MeasId configured in Table 7.3.3.4.4.3-2 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

### 7.3.3.4.5 Test requirements

Table 7.3.3.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.3.4.5-1: Cell specific test parameters for NR FR2-FR1 Inter-frequency conditional handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| AoA setup | | | Setup 1 as defined in clause A.3.15 | | NA | |
| Assumption for UE beams[Note 6] | | | Rough | | NA | |
| Duplex mode | | | TDD | | FDD | |
| TDD configuration | | | TDDConf.3.1 | | NA | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| DRx Cycle | | ms | Not Configured | | Not Configured | |
| Gap pattern ID | | | gp0 | | NA | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | SR.1.1 FDD | |
| CORESET Reference Channel | | | CR3.1 TDD | | CR.1.1 FDD | |
| OCNG Patterns | | | OCNG pattern 1 | | OCNG pattern 1 | |
| SMTC Configuration | | | SMTC pattern 1 | | SMTC pattern 1 | |
| SSB Configuration | | | SSB.1 FR2 | | SSB.1 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | 15 kHz | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | FR1 PRACH configuration 1 | |
| TRS configuration | | | TRS.2.1 TDD | | NA | |
| TCI configuration | | | CSI-RS.Config.0 | | NA | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| Propagation condition | | - | AWGN | | N/A | |

| | | | |
|---|---|---|---|
| | | | Link only, see clause A.3.7A |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.3.3.4.5-2: OTA related test parameters for NR FR2-FR1 Inter-frequency conditional handover test case**

| Parameter | | Unit | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | | According to clause A.3.15.1 | | | | N/A | | | |
| Assumption for UE beams Note 7 | | | Rough | | | | N/A | | | |
| $N_{oc}$ Note 1 | Config 1,2,3 | dBm/15kHz | -104.7+TT | | | | Link only, see clause A.3.7A | | | |
| $N_{oc}$ Note 1 | Config 1,2,3 | dBm/SCS | -95.7+TT | | | | | | | |
| $\hat{E}_s / N_{oc}$ | Config 1,2,3 | dB | 7+TT | | | | | | | |
| $\hat{E}_s / I_{ot}$ | Config 1,2,3 | dB | 7+TT | | | | | | | |
| SSB_RP Note 2, Note 4 | Config 1,2,3 | dBm/SCS | -88.7+TT | | | | | | | |
| Io Note 2, Note 4 | Config 1,2,3 | dBm/95.04 MHz | -58.92+TT | | | | | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: Void<br>Note 6: Void<br>Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | | | | |

$T_{RRC} + T_{Event_DU}$ occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ = 1022ms from the start of T2 and the interruption during T2 shall not exceed $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ = 62 ms excluding any transmissions which do not occur due to measurement gaps.

## 7.3.3.5 NR SA FR2 NR conditional handover including target MCG and target SCG from FR1-FR2 NR-DC to FR1-FR2 NR-DC

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Message contents are TBD.

### 7.3.3.5.1 Test purpose

The purpose of this test is to verify the requirements of CHO including target MCG and target SCG in NR-DC requirements specified in clause 6.1.6.2 in TS 38.133 [6]. This test verifies the requirements for inter-frequency FR1-FR1 conditional handover and intra-frequency FR2-FR2 PSCell change.

### 7.3.3.5.2 Test applicability

This test applies to all types of NR-DC UE from Release 17 onwards and supporting conditional handover.

#### 7.3.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.5.

#### 7.3.3.5.4 Test description

##### 7.3.3.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.5.4.1-1.

**Table 7.3.3.5.4.1-1: NR Supported test configurations for CHO with PSCell change from NR-DC to NR-DC**

| Config | Description |
|---|---|
| 1 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | Source PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.5.4.1-2.

**Table 7.3.3.5.4.1-2: Initial conditions for NR SA FR2-FR2 conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

**Table 7.3.3.5.4.1-3: General test parameters for PCell FR1-FR1 Inter-frequency conditional handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 3 | |
| Final condition | Active cell | | Cell 3 | |
| A3-Offset in handover condition | | dBm | -4 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

**Table A.7.3.3.5.1-4: General test parameters Intra-frequency FR2-FR2 PSCell change**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 2 | |
| | Neighbouring cell | | Cell 4 | |
| Final condition | Active cell | | Cell 4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤10 | |

### 7.3.3.5.4.2 Test procedure

The test scenario comprises four NR cells, source PCell(Cell 1) and source PSCell(Cell 2), target PCell(Cell 3), target PSCell(Cell 4).Cell 1 and Cell 3 are on radio channel 1 in FR1.Cell 2 and Cell 4 are on radio channel 2 in FR2. The supported test configurations are given in Table **7**.3.3.5.4.1-1. Test parameters are given in Tables Table 7.3.3.5.4.1-3 and Table 7.3.3.5.4.1-4 below.

The test consists of two successive time periods, with time durations of T1, T2 respectively.

At the start of time duration T1, the UE shall be connected to Cell 1 on radio channel 1 and Cell 2 on radio channel 2. The UE does not have any timing information of cell 3 and cell 4. NR shall configure a message implying conditional handover including target MCG in FR1 and target SCG in FR2 to Cell 3 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. UE shall be able to do inter-frequency conditional handover from cell 1 to cell 3 and intra-frequency PSCell change from cell 2 to cell 4.

No interruption shall be observed in time period T1. where,

- $T_{RRC}$ = 16ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell 3 and Cell 4 become detectable and the condition for conditional PCell handover is met. During T2, the UE performs measurement on Cell 3 and evaluates the execution condition and starts handover procedure when execution condition is satisfied.

The UE shall start to transmit the PRACH to Cell 3 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ from the start of T2 and the interruption during T2 shall not exceed $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$.

The UE shall start to transmit the PRACH to Cell 4 less than $T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ from the start of T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 and Cell 2 is the active cell. Set Cell 3 and Cell 4 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.5.5-1 and Table 7.3.3.5.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1, Cell 2 and monitoring corresponding ACK/NACK feedback sent by the UE.

3. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) and Cell 4 physical cell identity = ((current cell 4 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.5.5-1 and Table 7.3.3.5.5-2. T2 starts.

7. If

a_ the UE transmits the PRACH preambles to Cell 3 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

b) The UE shall start to transmit the PRACH to Cell 4 less than $T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ from the start of T2.

and

no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- $X = 8 \cdot T_{interrupt}$ for all test configurations

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back from cell 3 to cell 1 and PSCell change from cell 4 to cell 2.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, Cell 2, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.3.5.4.3 Message Contents

TBD

7.3.3.5.5 Test Requirements

7.3.3.5.5.1 Test Requirements for NR Conditional Handover

**Table 7.3.3.5.5-1: Cell specific test parameters for PCell FR1-FR1 Inter-frequency conditional handover**

| Parameter | | Unit | Cell 1 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| Gap pattern ID | | | gp0 | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | 4+TT | 4+TT | -Infinity | 5+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4+TT | 4+TT | -Infinity | 5+TT |
| SSB_RP | Config 1,2 | dBm/SCS | -94+TT | -94+TT | -Infinity | -93+TT |
| | Config 3 | dBm/SCS | -91+TT | -91+TT | -Infinity | -90+TT |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59+TT | -64.59+TT | -70.05+TT | -63.85+TT |
| | Config 3 | dBm/ 38.16MHz | -58.49+TT | -58.49+TT | -63.94+TT | -57.75+TT |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

$T_{RRC} + T_{Event_DU}$ occurs during T1 as the handover condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 3 less than $T_{measure} + T_{interrupt} + T_{CHO_execution}$ = 1040+67+10 ms= 1117 ms from the start of T2 and the interruption during T2 shall not exceed $T_{interrupt}=T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ =25+20+20+2 = 67 ms excluding any transmissions which do not occur due to scheduling restrictions.

The rate of correct handovers observed during repeated tests shall be at least 90%.

7.3.3.5.5.2 Test Requirements for NR PSCell change

**Table 7.3.3.5.5-2: Cell specific test parameters for Intra-frequency FR2-FR2 PSCell change**

| Parameter | Unit | Cell 2 | | Cell 4 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Assumption for UE beams Note 6 | | Rough | | Rough | |
| AoA setup | | Setup 1 as defined in clause A.3.15 | | | |
| NR RF Channel Number | | 1 | | 1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | | 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC pattern 1 | | | |
| SSB Configuration | | | SSB. 3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuraiton | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | 0 | | 0 | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | | | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 6+TT | -1.8+TT | -Infinity | 0+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 6+TT | 6+TT | -Infinity | 7+TT |
| Io Note3 | | dBm/BW | -59.7+TT | -56.7+TT | -59.7+TT | -56.7+TT |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

–

The UE shall start to transmit the PRACH to Cell 4 less than $T_{measure} + T_{CHO_execution} + T_{processing} + T_{search_PCell_Conditional} + T_{search_PSCell} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ =1040+10+25+20+20 +2 ms= 1117 ms from the start of T2.

### 7.3.3.6 NR SA FR2 conditional handover including target MCG and candidate SCG from FR1-FR2 NR-DC to FR1-FR2 NR-DC

Editor's Note: This test case is incomplete in the following aspects:

- TT analysis and ACR are missing.
- Message contents are TBD.

#### 7.3.3.6.1 Test purpose

The purpose of this test is to verify the requirements of CHO including target MCG and candidate SCG in NR-DC requirements specified in clause 6.1.7.2 in TS 38.133 [6]. This test verifies the requirements for inter-frequency FR1-FR1 conditional handover and intra-frequency FR2-FR2 PSCell change.

#### 7.3.3.6.2 Test applicability

This test applies to all types of NR-DC UE from Release 18 onwards and supporting conditional handover.

#### 7.3.3.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.6.

#### 7.3.3.6. 4 Test description

##### 7.3.3.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.6.4.1-1.

**Table 7.3.3.6.4.1-1: NR Supported test configurations for CHO with PSCell change from NR-DC to NR-DC**

| Config | Description |
|---|---|
| 1 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | Source PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target PCell: FR1 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | Source PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target PCell: FR1 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.6.4.1-2.

**Table 7.3.3.6.4.1-2: Initial conditions for NR-DC FR1 conditional handover including target MCG and candidate SCG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The power levels and settings for NR Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 3 and Cell 4 is NR FR1 target PCell and NR FR2 target PSCell and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

**Table 7.3.3.6.4.1-3: General test parameters for FR1-FR1 inter-frequency conditional handover with target MCG and FR2-FR2 intra-frequency conditional PSCell change with candidate SCG**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1, 2 | |
| | Target cell | | Cell 3, 4 | |
| Final condition | Active cell | | Cell 3, 4 | |
| A3-Offset in condition for PCell | | dBm | -4 | |
| A4-Offset in condition for PSCell | | dBm | -120 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 1 | |
| T2 | | s | 2 | It is the time gap between target PCell and target PSCell become detectable |
| T3 | | s | ≤2 | |

### 7.3.3.6.4.2 Test procedure

The test scenario comprises four NR cells, source PCell (Cell 1) and source PSCell (Cell 2), target PCell (Cell 3), target PSCell (Cell 4). Cell 1 is on radio channel 1 in FR1. Cell 3 is on radio channel 2 in FR1, Cell 2 and Cell 4 are on radio channel 3 in FR2. The event-triggered reporting with Event A3 is used for handover condition. Gap pattern ID gp0 is configured for PCell FR1-FR1 Inter frequency conditional handover in the test case. The supported test configurations are given in Table **7**.3.3.6.4.1-1. General test parameters and cell specific parameters are given in Table 7.3.3.6.4.1-3 and Table 7.3.3.6.5.1, 7.3.3.6.5.2.

The test consists of three successive time periods, with time durations of T1, T2 and T3, respectively.

At the start of time duration T1, the UE shall be connected to Cell 1 on radio channel 1 and Cell 2 on radio channel 3. The UE does not have any timing information of Cell 3 and Cell 4.TE shall configure a condition implying conditional handover to Cell 3 with a condition implying conditional PSCell change to cell 4 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2. UE shall be able to do inter-frequency conditional handover from Cell 1 to Cell 3 and intra-frequency PSCell change from Cell 2 to Cell 4.

No interruption shall be observed in time period T1 where,

- $T_{RRC}$ = 16ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

At the start of T2, Cell 3 becomes detectable. At the start of T3, Cell 4 becomes detectable. The condition for PCell conditional handover and the condition for conditional PSCell change is met during T3

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRCReconfiguration message. Cell 1 and Cell 2 are the active cells. Set Cell 3 and Cell 4 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.6.5-1 and Table 7.3.3.6.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1, Cell 2 and monitoring corresponding ACK/NACK feedback sent by the UE.

3. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) and Cell 4 physical cell identity = ((current cell 4 physical cell identity + 1) mod 1008).4. The SS will send an RRCReconfiguration message with conditionalReconfiguration on Cell 1, containing conditions for both conditional handover and conditional PSCell change, and measurement gap pattern #0 for the UE.

5. The UE shall transmit an RRCReconfigurationComplete message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 to T3 as specified in Table 7.3.3.6.5-1 and Table 7.3.3.6.5-2. T3 starts.

7. If

The UE shall start to transmit the PRACH to Cell 3 less than 1677 ms (for power class 1) or 1157 ms (for power classes 2, 3, and 4) from the beginning of time period T3 [Note 1], as specified in Clause 7.3.3.6.5.1.

The UE shall transmit the PRACH to Cell 4 at the latest 1677 ms (for power class 1) or 1157 ms (for power classes 2, 3, and 4) from the beginning of time period T3 [Note 2], as specified in Clause 7.3.3.6.5.2.

and

No longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T3 to the instant the UE transmits the first PRACH preamble, where

- X = 8·Tinterrupt for all test configurations.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, the SS sends an RRCReconfiguration with reconfigurationWithSync to cause UE handover back from cell 3 to cell 1 and PSCell change from cell 4 to cell 2.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity NR, connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1, Cell 2, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1 and Cell 2.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.3.3.6.4.3 Message contents

TBD

### 7.3.3.6.5 Test Requirement

### 7.3.3.6.5.1 Test Requirements for NR Conditional Handover

**Table 7.3.3.6.5-1: Cell specific test parameters for PCell FR1-FR1 Inter frequency conditional handover with target MCG**

| Parameter | | Unit | Cell 1 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 2 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | gp0 | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR2.1 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |

| Parameter | | Unit | Cell 1 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98+TT | | | -98+TT | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98+TT | | | -98+TT | | |
| | Config 3 | | -95+TT | | | -95+TT | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4+TT | 4+TT | 4+TT | -Infinity | 5+TT | 5+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4+TT | 4+TT | 4+TT | -Infinity | 5+TT | 5+TT |
| SSB_RP | Config 1,2 | dBm/SCS | -94+TT | -94+TT | -94+TT | -Infinity | -93+TT | -93+TT |
| | Config 3 | dBm/SCS | -91+TT | -91+TT | -91+TT | -Infinity | -90+TT | -90+TT |
| Io Note3 | Config 1,2 | dBm/9.36 MHz | -64.59+TT | -64.59+TT | -64.59+TT | -70.05+TT | -63.85+TT | -63.85+TT |
| | Config 3 | dBm/38.16 MHz | -58.49+TT | -58.49+TT | -58.49+TT | -63.94+TT | -57.75+TT | -57.75+TT |
| Propagation condition | | - | AWGN | | | AWGN | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

$T_{RRC} + T_{Event_DU}$ occurs during T1 and T2, as the conditional handover condition for cell 3 becomes satisfied from the start of T2, and the conditional PSCell change condition for cell 4 becomes satisfied from the start of T3. The test shall verify that there are no interruptions during T1 and T2. The UE shall not start the transmission of the new uplink PRACH channel of the target PCell before T3.

The rate of correct observed delay in conditional handover including target MCG and candidate SCG during repeated tests shall be at least 90 %.

NOTE 1: The PCell conditional handover delay can be expressed as specified in clause 7.3.3.0.5:

$D_{CHOwithCPC_PCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PCell} + T_{PCell_DU} + 2$ ms

Where:

- $\max(T_{measure_PCell}, T_{measure_PSCell})$ = 1600 ms (power class 1) or 1080 ms (power classes 2, 3 and 4)
- $T_{UE_preparation}$ = 10 ms
- $T_{processing}$ = 25 ms
- $T_{\Delta_PCell}$ = 20 ms
- $T_{PCell_DU}$ = 20 ms
- For power class 1 = 1600+10+25+20+20+2ms = 1677 ms.
- For power class 2, 3 and 4 = 1080+10+25+20+20+2 = 1157ms.

This gives a total of 1677 ms for power class 1 UE and 1157 ms for power class 2/3/4 UE.

### 7.3.3.6.5.2 Test Requirements for NR PSCell change

**Table 7.3.3.6.5-2: Cell specific test parameters for conditional Intra-frequency FR2-FR2 PSCell change with candidate SCG**

| Parameter | | Unit | Cell 2 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 6 | | | Rough | | | Rough | | |
| AoA setup | | | Setup 1 as defined in A.3.15 | | | | | |
| NR RF Channel Number | | | 3 | | | 3 | | |
| Duplex mode | | | TDD | | | | | |
| TDD configuration | | | TDDConf.3.1 | | | | | |
| $BW_{channel}$ | | MHz | 100: $N_{PRB,c}$ = 66 | | | | | |
| BWP BW | | MHz | 100: $N_{PRB,c}$ = 66 | | | | | |
| Data PRBs allocated | | | 66 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | SR3.1 TDD | | | | | |
| RMSI CORESET Reference Channel | | | CR3.1 TDD | | | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | | | |
| OCNG Patterns | | | O P. 1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| SSB Configuration | | | SSB. 3 FR2 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | | | |
| PRACH configuration | | | FR2 PRACH configuration 1 | | | | | |
| TRS configuration | | | TRS.2.1 TDD | | | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | | | |
| BWP configuraiton | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104.7+TT | | | | | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7+TT | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 5.03+TT | 5.03+TT | -5.41+TT | -Infinity | -Infinity | 3.81+TT |
| $\hat{E}_s/N_{oc}$ | | dB | 6+TT | 6+TT | 6+TT | -Infinity | -Infinity | 11+TT |
| Io[Note3] | | dBm/BW | -59.7+TT | -59.7+TT | -54.2+TT | -59.7+TT | -59.7+TT | -54.2+TT |
| Propagation condition | | - | AWGN | | | AWGN | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation

NOTE 2: The PSCell conditional change delay can be expressed as follows as specified in clause 7.3.3.0.5:

$D_{CHOwithCPC_PSCell} = T_{RRC_delay} + T_{Event_DU} + \max(T_{measure_PCell}, T_{measure_PSCell}) + T_{UE_preparation} + T_{processing} + T_{\Delta_PSCell} + T_{PSCell_DU} + 2$ ms

Where:

- $\max(T_{measure_PCell}, T_{measure_PSCell})$ = 1600 ms (power class 1) or 1080 ms (power classes 2, 3 and 4)
- $T_{UE_preparation}$ = 10 ms
- $T_{processing}$ = 25 ms
- $T_{PSCell_DU}$ = 20 ms
- $T_{\Delta_PSCell}$ = 20 ms
- For power class 1 = 1600+10+25+20+20+2ms = 1677 ms.
- For power class 2, 3 and 4 = 1080+10+25+20+20+2 = 1157ms.

This gives a total of 1677 ms for power class 1 UE and 1157 ms for power class 2/3/4 UE.

## 7.3.4 LTM PCell Switch

### 7.3.4.0 Minimum conformance requirements

#### 7.3.4.0.1 Minimum conformance requirements for NR FR2 LTM PCell Switch

Same as section 6.3.4.0.1

### 7.3.4.1 NR SA FR2 RACH based Intra-frequency PCell switch from FR2 to FR2

Editor's Note: The test is incomplete in following aspects:

- Test frequency f > 40.8 GHz
- UE power class other than PC3.

This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

#### 7.3.4.1.1 Test purpose

To verify the UE's ability to perform NR FR2-NR FR2 RACH-based intra-frequency PCell switch specified in 38.133 [6] clause 6.3.1, including cell switch delay and interruption length, for both with and without early TCI state activation.

#### 7.3.4.1.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for MCG from Release 18 onwards.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

#### 7.3.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.4.1.

#### 7.3.4.1.4 Test description

##### 7.3.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.4.1.4.1-1.

**Table 7.3.4.1.4.1-1: Intra-frequency cell switch from FR2 to FR2 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.4.1.4.1-2.

**Table 7.3.4.1.4.1-2: Initial conditions for Intra-frequency cell switch from FR2 to FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.3.4.1.4.1-3.
2. Message contents are defined in clause 7.3.4.1.4.3.

3. Two cells are deployed in the test, which are FR2 PCell (Cell 1) and FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 7.3.4.1.4.1-3: General test parameters for Intra-frequency cell switch from FR2 to FR2**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -15 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 0.3 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.10B. |
| | CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.2 | | | | |

#### 7.3.4.1.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table 7.3.4.1.4.1-1.

Both cell switch delay and interruption length are tested by using the parameters in table 7.3.4.1.4.1-3, and 7.3.4.1.5-1.

The test consists of four successive time periods, with time durations of T1, T2, T3 and T4, respectively.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 7.3.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message to configure event A3 triggered measurement reporting on the intra-frequency carrier of Cell 2.

4. UE shall transmit RRCReconfigurationComplete message.

5. If the UE transmit an A3 message report, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.4.1.5-1. T2 starts.

6. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell2, and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on the candidate cell (Cell 2) in PUCCH format 2.

7. UE shall transmit RRCReconfigurationComplete message.

8. If the UE transmits a valid L1-RSRP result of Cell2:

   - Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 7.3.4.1.5-1. T3 starts.

   - Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 7.3.4.1.5-1. T4 starts, go to step10.

9. At the start of T3, the SS shall transmit a Candidate Cell TCI States Activation MAC-CE (Refer to TS 38.321 [12], clauses 5.18.36, 6.1.3.76) of Cell2. 50ms after the candidate cell TCI state activation MAC-CE transmission, the SS shall switch the power setting from T3 to T4 as specified in Table 7.3.4.1.5-1. T4 starts.

   candidate cell TCI activation MAC-CE:

   - Test 1A: *CandidateTCI-State#1* is activated.

   - Test 1B: *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

10. The start of T4 is the instant when the last TTI containing the LTM cell switch command MAC CE(Refer TS 38.321 [12], clauses 6.1.3.75) is sent by Cell1 to the UE.

    cell switch MAC-CE:

    - Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF

    - Test 1A: CandidateTCI-State#2 is indicated.

    - Test 1B: CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated

    - Test 2A: CandidateTCI-State#1 is indicated.

    - Test 2B: CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated

11. If the UE transmits the uplink PRACH channel to Cell 2 less than $D_{LTM}$ from the beginning of time period T4 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.T4 ends.

12. After T4 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18*, to cause UE handover back to Cell 1.

13. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1

14. Power off Cell2 and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop. Upon setting the new physical cell identity for Cell 2, power on Cell 2 to ensure Cell 2 is available for the following test steps.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.4.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.3 FR2, SMTC.1 and Synchronous cells<br>Table H.3.1-4 with A3-offset = -15dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 7.3.4.1.4.3-2: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12.1 with Condition LTM L1-RSRP<br>Table H 3.12-2 with Condition LTM L1-RSRP<br>Table H.3.12-3 for Cell 2 and Condition Candidate config and TCI_INFO<br>Table H.3.12.4<br>Table H.3.12-5 with pucch-ResourceId = 8<br>Table H.3.12-6, H.3.12-7 and H.3.12-13 with SSB index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for Test 1A<br>Table H.3.12-10 with Condition Seperate for Test 1B and Test 2B<br>Table H.3.12-10 with Condition Joint for Test 2A<br>Table H.3.12-11 |

**Table 7.3.4.1.4.3-3: *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR2 | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n16 | | |
| } | | | |
| rsrp-ThresholdSSB | RSRP_51 | | |

| | | | |
|---|---|---|---|
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| } | | | |

**Table 7.3.4.1.4.3-4: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.3.4.1.5 Test requirements

Table 7.3.4.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.4.1.5-1: Cell specific test parameters for NR FR2-FR2 Intra-frequency cell switch test case**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | | | 1 | 1 |
| Assumption for UE beams[Note 6] | | | Rough | Rough |
| AoA setup | | | Setup 1 as defined in clause A.9.1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference | | | SR3.1 TDD | |
| CORESET Reference Channel | | | CR3.1 TDD | |
| Control Channel RMC | | | CCR.3.1 TDD | |
| CP length | | | Normal | |
| TRS configuration | | | TRS.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | | | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | |
| PRACH configuration | | | PRACH.6 FR2 | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.8 | 0 |
| $\hat{E}_s / N_{oc}$ | | dB | 6 | 7 |
| SSB_RP | | dBm/SCS | -89.7 | -88.7 |
| Io Note3 | | dBm/ 95.04MHz | -56.7 | -56.7 |
| Propagation condition | | - | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

The UE shall start to transmit the PRACH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms and is specified in 38.133 [6] clause 6.3.1.2.

$T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ ms and is specified in 38.133 [6] clause 6.3.1.2.1

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 0 ms for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 22 ms for Test 2A and 2B
- $T_{LTM\text{-}IU_}$=20ms
- $T_{LTM\text{-}RRC\text{-}processing}$ =10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ =10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM\text{-}processing}$ =15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM\text{-}processing}$ =20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

## 7.3.4.2 NR SA FR2 RACH-less Intra-frequency PCell switch from FR2 to FR2

Editor's Note: The test is incomplete in following aspects:

- Test frequency f > 40.8 GHz
- UE power class other than PC3.

This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

### 7.3.4.2.1 Test purpose

To verify the UE's ability to perform NR FR2-NR FR2 RACH-less intra-frequency PCell switch specified in 38.133 [6] clause 6.3.1, including cell switch delay and interruption length, for both with and without early TCI state activation.

#### 7.3.4.2.2 Test applicability

This test applies to all NR UEs supporting NR LTM for MCG with RACH-less with L1-RSRP measurement and report from Release 18 onwards, and with optional support for *rach-EarlyTA-Measurement-r18*. The test consists of four parts, and the UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B:

- Test 1: for a UE that supports ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18
  - Test 1A: for a UE that supports *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE that supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE that does not supports ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18
  - Test 2A: for a UE that supports *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE that supports ltm-BeamIndicationSeparateTCI-r18 and does not support ltm-BeamIndicationJointTCI-r18.

#### 7.3.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.4.2.

#### 7.3.4.2.4 Test description

##### 7.3.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations that the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.4.2.4.1-1.

**Table 7.3.4.2.4.1-1: Intra-frequency cell switch from FR2 to FR2 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.4.2.4.1-2.

**Table 7.3.4.2.4.1-2: Initial conditions for Intra-frequency cell switch from FR2 to FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.4.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.3.4.2.4.1-3.
2. Message contents are defined in clause 7.3.4.2.4.3.
3. Two cells are deployed in the test, which are FR2 PCell(Cell 1) and FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 7.3.4.2.4.1-3: General test parameters for Intra-frequency cell switch from FR2 to FR2**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -15 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 0.3 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| EarlyUL-SyncConfig | frequencyInfoUL | | NR RF Channel Number 1 | | | | Same as Cell 1 |
| | PRACH configuration | | PRACH.5 FR2 | | | | RACH bandwidth is within active UL BWP of Cell 1 |
| | bwp-GenericParameters | | ULBWP.0.1 | | | | |
| | n-TimingAdvanceOffset | Tc | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.10B.<br><br>In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |

| | | | |
|---|---|---|---|
| T2 | s | ≤0.2 | |
| T3 | s | ≤0.1 | |
| T4 | s | ≤0.2 | |
| T5 | s | ≤0.1 | |

#### 7.3.4.2.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in Table 7.3.4.2.4.1-1. No measurement gap is configured in the test case.

Both cell switch delay and interruption length are tested by using the parameters in table 7.3.4.2.4.1-3, and 7.3.4.2.5-1.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRCReconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 7.3.4.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier of Cell 2 for Test 1A, 1B, 2A and 2B.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by Event A3. T1 ends with UE reporting an L3 measurement result of Cell2 to Cell 1.
6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.3.4.2.5-1. T2 starts.
7. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell 2, and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on the candidate cell (Cell 2) in PUCCH format 2 for Test 1A, 1B, 2A and 2B.
8. The UE shall transmit *RRCReconfigurationComplete* message.
9. T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

- Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 7.3.4.2.5-1. T3 starts.
- Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 7.3.4.2.5-1 if the UE is capable of *rach-EarlyTA-Measurement-r18*. T4 starts, go to step12. Otherwise, the SS shall switch the power setting from T2 to T5 as specified in Table 7.3.4.2.5-1. T5 starts, go to step14.

10. At the start of T3, the SS shall transmit a Candidate Cell TCI States Activation MAC-CE (Refer to TS 38.321 [12], clauses 5.18.36, 6.1.3.76) of Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.
- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are activated.

11. T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission. And the SS shall switch the power setting from T3 to T4 as specified in Table 7.3.4.2.5-1. T4 starts.

- For the UE is incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped. The SS shall switch the power setting from T3 to T5 as specified in Table 7.3.4.2.5-1. T5 starts, go to step14.

12. At the start of T4, the SS shall transmit a PDCCH order (Refer to TS 38.213 [8], clause 21, and TS 38.212 [31], clause 7.3.1.2.1) to trigger the UE to transmit the PRACH on Cell 2 for Test 1A, 1B, 2A and 2B if the UE is capable of *rach-EarlyTA-Measurement-r18*.
13. T4 ends 5ms after the UE transmits the PRACH to Cell 2. And the SS shall switch the power setting from T4 to T5 as specified in Table 7.3.4.2.5-1. T5 starts.

14. The start of T5 is the instant when the last TTI containing the LTM Cell Switch Command MAC-CE (Refer to TS 38.321 [12], clauses 5.18.35, 6.1.3.75) is sent by Cell 1 to trigger UE switches to Cell 2 for Test 1A, 1B, 2A and 2B. T5 starts.

    - In the cell switch MAC-CE:

        - The target cell is Cell 2.

        - Timing Advance Command is set to 0.

        - In test 1A, *CandidateTCI-State#2* is indicated.

        - In test 1B, *CandidateTCI-State#2* and *CandidateTCI-UL-State#1* are indicated.

        - In test 2A, *CandidateTCI-State#1* is indicated.

        - In test 2B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* are indicated.

    - Cell 2 continuously schedules PUSCH for the UE.

15. T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than ($T_{cmd}$ + $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier. The values of $T_{cmd}$, $T_{LTM\text{-}RRC\text{-}processing}$ $T_{LTM\text{-}processing}$, $T_{first\text{-}RS}$ and $T_{RS\text{-}proc}$ are specified in 7.3.4.2.5.

16. If the UE transmits PUSCH to Cell 2 in less than $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$) ms from the beginning of time period T5, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

17. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18*, to cause UE handover back to Cell 1.

18. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 on Cell 1.

19. Power off Cell2 and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop. Upon setting the new physical cell identity for Cell 2, power on Cell 2 to ensure Cell 2 is available for the following test steps.

20. Repeat steps 2-19 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.4.2.4.3-1: Common Exception messages (Step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.3 FR2, SMTC.1 and Synchronous cells<br>Table H.3.1-4 with A3-offset = -15dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 7.3.4.2.4.3-2: Common Exception messages (Step 7)**

| Default Message Contents |
|---|

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with Condition L1-RSRP<br>Table H.3.12-2 with Condition L1-RSRP<br>Table H.3.12-3 for Cell 2 with Condition Candidate Config, TA_PDCCH-ORDER, TCI_INFO<br>Table H.3.12-4<br>Table H.3.12-5 for Cell 1 with pucch-ResourceId = 8<br>Table H.3.12-6, H.3.12-7 and H.3.12-13 with SSB-Index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for Test 1A<br>Table H.3.12-10 with Condition Separate for Test 1B and Test 2B<br>Table H.3.12-10 with Condition Joint for Test 2A<br>Table H.3.12-11<br>Table H.3.12-12 for Cell 2 with l139 = 0 |

**Table 7.3.4.2.4.3-3 *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR2 | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n16 | | |
| } | | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| } | | | |

**Table 7.3.4.2.4.3-4: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 7.3.4.2.5 Test requirement

Table 7.3.4.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.4.2.5-1: Cell specific test parameters for NR FR2-FR2 Intra-frequency cell switch**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1 ~ T5 | T1 ~ T5 |
| NR RF Channel Number | | | 1 | 1 |
| Assumption for UE beams[Note 6] | | | Rough | Rough |
| AoA setup | | | Setup 1 as defined in clause A.9.1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference | | | SR3.1 TDD | |
| CORESET Reference Channel | | | CR3.1 TDD | |
| Control Channel RMC | | | CCR.3.1 TDD | |
| CP length | | | Normal | |
| TRS configuration | | | TRS.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | | | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | |
| PRACH configuration | | | PRACH.6 FR2 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.8 | 0 |
| $\hat{E}_s / N_{oc}$ | | dB | 6 | 7 |
| SSB_RP | | dBm/SCS | -89.7 | -88.7 |
| Io[Note3] | | dBm/ 95.04MHz | -56.7 | -56.7 |
| Propagation condition | | - | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit PUSCH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T5.
The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms, as specified in TS 38.133 [6] clause 6.3.1.2. $T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ is defined in TS 38.133 [6] clause 6.3.1.3.

- $T_{first-RS}$ + $T_{RS-proc}$=0 for Test 1A and 1B, $T_{first-RS}$ + $T_{RS-proc}$=22ms for Test 2A and 2B.
- $T_{LTM-IU}$ is the uncertainty in transmitting the first uplink transmission on Cell 2.
- $T_{LTM-RRC-processing}$ = 10 ms if the UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM-RRC-processing}$ =0ms
- $T_{LTM-processing}$ = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM-processing}$ = 15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM-processing}$ = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

### 7.3.4.3 NR SA FR2 RACH-based Inter-frequency LTM PCell switch from FR2 to FR2

Editor's Note: The test is incomplete in following aspects:

- Test frequency f > 40.8 GHz
- UE power class other than PC3.

This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

#### 7.3.4.3.1 Test purpose

To verify the UE's ability to perform NR FR2-NR FR2 RACH-based inter-frequency PCell switch specified in 38.133 [6] clause 6.3.1, including cell switch delay and interruption length, for both with and without early TCI state activation.

#### 7.3.4.3.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for MCG with L1-RSRP measurement and report based on SSB(s) of candidate cell(s) from Release 18 onwards.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*
  - Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.
  - Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.
- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*
  - Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.
  - Test 2B: for a UE supporting ltm-BeamIndicationSeparateTCI-r18 and does not support ltm-BeamIndicationJointTCI-r18.

#### 7.3.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.4.3.

#### 7.3.4.3.4 Test description

##### 7.3.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.4.3.4.1-1.

**Table 7.3.4.3.4.1-1: Inter-frequency cell switch from FR2 to FR2 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.3.4.3.4.1-2

**Table 7.3.4.3.4.1-2: Initial conditions for Inter-frequency cell switch from FR2 to FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.3.4.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.3.4.3.4.1-3.
2. Message contents are defined in clause 7.3.4.3.4.3.
3. Two cells are deployed in the test, which are FR2 PCell(Cell 1) and FR2 neighbour cell (Cell 2) on the different frequency than the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 7.3.4.3.4.1-3: General test parameters for Inter-frequency cell switch from FR2 to FR2**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1 | | | | |
| | Neighbouring cell | | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell | | Cell 2 | | | | |
| A3-Offset | | dB | -15 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| includeBeamMeasurements | | | True | | | | |
| DRX | | | OFF | | | | DRX is not used |
| Measurement gap pattern ID | | | gp0 | | | | As specified in TS 38.133 [6] Table 9.1.2-1 |
| Measurement gap offset | | | 39 | | | | |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | | | 0.3 μs | | | | |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | As specified in clause A.10B. |
| | CandidateTCI-State#2 | | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.3 | N/A | N/A | In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI- |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | Candidate UL TCI.State.0 | N/A | Candidate UL TCI.State.0 | UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.<br><br>In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.2 | | | | |
| T4 | | s | ≤0.1 | | | | |

### 7.3.4.3.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the different frequency than the PCell. Test configurations are given in table 7.3.4.3.4.1-1.

Both cell switch delay and interruption length are tested by using the parameters in table 7.3.4.3.4.1-3, and 7.3.4.3.5-1.

The test consists of four successive time periods, with time durations of T1, T2, T3 and T4, respectively.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 7.3.4.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message to configure event A3 triggered measurement reporting on the intra-frequency carrier of Cell 2.

4. UE shall transmit RRCReconfigurationComplete message.

5. If the UE transmit an A3 message report, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.4.3.5-1. T2 starts.

6. At the start of T2, the SS shall transmit an *RRCReconfiguration* message with *LTM-Candidate-r18* for Cell2, and SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on the candidate cell (Cell 2) in PUCCH format 2.

7. UE shall transmit RRCReconfigurationComplete message.

8. If the UE transmits a valid L1-RSRP result of Cell2:

   - Test 1A and 1B: The SS shall switch the power setting from T2 to T3 as specified in Table 7.3.4.3.5-1. T3 starts.

   - Test 2A and 2B: T3 is skipped. The SS shall switch the power setting from T2 to T4 as specified in Table 7.3.4.3.5-1. T4 starts, go to step10.

9. At the start of T3, the SS shall transmit the candidate cell TCI activation MAC-CE (Refer TS 38.321 [12], clauses 6.1.3.76) for Cell2. 100ms after the candidate cell TCI state activation MAC-CE transmission, the SS shall switch the power setting from T3 to T4 as specified in Table 7.3.4.3.5-1. T4 starts.

candidate cell TCI activation MAC-CE:

- Test 1A: *CandidateTCI-State#1* is activated.

- Test 1B: *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

10. The start of T4 is the instant when the last TTI containing the LTM cell switch command MAC CE(Refer TS 38.321 [12], clauses 6.1.3.75) is sent by Cell1 to the UE.

    cell switch MAC-CE:

    - Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF

    - Test 1A: CandidateTCI-State#2 is indicated.

    - Test 1B: CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated

    - Test 2A: CandidateTCI-State#1 is indicated.

    - Test 2B: CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated

11. If the UE transmits the uplink PRACH channel to Cell 2 less than $D_{LTM}$ from the beginning of time period T4 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.T4 ends.

12. After T4 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync*, which includes the release of *LTM-Config-r18*, to cause UE handover back to Cell 1.

13. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1

14. Power off Cell2 and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop. Upon setting the new physical cell identity for Cell 2, power on Cell 2 to ensure Cell 2 is available for the following test steps.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.3.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.3.4.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.3 FR2, SMTC.1<br>Table H.3.1-5 with Condition SSB Index<br>Table H.3.1-6 with Conditions gapUE and Pattern #0<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index |

**Table 7.3.4.3.4.3-2: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12.1 with Condition LTM L1-RSRP<br>Table H 3.12-2 with Condition LTM L1-RSRP<br>Table H.3.12-3 for Cell 2 and Condition Candidate config and TCI_INFO<br>Table H.3.12.4<br>Table H.3.12-5 with pucch-ResourceId = 8<br>Table H.3.12-6, H.3.12-7 abd H.3.12-13 with SSB index = 0<br>Table H.3.12-8<br>Table H.3.12-9 for Cell 2<br>Table H.3.12-10 with Condition Joint AND Early DL Sync for test 1A<br>Table H.3.12-10 with Condition Seperate for test 1B and 2B<br>Table H.3.12-10 with Condition Joint for test 2A<br>Table H.3.12-11 |

**Table 7.3.4.3.4.3-3: ReportConfigNR (step3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -15 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| | | | |
| } | | | |
| reportQuantity-RsIndexes SEQUENCE { | | | |
| rsrp | true | | |
| } | | | |
| maxReportCells | 1 | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.3.4.3.4.3-4: *RACH-ConfigCommon* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 with condition FR2 | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n16 | | |
| } | | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 120 | | |
| } | | | |

**Table 7.3.4.3.4.3-5: *RACH-ConfigDedicated* for Contention Free Random Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.3.4.3.5 Test requirements

Table 7.3.4.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.4.3.5-1: Cell specific test parameters for NR FR2-FR2 Inter-frequency cell switch test case**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| | | | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | | | 1 | 2 |
| Assumption for UE beams[Note 6] | | | Rough | Rough |
| AoA setup | | | Setup 1 as defined in clause A.9.1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference | | | SR3.1 TDD | |
| CORESET Reference Channel | | | CR3.1 TDD | |
| Control Channel RMC | | | CCR.3.1 TDD | |
| CP length | | | Normal | |
| TRS configuration | | | TRS.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | | | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | |
| PRACH configuration | | | PRACH.6 FR2 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | |
| | | | 5 | |
| $\hat{E}_s/I_{ot}$ | | dB | 5 | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 5 | 5 |
| SSB_RP | | dBm/SCS | -90.7 | -90.7 |
| Io Note3 | | dBm/ 95.04MHz | -60.5 | -60.5 |
| Propagation condition | | - | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

The UE shall start to transmit the PRACH to Cell 2 in no later than $D_{LTM}$ from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM\text{-}interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3ms and is specified in 38.133 [6] clause 6.3.1.2.

$T_{LTM\text{-}interrupt}$ = $T_{LTM\text{-}RRC\text{-}processing}$ + $T_{LTM\text{-}processing}$ + $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$ + $T_{LTM\text{-}IU}$ ms and is specified in 38.133 [6] clause 6.3.1.2.1

- $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 0 ms for Test 1A and 1B, $T_{first\text{-}RS}$ + $T_{RS\text{-}proc}$= 22 ms for Test 2A and 2B
- $T_{LTM\text{-}IU_}$=20ms
- $T_{LTM\text{-}RRC\text{-}processing}$ =10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM\text{-}RRC\text{-}processing}$ =0ms
- $T_{LTM\text{-}processing}$ =10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM\text{-}processing}$ =15 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM\text{-}processing}$ =20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

## 7.3.5 LTM PSCell Switch

### 7.3.5.0 Minimum conformance requirements

Same as in clause 6.3.5.0.

### 7.3.5.1 NR SA FR2 RACH-based Intra-frequency LTM PSCell switch

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing

Message contents are TBD

Test procedure is missing

#### 7.3.5.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 RACH-based intra-frequency PSCell switch specified in 38.133 [6] clause 8.20 for both with and without early TCI state activation.

#### 7.3.5.1.2 Test applicability

This test applies to all types of NR UEs supporting NR LTM for SCG with RACH from Release 18 onwards.

#### 7.3.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.5.0.

The normative reference for this requirement is TS 38.133 [6] clauses 8.20 and A.7.3.5.1.

#### 7.3.5.1.4 Test description

##### 7.3.5.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.5.1.4.1-1.

**Table 7.3.5.1.4.1-1: NR SA FR2 RACH-based Intra-frequency LTM PSCell switch test configurations**

| Config | Description |
|---|---|
| 7.3.5.1-1 | PCell: FR1 NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>Source PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.5.1-2 | PCell: FR1 NR 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.3.5.1-3 | PCell: FR1 NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>Source PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target PSCell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 7.3.5.1.4.1-2

**Table 7.3.5.1.4.1-2: Initial conditions for NR SA FR2 RACH-based Intra-frequency LTM PSCell switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.3.5.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.5.1.4.1-3 below.

**Table 7.3.5.1.4.1-3: General test parameters for NR SA FR2 RACH-based Intra-frequency LTM PSCell switch**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1A | Test 1B | Test 2A | Test 2B | |
| Initial conditions | Active cell | | Cell 1, Cell 2 | | | | |
| | Neighbouring cell | | Cell 3 | | | | Cell 3 is the candidate cell |
| Final condition | Active cell | | Cell 1, Cell 3 | | | | |
| A3-Offset | | dB | -30 | | | | |
| Hysteresis | | dB | 0 | | | | |
| Time To Trigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| DRX | | | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between Cell 2 and Cell 3 | | | 0.3 μs | | | | RTD between Cell 2 and Cell 3 is less than CP |
| deriveSSB-IndexFromCell | | | Enabled | | | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | | | Report candidate cell's (Cell 3) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | | | |
| | spCellInclusion | | N/A | | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 | | DlorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B. In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| | CandidateTCI-State#2 | | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A | |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 | | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 | |
| ltm-ConfigComplete | | | True | | | | Candidate cell's configuration is complete configuration |
| T1 | | s | <3 | | | | |
| T2 | | s | ≤0.2 | | | | |
| T3 | | s | ≤0.1 | | | | |
| T4 | | s | ≤0.1 | | | | |

7.3.5.1.4.2 Test procedure

TBD

7.3.5.1.4.3 Message contents

TBD

7.3.5.1.5 Test requirements

Table 7.3.5.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.3.5.1.5-1: Cell specific test parameters for NR SA FR2 RACH-based Intra-frequency LTM PSCell switch**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| | | | T1~T4 |
| NR RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| DRx Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 |
| | Config 3 | | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 |
| | Config 3 | | 30 |
| PRACH configuration | | | FR1 PRACH configuration 6 |
| BWP | Initial DL BWP | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98+TT |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98+TT |
| | Config 3 | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4+TT |
| SSB_RP | Config 1,2 | dBm/SCS | -94+TT |
| | Config 3 | | -91+TT |

| | | | |
|---|---|---|---|
| Io[Note3] | Config 1,2 | dBm/ 9.36MHz | -64.59+TT |
| | Config 3 | dBm/ 38.16MHz | -58.49+TT |
| Propagation condition | | - | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table 7.3.5.1.5-1: Cell specific test parameters for NR SA FR2 RACH-based Intra-frequency LTM PSCell switch**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| | | | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | | | 2 | 2 |
| Assumption for UE beams[Note 6] | | | Rough | Rough |
| AoA setup | | | Setup 1 as defined in clause A.3.15 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference | | | SR3.1 TDD | |
| CORESET Reference Channel | | | CR3.1 TDD | |
| Control Channel RMC | | | CCR.3.1 TDD | |
| CP length | | | Normal | |
| TRS configuration | | | TRS.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | | | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | |
| PRACH configuration | | | FR2 PRACH configuration 6 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7+TT | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7+TT | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.8+TT | 0+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 6+TT | 7+TT |
| SSB_RP | | dBm/SCS | -88.7+TT | -89.7+TT |
| Io[Note3] | | dBm/ 95.04MHz | -56.7+TT | -56.7+TT |
| Propagation condition | | - | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall start to transmit the PRACH to Cell 3 in no later than $D_{LTM}$ from the beginning of time period T4.

The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as $D_{LTM}$ (= $T_{cmd}$ + $T_{LTM-interrupt}$), where:

$T_{cmd}$ = $T_{HARQ}$ + 3 ms and is specified in clause 6.3.1.2, $T_{LTM-interrupt}$ is defined in clause 8.20.3 as $T_{LTM-interrupt}$ = $T_{LTM-RRC-processing}$ + $T_{LTM-processing}$ + $T_{first-RS}$ + $T_{RS-proc}$ + $T_{LTM-IU}$ ms.

- $T_{first-RS}$ + $T_{RS-proc}$= 0 ms for Test 1A and 1B, $T_{first-RS}$ + $T_{RS-proc}$= 22 ms for Test 2A and 2B
- $T_{LTM-IU}$=20ms,
- $T_{LTM-RRC-processing}$ = 10 ms if UE does not support *ltm-FastProcessingConfig-r18*, otherwise $T_{LTM-RRC-processing}$ =0ms
- $T_{LTM-processing}$ = 10 ms if the UE supports *ltm-FastUE-Processing-r18* capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM-processing}$ = 15 ms if the UE supports *ltm-FastUE-Processing-r18*] capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability
- $T_{LTM-processing}$ = 20 ms if the UE does not support *ltm-FastUE-Processing-r18* capability.

# 7.4 Timing

## 7.4.1 UE transmit timing

### 7.4.1.0 Minimum Conformance Requirements

#### 7.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 7.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{TA} + N_{TA\,offset}) \times T_c$ . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{TA}$ for PRACH is defined as 0.

$(N_{TA} + N_{TA\,offset}) \times T_c$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. $N_{TA}$ for other channels is not changed until next timing advance is received. The value of $N_{TA\,offset}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{TA\,offset}$ is defined in Table 7.4.1.0.1-2.

For multi-DCI based multi-TRP operation with two TAs, UE initial transmission timing error requirements specified in this clause is applicable for each TAG and shall be met for each TAG separately. The reference point for each TAG is the first detected path (in time) of [one of] the corresponding downlink reference signal(s) of the cell associated with a coresetPoolIndex having same TAG as the uplink signal [TS 38.331].

**Table 7.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 15 | 15 | 12*64*$T_c$ |
| | | 30 | 10*64*$T_c$ |
| | | 60 | 10*64*$T_c$ |
| | 30 | 15 | 8*64*$T_c$ |
| | | 30 | 8*64*$T_c$ |
| | | 60 | 7*64*$T_c$ |
| 2 | 120 | 60 | 3.5*64*$T_c$ |
| | | 120 | 3.5*64*$T_c$ |
| | 240 | 60 | 3*64*$T_c$ |
| | | 120 | 3*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 7.4.1.0.1-2: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in [3] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.<br>NOTE 2: Void | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.

2) The minimum aggregate adjustment rate shall be $T_p$ per second.

3) The maximum aggregate adjustment rate shall be $T_q$ per 200ms.

where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 7.4.1.0.1-3.

For multi-DCI based multi-TRP operation with two TAs, gradual timing adjustment specified in this clause applies for each TAG and shall be met for each TAG. The reference timing for each TAG is the first detected path (in time) of [one of] the corresponding downlink reference signal(s) of the cell associated with a coresetPoolIndex having same TAG as uplink signal [TS 38.331].

**Table 7.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 1 | 15 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 30 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 60 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| 2 | 60 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| | 120 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |

NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

### 7.4.1.1 NR SA FR2 UE transmit timing accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. *highSpeedMeasFlagFR2-r17* is broadcast to UE supporting power class 6. This test will verify the requirements in clause 7.1.2 of TS 38.133 [6].

#### 7.4.1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SA FR2.

#### 7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.1.1

#### 7.4.1.1.4 Test Description

##### 7.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 7.4.1.1.4.1-1.

**Table 7.4.1.1.4.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.4.1.1.4.1-2

**Table 7.4.1.1.4.1-2: Initial conditions for NR SA FR2 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.4.1.1.4.3.

2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.4.1.1.4.2 Test procedure

The test consists of a single NR FR2 cell (PCell). The downlink timing of the PCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Setup NR PCell according to parameters given in Table 7.4.1.1.4.1-1.

3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with the message content defined in clause 7.4.1.1.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the UE in the Rx beam peak direction found with one of the Rx Beam Peak Search procedures described in Annex I. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.

6. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.

   a. The $N_{TA}$ offset value (in $T_c$ units) is 13792 for FR2

   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 7.4.1.1.5-4.

7. The test system shall adjust the timing of the DL path by values given in Table 7.4.1.1.4.2-1

**Table 7.4.1.1.4.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | **Test1** | **Test2** |
| 240 | +8*64Tc | +4*64Tc |

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 7.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 7.4.1.0.1 and Table 7.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 7.4.1.1.4.2-1.

9. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within

$(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

#### 7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.4.1.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table 4.6.3-169 in TS 38.508-1 [14] with condition R17 HST FR2 |
| Specific message contents exceptions for Test Configuration 7.4.1.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

**Table 7.4.1.1.4.3-1: *SRS-Config* for UE transmit timing accuracy for NR SA FR2 UE**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 17 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl2560 | 4 | | Test 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.4.1.1.4.3-2: *DRX-Config* for UE transmit timing accuracy Test 2 for NR SA FR2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |

| | | | |
|---|---|---|---|
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | NOT PRESENT | |
| } | | | |

### 7.4.1.1.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 7.4.1.1.5-4.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 7.4.1.1.5-5.

**Table 7.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | Test2 |
|---|---|---|---|---|
| SSB ARFCN | | 1 | Freq1 | Freq1 |
| Duplex Mode | | 1 | TDD | |
| TDD configuration | | 1 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 66 | |
| Initial BWP Configuration | | 1 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1 | DLBWP.1.1<br>ULBWP.1.1 | |
| TRS Configuration | | 1 | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| DRx Cycle | ms | 1 | N/A | DRX.8[Note5] |
| PDSCH Reference measurement channel | | 1 | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1 | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1 | CCR.3.7 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| SSB Configuration | | 1 | SSB.4 FR2 | |
| SMTC Configuration | | 1 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 120 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Propagation condition | | 1 | AWGN | |
| SRS Config | | 1 | SRSConf.1 Note6 | SRSConf.2 Note6 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: DRx related parameters are given in Table A.5-1<br>Note 6: SRS configs are given in Table A.7.4.1.1.5-2 | | | | |

**Table 7.4.1.1.5-2: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | |
| | resourceType | Periodic | Periodic | |
| | Usage | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | |
| | freqDomainShift | 0 | 0 | |
| | freqHopping c-SRS | 17 | 17 | Matches $N_{RB,C}$ |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1,0 | sl2560,4 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | Any 10 bit number |

**Table 7.4.1.1.5-3: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in A.9.1 | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -100 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -96 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io Note2 | dBm/95.04 MHz Note4 | -68.5 | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in TS 38.133 [6] section B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.4.1.1.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 2 | 120 | 60 | N/A |
| | | 120 | N/A |
| | 240 | 60 | N/A |
| | | 120 | 3.75*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 7.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | The Maximum timing change in one adjustment $T_q$ | The Minimum aggregate adjustment rate $T_p$ | The Maximum aggregate adjustment rate $T_q$ |
|---|---|---|---|---|
| 2 | 120 | 3.125*64*$T_c$ | -1.225*64*$T_c$ | +3.725*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

**Table 7.4.1.1.5-6: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_C$) |
|---|---|
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [8] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell. | |
| NOTE 2: Void | |

## 7.4.1.2

## 7.4.1.3 NR SA FR2 UE Transmit Timing Test with 2-TA for FR2 UE supporting multiDCI-IntraCellMultiTRP-TwoTA-r18

### 7.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits, for UE supporting *multiDCI-IntraCellMultiTRP-TwoTA-r18* and is configured with 2 TAGs for multi-DCI multi-TRP operation. UE is also configured with *dl-OrJointTCI-StateList*. This test will verify the requirements in clause 7.1.2 of TS 38.133 [6].

#### 7.4.1.3.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting for UE supporting *multiDCI-IntraCellMultiTRP-TwoTA-r18* and is configured with 2 TAGs for multi-DCI multi-TRP operation. UE is also configured with *dl-OrJointTCI-StateList*.

#### 7.4.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.1.3.

#### 7.4.1.3.4 Test Description

##### 7.4.1.3.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 7.4.1.3.4.1-1.

**Table 7.4.1.3.4.1-1: Supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.4.1.3.4.1-2

**Table 7.4.1.3.4.1-2: Initial conditions for NR SA FR2 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.4.1.3.4.3.
2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.4.1.3.4.2 Test procedure

The test consists of a single NR FR2 cell. The downlink timing of the TRP1 is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

For UE not supporting the capability of “rxTimingDiff-r18”, are required to be tested in Test1 and Test3.

For UEs that support the capability of “rxTimingDiff-r18”, are required to be tested in Test2 and Test4.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Setup NR PCell according to parameters given in Table 7.4.1.3.4.1-1.

3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with the message content defined in clause 7.4.1.3.4.3.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the UE in the Rx beam peak direction found with one of the Rx Beam Peak Search procedures described in Annex I. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.

6. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of the corresponding downlink reference signal(s) of the cell associated with a coresetPoolIndex having same TAG as the uplink signal, where $N_{TA}$ is commanded by the network independently for each TAG as defined in TS 38.331[12].

7. The test system shall adjust the timing of the DL path by values given in Table 7.4.1.3.4.2-1 for only TRP#1. The timing of the DL path of TRP#2 is not changed.

**Table 7.4.1.3.4.2-1: Adjustment Value for DL Timing**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1&Test2 | Test3&Test4 |
| 240 | +8*64Tc | +4*64Tc |

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 7.4.1.3.5-6. This will only be done for Test1 and Test2. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1.To check that the minimum adjustment rate is within Rule 2,the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3,the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules, as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3 are applied until the UE transmit timing offset is within the limits specified in same clause with respect to the first detected path (in time) of the corresponding downlink frame of TRP1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 7.4.1.3.4.2-1.

9. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of the corresponding downlink reference signal(s) of the cell associated with a coresetPoolIndex having same TAG as the uplink signal. For Test 3 and Test 4 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

### 7.4.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.4.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Specific message contents exceptions for Test Configuration 7.4.1.3-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |

**Table 7.4.1.3.4.3-2: *SRS-Config* for UE transmit timing accuracy for NR SA FR2 UE**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 17 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| Sl2 | 0 | | Test 1 |
| Sl2 | 1 | | Test 2 |
| sl2560 | 4 | | Test 3 |
| sl2560 | 9 | | Test 4 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.4.1.3.4.3-3: *DRX-Config* for UE transmit timing accuracy Test 2 for NR SA FR2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | NOT PRESENT | |
| } | | | |

**Table 7.4.1.3.4.3-4: PDSCH-Config for UE transmit timing accuracy**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| dl-OrJointTCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| dl-OrJointTCI-StateToAddModList-r17 SEQUENCE (SIZE (1..maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State[1] SEQUENCE { | | entry 1 | |
| tci-StateId | 0 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| } | | | |
| TCI-State[2] SEQUENCE { | | entry 2 | |
| tci-StateId | 1 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| Ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| } | | | |
| } | | | |
| dl-OrJointTCI-StateToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |

### 7.4.1.3.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 7.4.1.3.5-5. The adjustment step size and the adjustment rate shall conform to the conditions outlined in clause 7.4.1.0.1. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{TA} + N_{TA_offset}) \times T_c$. The downlink timing is defined as the time when the first detected path(in time) of DL SSB of each TAG is received from the reference cell at the UE antenna. $N_{TA_offset}$ is defined in Table 7.4.1.3.5-7.

**Table 7.4.1.3.5-2: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test1 | | Test2 | | Test3 | | Test4 | | Band Group |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TRP #1 | TRP #2 | TRP #1 | TRP #2 | TRP #1 | TRP #2 | TRP #1 | TRP #2 | |
| SSB ARFCN | | 1,2 | Freq1 | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Duplex Mode | | 1,2 | TDD | | | | | | | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | | | | | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | | | | | | | |
| Data RBs allocated | | 1,2 | 66 | | | | | | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | | | | | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | | | | | | | | |
| TRS Configuration | | 1,2 | TRS.2.1 TDD<br>TRS.2.2 TDD | | | | | | | | |
| DRx Cycle | ms | 1,2 | N/A | | | | DRX.8[Note5] | | | | |
| PDSCH Reference measurement channel | | 1,2 | SR.3. 3 TDD | | | | | | | | |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD | | | | | | | | |
| coresetPoolIndex for dedicated CORESET Reference Channel | | 1,2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | CCR.3.4 TDD | CCR.3.6 TDD | |
| TCI configuration | | 1,2 | DLorJointTCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJointTCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJointTCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJointTCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJointTCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJointTCI.State.1 with tag-Id-ptr-r18 = n1 | DLorJointTCI.State.0 with tag-Id-ptr-r18 = n0 | DLorJointTCI.State.1 with tag-Id-ptr-r18 = n1 | |
| Timing difference compared to TRP#1 | us | 1,2 | 0 | 0.1 | 0 | 8 | 0 | 0.1 | 0 | 8 | |
| OCNG Patterns | | 1,2 | OP.1 | | | | | | | | |
| SSB Configuration | | 1,2 | SSB.1 FR2 | | | | | | | | |
| SMTC Configuration | | 1,2 | SMTC.1 | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| Propagation condition | | 1,2 | AWGN | | |
| SRS Config | | 1,2 | SRSConf.1[Note6] | SRSConf.2[Note6] | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: DRx related parameters are given in 38.133 [6] Table A.3.3.8-1
Note 6: SRS configs are given in 38.133 [6] Table A.5.4.1.x.1-3

**Table 7.4.1.3.5-3: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | | SRSConf.2 | | Comments |
|---|---|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 1 | 0 | 1 | |
| | srs-ResourceIdList | 0 | 1 | 0 | 1 | |
| | resourceType | Periodic | Periodic | Periodic | Periodic | |
| | Usage | Codebook | Codebook | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 1 | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | n1 | n1 | |

| | | | | | |
|---|---|---|---|---|---|
| resourceMapping repetitionFactor | n1 | n1 | n1 | n1 | |
| freqDomainPosition | 0 | 0 | 0 | 0 | |
| freqDomainShift | 0 | 0 | 0 | 0 | |
| freqHopping c-SRS | 17 | 17 | 17 | 17 | Matches $N_{RB,c}$ |
| freqHopping b-SRS | 0 | 0 | 0 | 0 | |
| freqHopping b-hop | 0 | 0 | 0 | 0 | |
| groupOrSequenceHopping | Neither | Neither | Neither | Neither | |
| resourceType | Periodic | Periodic | Periodic | Periodic | |
| periodicityAndOffset-p | sl2, 0 | sl2, 1 | sl2560, 4 | sl2560, 9 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | 0 | 0 | Any 10 bit number |
| TCI state | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | |

**Table 7.4.1.3.5-4: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 3 as defined in clause A.9.3 Note 7 | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -100 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -96 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io Note2 | dBm/95.04 MHz Note4 | -68.5 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 7: AoA1 for TRP1 and AoA2 for TRP2

**Table 7.4.1.3.5-5: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 2 | 240 | 120 | $3*64*T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 7.4.1.3.5-6: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | The Maximum timing change in one adjustment $T_q$ | The Minimum aggregate adjustment rate $T_p$ | The Maximum aggregate adjustment rate $T_q$ |
|---|---|---|---|---|
| 2-1 | 120 | 3.125*64*$T_c$ | -1.225*64*$T_c$ | +3.725*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

**Table 7.4.1.3.5-7: The Value of $N_{TA\ offset}$**

| Frequency range and band of cell used for uplink transmission | $N_{TA\ offset}$ (Unit: Tc) |
|---|---|
| FR2 | 13792 |
| NOTE 1: The UE identifies $N_{TA\ offset}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [13]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{TA\ offset}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [8] and the value 39936 of $N_{TA\ offset}$ can also be provided for a FDD serving cell. | |
| NOTE 2: Void | |

## 7.4.2 UE timer accuracy

FFS.

## 7.4.3 Timing advance

### 7.4.3.0 Minimum conformance requirements

#### 7.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.4.3.0.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

**Table 7.4.3.0.3-1: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS (kHz) | 15 | 30 | 60 | 120 |
|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ |

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.

### 7.4.3.1 NR SA FR2 timing advance adjustment accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC1, PC3

- The test is incomplete for UE power classes other than PC1 and PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

#### 7.4.3.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward, supporting SA FR2.

#### 7.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.4.3.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.1.

#### 7.4.3.1.4 Test description

##### 7.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [17].

This test shall be tested using any of the test configurations in Table 7.4.3.1.4.1-1.

**Table 7.4.3.1.4.1-1: NR SA FR2 timing advance adjustment accuracy supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.4.3.1.4.1-2

**Table 7.4.3.1.4.1-2: Initial conditions for NR SA FR2 timing advance adjustment accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.4.3.1.4.1-3: General test parameters for timing advance**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 of TS 38.133 [6] |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 of TS 38.133 [6] |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 of TS 38.133 [6] |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 of TS 38.133 [6] |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |

| | | | |
|---|---|---|---|
| Timing Advance Command ($T_A$) value during T2 | | 39 | For 120 kHz SCS $N_{TA_new} = N_{TA_old} + 1024*T_c$ (based on equation in clause 4.2 of TS 38.213 [8]) |
| T1 | s | 5 | |
| T2 | s | 5 | |

1. Message contents are defined in clause 7.4.3.1.4.3.
2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.4.3.1.4.2 Test Procedure

The test consists of a single NR FR2 cell, Cell 1, which is the PCell in the primary Timing Advance Group (pTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for pTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 7.4.3.1.5-1 and Table 7.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PCell in pTAG. The UE Time Alignment Timer (*timeAlignmentTimer* IE), described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.4.3.1.4.3.
2. Set the parameters according to values in Tables 7.4.3.1.4.1-3 and Table 7.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for pTAG, as specified in Clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for pTAG used by the UE is established.
6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for pTAG, with Timing Advance Command value of 39 as specified in table 7.4.3.1.4.1-3.
7. This value shall result in changes of the timing advance for pTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.
8. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay shall be considered when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.
9. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.
10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 7.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.
11. If the UE adjusts the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 7.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. After the RRC connection release, the SS transmits a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5 or if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5. Message contents are set as defined in clause 7.4.3.1.4.3.

14. Repeat steps 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 7.4.3.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1 |
| Specific message contents exceptions for Test Configuration 7.4.1.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |

**Table 7.4.3.1.4.3-1: SRS-Config for NR SA FR2 timing advance adjustment accuracy**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 16 | | |
| } | | | |
| groupOrSequenceHopping | Neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | Periodic | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 4 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PCell in pTAG to the transmission timing at the designated activation time i.e. $k+1$ slots after the reception of the timing advance command, where $k = 11$.

The Timing Advance adjustment accuracy for PCell in pTAG shall be within the limits specified in Table 7.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90% with a confidence level of 95%.

Table 7.4.3.1.5-1, Table 7.4.3.1.5-1a and Table 7.4.3.1.5-2 define the primary level settings.

**Table 7.4.3.1.5-1: Cell specific test parameters for timing advance**

| Parameter | Unit | Test1 | |
|---|---|---|---|
| | | T1 | T2 |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | |
| CORESET Reference Channel | | CR.3.1 TDD | |
| OCNG Patterns | | OCNG pattern 1 | |
| TRS configuration | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | TCI.State.2 | |
| SMTC configuration | | SMTC.1 | |
| SSB Configuration | | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 kHz | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Propagation condition | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

**Table 7.4.3.1.5-1a: OTA specific test parameters for timing advance**

| Parameter | Unit | Test 1 | |
|---|---|---|---|
| | | T1 | T2 |
| Angle of arrival configuration | | Setup 1 as defined in clause A.9 | |
| Assumption for UE beams[Note 6] | | Fine | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -112 | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -103 | |
| $\hat{E}_s / N_{oc}$ | dB | 4 | |
| SS-RSRP[Note2] | dBm/SCS [Note4] | -99 | |
| $\hat{E}_s / I_{ot}$ | dB | 4 | |
| Io[Note2] | dBm/95.04 MHz [Note4] | -68.5 | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 7.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance**

| Field | Value | Comment |
|---|---|---|
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 | |
| b-hop | 0 | |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=4 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 | |
| repetitionFactor | n1 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| NOTE: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

**Table 7.4.3.1.5-3: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 60 | 120 |
|---|---|---|
| UE Timing Advance adjustment accuracy | ±128 $T_c$ | ±72 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 7.5 Signalling characteristics

## 7.5.1 Radio link monitoring

### 7.5.1.0 Minimum conformance requirements

#### 7.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

Same as section 5.5.1.0.1

#### 7.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

Same as section 5.5.1.0.2

#### 7.5.1.0.3 Minimum conformance requirements for out-of-sync CSI-RS based RLM

Same as section 5.5.1.0.3

#### 7.5.1.0.4 Minimum conformance requirements for in-sync CSI-RS based RLM

Same as section 5.5.1.0.4

#### 7.5.1.0.5 Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

[TS 38.133, clause 8.1.7.3]

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

### 7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 7.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

#### 7.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.1.

### 7.5.1.1.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to 'rlf'. Supported test configurations are shown in table 7.5.1.1.4.1-1. The test parameters are given in Tables 7.5.1.1.4.1-3, 7.5.1.1.5-1, and 7.5.1.1.5-2 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

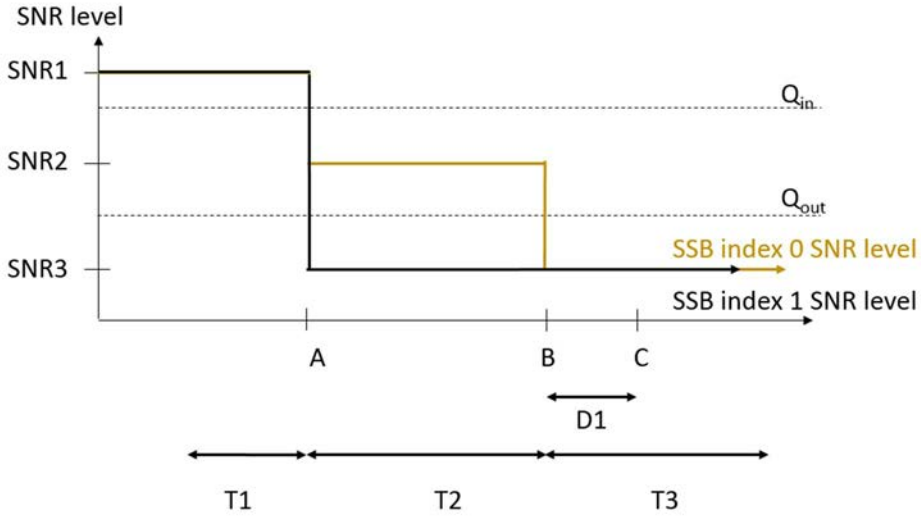



**Figure 7.5.1.1.4-1: SNR variation for out-of-sync testing**

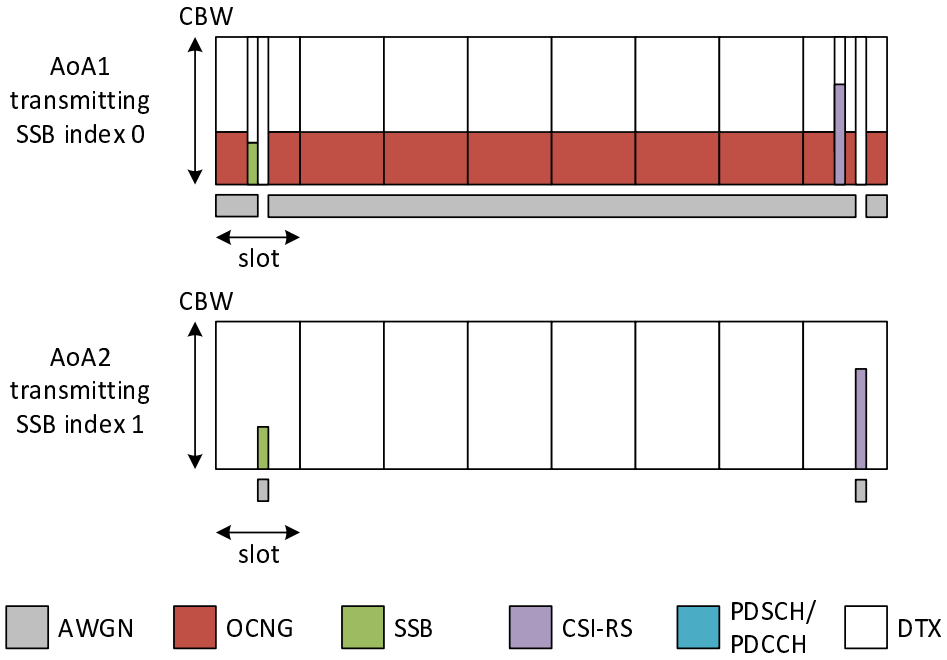



**Figure 7.5.1.1.4-2: Time multiplexed downlink transmissions**

#### 7.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.1.4.1-1.

**Table 7.5.1.1.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 7.5.1.1-1 | TDD, SSB SCS 120 kHz, data SCS 120kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.1.4.1-2

**Table 7.5.1.1.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.1.4.1-3

2. Message contents are defined in clause 7.5.1.1.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.1.4.1-3: General test parameters for FR2 out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1 | | 24 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.4 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 | | 0,1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *gp0* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD Note 3 |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations. | | | | |

#### 7.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.1.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

   b) does not detect any uplink power from time point C ([240] ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.1.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.1.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with Condition RLM<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.1.4.3-1: Void**

**Table 7.5.1.1.4.3-2: UE-TimersAndConstants**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 7.5.1.1.4.3-3: Void**

#### 7.5.1.1.5 Test Requirement

Table 7.5.1.1.4.1-3 and 7.5.1.1.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 7.5.1.1.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | | Setup 3 defined in A.9.3 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1 Note 6 | -3.9 Note 6 | -15 | | | |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | 4.1 Note 6 | -15 | -15 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -94.8 | | | -94.8 | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 7.5.1.1.4-2 | | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

**Table 7.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |

## 7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

### 7.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 7.5.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

#### 7.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.2.

#### 7.5.1.2.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and purpose set to 'rlf'. Supported test configurations are shown in table 7.5.1.2.4-1. The test parameters are given in Tables 7.5.1.2.4.1-3 and 7.5.1.2.5-1 below. There is one cell (Cell 1), which is the active cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

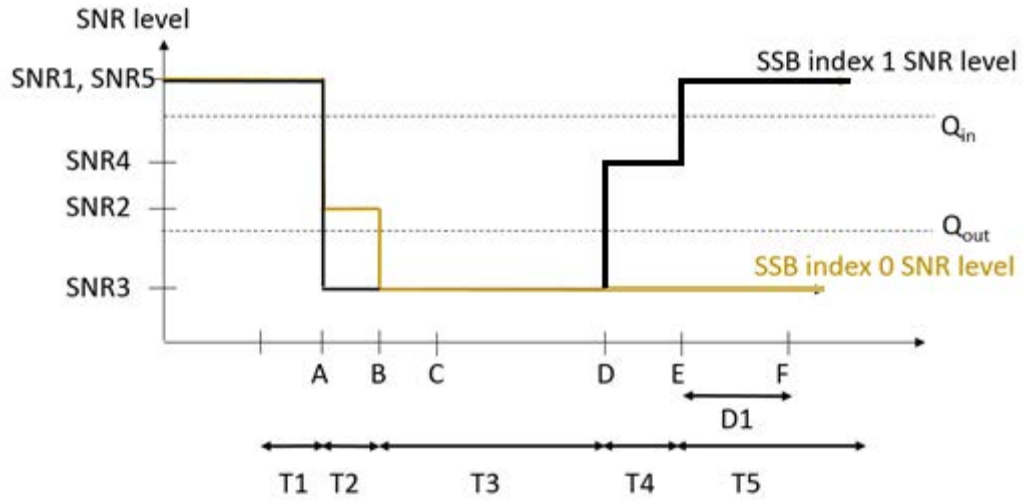



**Figure 7.5.1.2.4-1: SNR variation for in-sync testing**

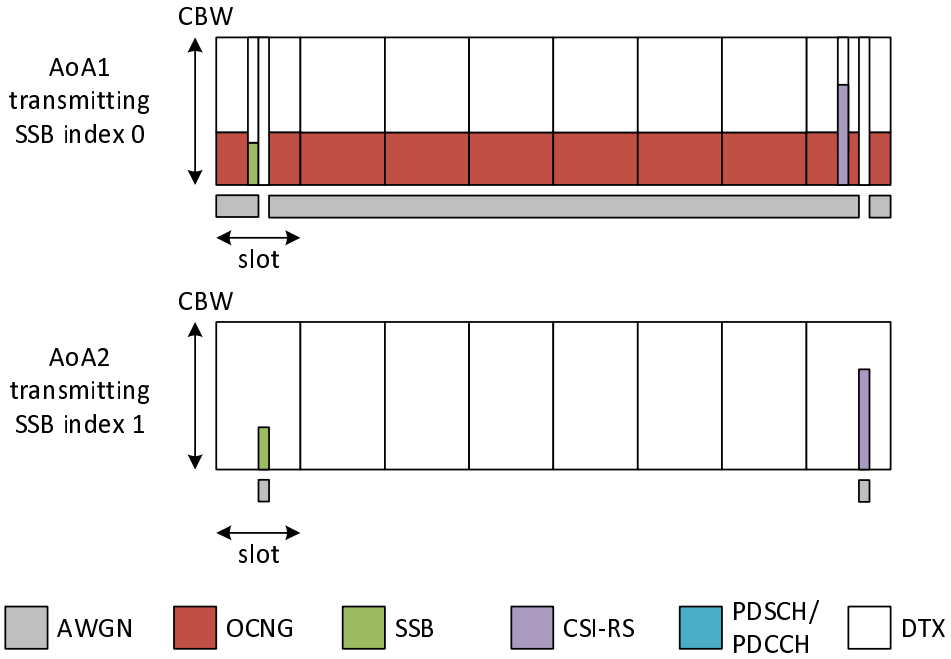



**Figure 7.5.1.2.4-2: Time multiplexed downlink transmissions**

### 7.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.2.4.1-1.

**Table 7.5.1.2.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 7.5.1.2-1 | TDD, SSB SCS 120 kHz, data SCS 120kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.2.4.1-2

**Table 7.5.1.2.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.2.4.1-3

2. Message contents are defined in clause 7.5.1.2.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.2.4.1-3: General test parameters for FR2 in-sync testing in non-DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 24 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.1 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 | | 0,1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD Note 3 |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |

| | | | |
|---|---|---|---|
| TCI states for PDCCH/PDSCH | | | TCI.State.2 |
| CSI-RS for tracking | Config 1 | | TRS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.88 |
| T4 | | s | 0.2 |
| T5 | | s | 3.84 |
| D1 | | s | 3.8 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations. | | | |

#### 7.5.1.2.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.2.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.2.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with Condition RLM<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.3 |

**Table 7.5.1.2.4.3-2: Void**

**Table 7.5.1.2.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms4000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 7.5.1.2.4.3-4: Void**

7.5.1.2.5 Test Requirement

Table 7.5.1.2.4.1-3 and 7.5.1.2.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 7.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** | **T1** | **T2** | **T3** | **T4** | **T5** |
| AoA setup | | | Setup 3 defined in A.9.3 | | | | | | | | | |
| | | | **AoA1** | | | | | **AoA2** | | | | |
| Assumption for UE beams Note 5 | | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1 Note 6 | -3.9 Note 6 | -15 | -15 | -15 | | | | | |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | | | 4.1 Note 6 | -15 | -15 | -4.5 | 4.1 Note 6 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -94.8 | | | | | -94.8 | | | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 7.5.1.2.4-2 | | | | | | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | | | | | |

| | |
|---|---|
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 4: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6. |
| Note 5: | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 6: | This value allows up to 1dB degradation from applied SNR to UE baseband |

### 7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 7.5.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

#### 7.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.3.

#### 7.5.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table 7.5.1.3.4.1-1. The test parameters are given in Tables 7.5.1.3.4.1-3 and 7.5.1.3.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

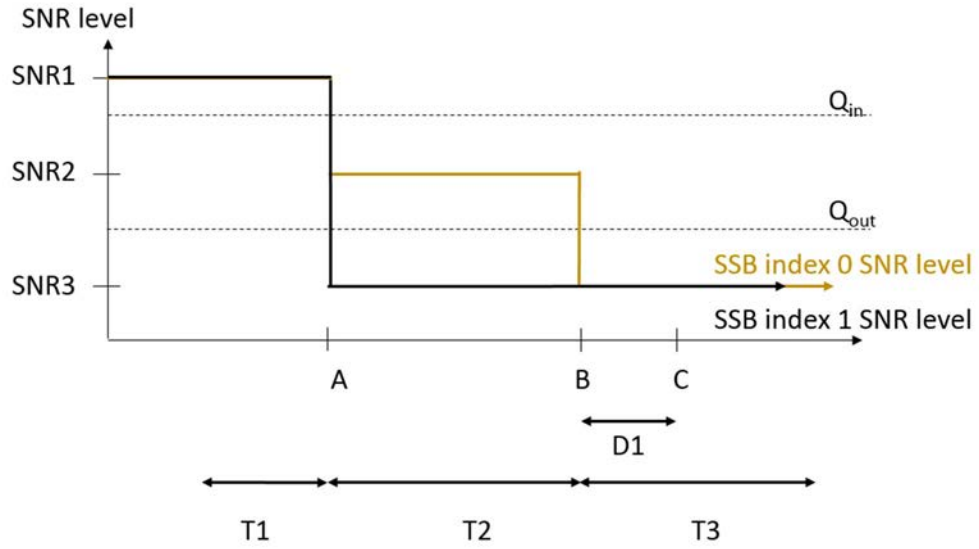



**Figure 7.5.1.3.4-1: SNR variation for out-of-sync testing**

### 7.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.3.4.1-1.

**Table 7.5.1.3.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 7.5.1.3-1 | TDD, SSB SCS 120 kHz, data SCS 120kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.3.4.1-2

**Table 7.5.1.3.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.3.4.1-3
2. Message contents are defined in clause 7.5.1.3.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.3.4.1-3: General test parameters for FR2 out-of-sync testing in DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 66 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 | | 0,1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 14.48 |
| T3 | | | s | 14.48 |
| D1 | | | s | 14.44 |

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

#### 7.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.3.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.3.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C ([240] ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.3.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.3.4.3-1: Void**

**Table 7.5.1.3.4.3-2: UE-TimersAndConstants**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

**Table 7.5.1.3.4.3-3: Void**

### 7.5.1.3.5 Test Requirement

Table 7.5.1.3.4.1-3 and 7.5.1.3.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| AoA setup | | | Setup 1 defined in A.9.1 | | |
| Assumption for UE beams Note 5 | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| ssb-Index 0 SNR | Config 1 | dB | 3.3 Note 6 | -4.7 Note 6 | -15.4 |
| ssb-Index 1 SNR | Config 1 | | 3.3 Note 6 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1 | dBm/15K Hz | -104.7dBm | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.

## 7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 7.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 7.5.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

#### 7.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.4.

#### 7.5.1.4.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables 7.5.1.4.4.1-3 and 7.5.1.4.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

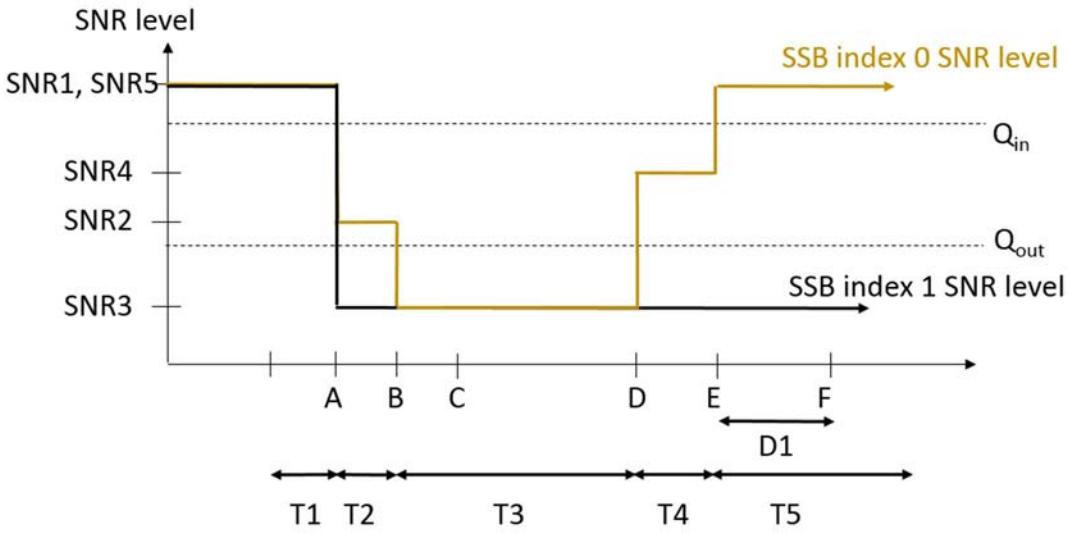



**Figure 7.5.1.4.4-1: SNR variation for in-sync testing**

#### 7.5.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.4.4.1-1.

**Table 7.5.1.4.4.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 7.5.1.4-1 | TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.4.4.1-2

**Table 7.5.1.4.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.4.4.1-3

2. Message contents are defined in clause 7.5.1.4.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.4.4.1-3: General test parameters for FR2 in-sync testing in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1 | | 66 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.3 |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 | | 0,1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.11 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 7.5.1.4.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.4.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.4.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.4.4.3-2: Void**

**Table 7.5.1.4.4.3-3: *RLF-TimersAndConstant***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms4000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

**Table 7.5.1.4.4.3-4: Void**

#### 7.5.1.4.5 Test Requirement

Table 7.5.1.4.4.1-3 and 7.5.1.4.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 7.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode**

| Parameter | Unit | Test 1 |
|---|---|---|

| | | | T1 | T2 | T3 | T4 | T5 |
|---|---|---|---|---|---|---|---|
| AoA setup | | | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 5 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 3.3Note 6 | -4.7Note 6 | -15.4 | -4.9 | 3.3Note 6 |
| ssb-Index 1 SNR | Config 1 | | 3.3Note 6 | -15.4 | -15.4 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -104.7dBm | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.

## 7.5.1.5 NR SA FR2 Radio Link Monitoring Out-of-sync Test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's Note: This test case is incomplete due to the following:

- Test Tolerances are available for the following configurations:
  - Test frequency f ≤ 40.8 GHz
  - UE PC3
  - The Test Tolerances are incomplete for UE power classes other than PC3
  - The Test Tolerances are incomplete for test frequencies > 40.8 GHz

### 7.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 7.5.1.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and CSI-RS based RLM.

### 7.5.1.5.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.3. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.5.

### 7.5.1.5.4 Test description

There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.5.4-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync states.

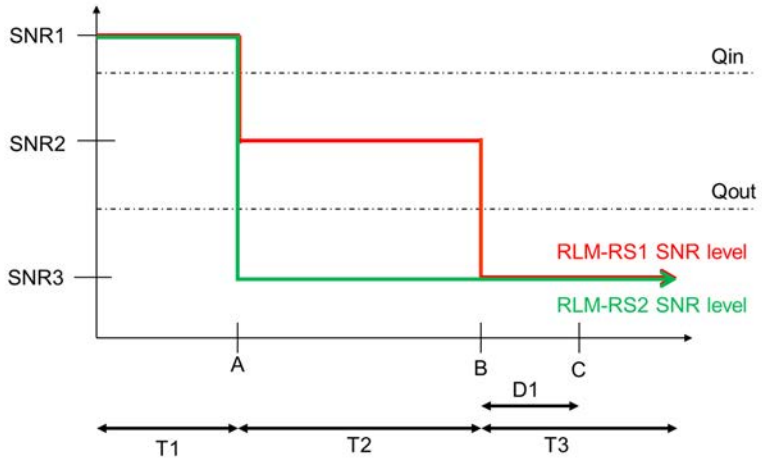



**Figure 7.5.1.5.4-1: SNR variation for NR SA FR2 Radio Link Monitoring Out-of-sync Test for PCell configured with CSI-RS-based RLM RS in non-DRX mode**

### 7.5.1.5.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.1.5.4.1-1.

**Table 7.5.1.5.4.1-1: Supported test configurations for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Configuration | Description |
|---|---|
| 7.5.1.5-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.5.4.1-2.

**Table 7.5.1.5.4.1-2: Initial conditions for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.5.4.1-3
2. Message contents are defined in clause 7.5.1.5.4.3.
3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.5.4.1-3: General test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1 | | 24 |
| $BW_{occupied}$ | Config 1 | | 24 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.4 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.4 TDD<br>CCR.3.6 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD Note 2 |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.35 |
| T3 | | s | 0.35 |
| D1 | | s | 0.31 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

| Note 2: | CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations. |
|---|---|

**Table 7.5.1.5.4.1-4: Measurement gap configuration for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| Note 1: RLM RS is partially overlapped with measurement gap | |

### 7.5.1.5.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 7.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.5.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.5.5-1. T3 starts.

7. If the SS:

   a) detects uplink power in each slot configured for CQI transmission (according to configured CQI reporting periodicity on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed to Step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.5.5-1.

9. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.1.5.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.5.4.3-1: Common Exception messages for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-6 with Condition RLM<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 and CSI-RS RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.5.4.3-2: *UE-TimersAndConstants* for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in non-DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

7.5.1.5.5 Test Requirement

Table 7.5.1.5.4.1-3 and 7.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for NR SA FR2 PCell configured with CSI-RS-based RLM RS in non-DRX mode.

**Table 7.5.1.5.5-1: Cell specific test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| AoA setup | | | Setup 3 defined in A.9.3 | | | | | |
| | | | **AoA1** | | | **AoA2** | | |
| Assumption for UE beams Note 10 | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR on RLM-RS1 | Config 1 | dB | 4.1 Note 11 | -3.9 Note 11 | -15 | | | |
| SNR on RLM-RS2 | Config 1 | dB | Not sent | | | 4.1 Note 11 | -15 | -15 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -94.8 | | | -94.8 | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.1.5.4.1-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6. |
| Note 10: | Information about types of UE beam is given in 38.133 [6] section B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 11: | This value allows up to 1dB degradation from applied SNR to UE baseband |

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ($D_1$ second after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 7.5.1.6 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

Editor's Note: This test case is incomplete due to the following:

- Procedure to ensure signal balancing in 2AoA setups is still FFS
- Signal levels and propagation conditions need further evaluation
- Test Tolerances are available for the following configurations:
  - Test frequency f ≤ 40.8 GHz
  - UE PC3
  - The Test Tolerances are incomplete for UE power classes other than PC3
  - The Test Tolerances are incomplete for test frequencies > 40.8 GHz

### 7.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 7.5.1.6.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and CSI-RS based RLM.

### 7.5.1.6.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.4. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.6.

#### 7.5.1.6.4 Test description

There is one cell, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.6.4-1 shows the variation of the downlink SNR in the PCell to emulate the in-sync states.

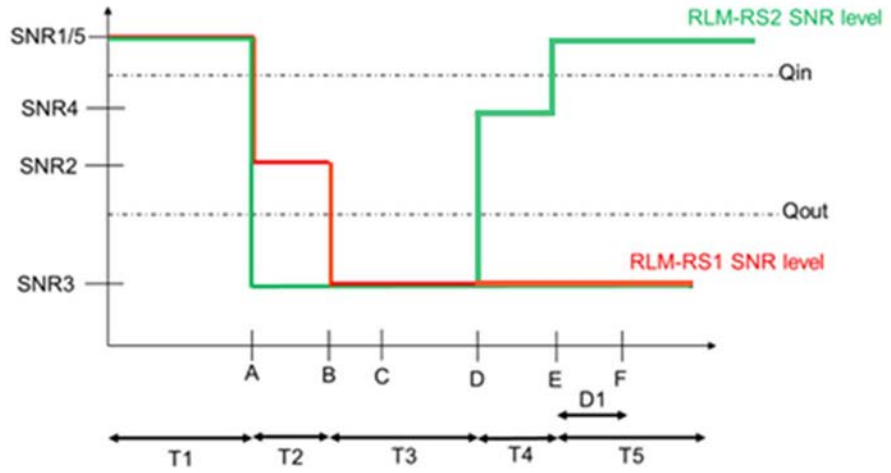



**Figure 7.5.1.6.4-1: SNR variation for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

#### 7.5.1.6.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.1.6.4.1-1.

**Table 7.5.1.6.4.1-1: Supported test configurations for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Configuration | Description |
|---|---|
| 7.5.1.6-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.6.4.1-2.

**Table 7.5.1.6.4.1-2: Initial conditions for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.6.4.1-3
2. Message contents are defined in clause 7.5.1.6.4.3.
3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.6.4.1-3: General test parameters for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | Config 1 | | 24 |
| $BW_{occupied}$ | Config 1 | | 24 |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.4 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |

| | | | |
|---|---|---|---|
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD Note 2 |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: CSI-RS.3.1 TDD uses 2 antenna ports, which implies the SS shall transmit signal on both polarizations. | | | |

#### 7.5.1.6.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled and SSB0 and SSB1 are configured as BFD-RS.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.6.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.6.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power in each slot configured for CQI transmission (according to configured CQI reporting periodicity on PUCCH) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

8. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.6.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.6.4.3-1: Common Exception messages for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 and CSI-RS RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.6.4.3-3: *RLF-TimersAndConstant* for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

7.5.1.6.5 Test Requirement

Table 7.5.1.6.4.1-3 and 7.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode.

**Table 7.5.1.6.5-1: Cell specific test parameters for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 3 defined in A.9.3 | | | | | | | | | |
| | | | AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | |
| SNR on RLM-RS1 | Config 1 | dB | 4.1 Note 11 | -3.9 Note 11 | -15 | -15 | -15 | | | | | |
| SNR on RLM-RS2 | Config 1 | dB | Not sent | | | | | 4.1 Note 11 | -15 | -15 | -4.5 Note 11 | 4.1 Note 11 |
| $N_{oc}$ | Config 1 | dBm/ 15 kHz | -94.8 | | | | | -94.8 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 7.5.1.6.4.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] clause A.3.6.
Note 10: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 7.5.1.7 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 7.5.1.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

### 7.5.1.7.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.7.

### 7.5.1.7.4 Test description

There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.7.4-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync states.

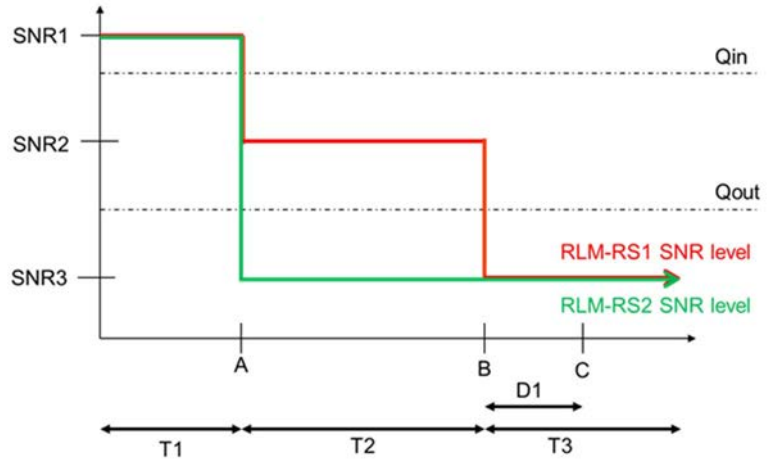



**Figure 7.5.1.7.4-1: SNR variation for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode**

#### 7.5.1.7.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.1.7.4.1-1.

**Table 7.5.1.7.4.1-1: Supported test configurations for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Configuration | Description |
|---|---|
| 7.5.1.7-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.7.4.1-2.

**Table 7.5.1.7.4.1-2: Initial conditions for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.7.4.1-3
2. Message contents are defined in clause 7.5.1.7.4.3.
3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.7.4.1-3: General test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.4 TDD<br>CCR.3.6 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |

| | | | |
|---|---|---|---|
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 7.5.1.7.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in the on duration part of every DRX cycle in the slots configured for CQI transmission (according to configured CQI reporting periodicity on PUCCH) during the period from time point A to time point B

and

   b) does not detect any uplink power from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed to Step 10.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

8. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.7.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.7.4.3-1: Common Exception messages for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 and CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.3.4.3-2: *UE-TimersAndConstants* for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-200 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 7.5.1.7.5 Test Requirement

Table 7.5.1.7.4.1-3 and 7.5.1.7.5-1 define the primary level settings including test tolerances for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM RS in DRX mode.

**Table 7.5.1.7.5-1: Cell specific test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| AoA setup | dB | Setup 1 defined in A.9.1 | | |
| Assumption for UE beams Note 10 | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PSS to SSS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS1 | Config 1 | dB | 3.3<br>Note 11 | -4.7<br>Note 11 | -15.4 |
| SNR on RLM-RS2 | Config 1 | dB | 3.3<br>Note 11 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -104.7 | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.1.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is clause 38.133 [6] clause A.3.6.
Note 10: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ($D_1$ seconds after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 7.5.1.8 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 7.5.1.8.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

#### 7.5.1.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.4. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.8.

#### 7.5.1.8.4 Test description

There is one cell, cell 1 which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.8.4-1 shows the variation of the downlink SNR in the PCell to emulate the in-sync states.

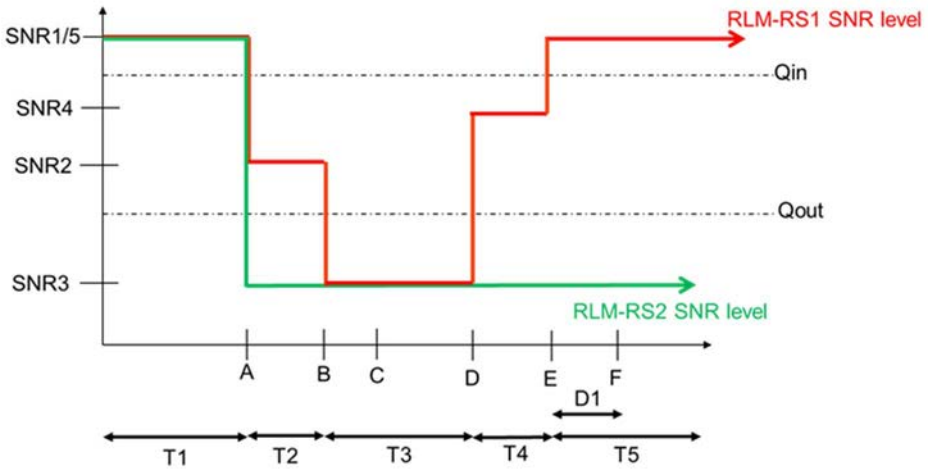



**Figure 7.5.1.8.4-1: SNR variation for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

##### 7.5.1.8.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.1.8.4.1-1.

**Table 7.5.1.8.4.1-1: Supported test configurations for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Configuration | Description |
|---|---|
| 7.5.1.8-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.8.4.1-2.

**Table 7.5.1.8.4.1-2: Initial conditions for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.8.4.1-3
2. Message contents are defined in clause 7.5.1.8.4.3.
3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.8.4.1-3: General test parameters for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | TDD |
| TDD Configuration | Config 1 | | TDDConf.3.1 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *2000* |

| | | | |
|---|---|---|---|
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| reportConfigType | | | periodic |
| reportQuantity | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.64 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table 7.5.1.8.4.1-4: Measurement gap configuration for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| Note 1: RLM RS is partially overlapped with measurement gap | |

### 7.5.1.8.4.2 Test Procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled and SSB0 and SSB1 are configured as BFD-RS.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 7.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.6.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.6.5-1. T3 starts.

7. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.6.5-1. T4 starts.

8. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.6.5-1. T5 starts.

9. If the SS detects uplink power in the On duration part of every DRX cycle in the slots configured for CQI transmission (according to configured CQI reporting periodicity on PUCCH) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.8.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.8.4.3-1: Common Exception messages for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-6 with Condition RLM<br>Table H.3.1-7<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 and CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3 and Gap<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.3 |

**Table 7.5.1.8.4.3-3: *RLF-TimersAndConstant* for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| n310 | n1 | | |
| n311 | n1 | | |
| t311-v1530 | ms1000 | | |
| } | | | |

7.5.1.8.5 Test Requirement

Table 7.5.1.8.4.1-3 and 7.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode.

**Table 7.5.1.8.5-1: Cell specific test parameters for NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | dB | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SNR on RLM-RS1 | Config 1 | dB | 3.3 Note 11 | -4.7 Note 11 | -15.4 | -4.9 Note 11 | 3.3 Note 11 |
| SNR on RLM-RS2 | Config 1 | dB | 3.3 Note 11 | -15.4 | -15.4 | -15.4 | -15.4 |
| $N_{oc}$ | Config 1 | dBm/15kHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 7.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] clause A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 7.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3

The test is incomplete for test frequencies > 40.8 GHz

### 7.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

### 7.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

### 7.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.9.

### 7.5.1.9.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

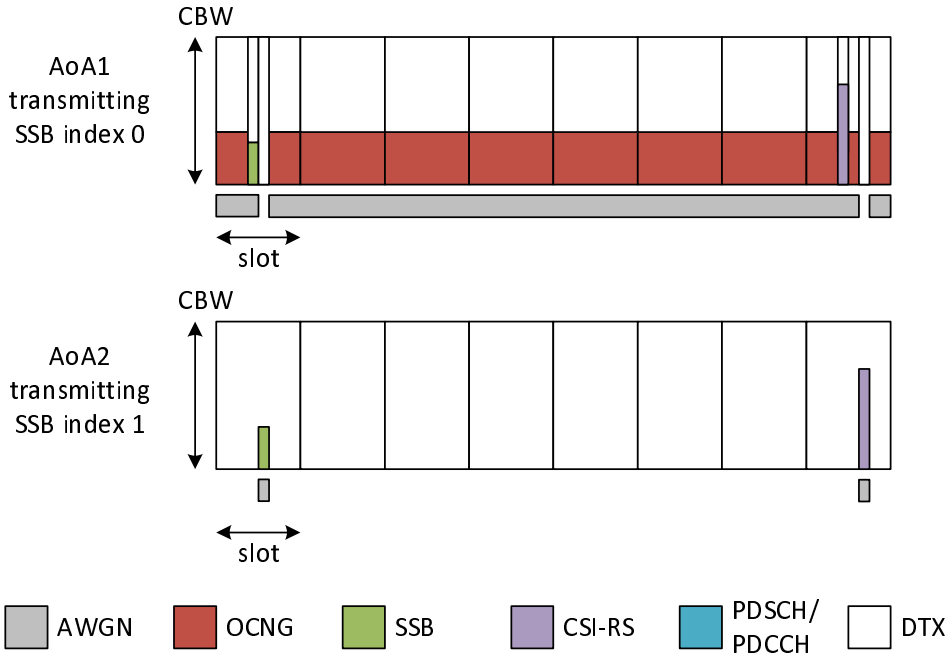



**Figure 7.5.1.9.4-1: Time multiplexed downlink transmissions**

### 7.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.1.9.4.1-1.

**Table 7.5.1.9.4.1-1: Supported test configurations for NR SA FR2 radio link monitoring UE scheduling restrictions**

| Configuration | Description |
|---|---|
| 7.5.1.9-1 | 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.9.4.1-2

**Table 7.5.1.9.4.1-2: Initial conditions for NR SA FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell are given in Table 7.5.1.9.4.1-3
2. Message contents are defined in clause 7.5.1.9.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.1.9.4.1-3: General test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | 1 | 1 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.3 | |
| DRX cycle length | s | 1 | OFF | |
| T1 | s | 1 | 5 | During T1 the UE is required to correctly transmit ACK/NACK |

### 7.5.1.9.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Set the parameters according to T1 in Table 7.5.1.9.4.4-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

2. The SS continuously schedules DL reception on the symbols #2-3 right before each SSB which is not covered by SMTC.

2. If the SS observes no ACK/NACK DTX on each UL transmission occasion scheduled during step 2 via PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. Otherwise, the number of failed tests is increased by one.

3. The UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

4. Repeat steps 1-3 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.1.9.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.9.4.3-1: Common Exception messages for NR SA FR2 radio link monitoring UE scheduling restrictions**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and set smtc1 as SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.3<br>Table H.3.1-8 with condition SSB RLM |

**Table 7.5.1.9.4.3-2: *SearchSpace***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 with condition USS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| monitoringSymbolsWithinSlot | 00100000000000 | Ensure that the UE monitors PDCCH | |

| | | | |
|---|---|---|---|
| | | on symbols right before SSB#0 (symbol #2 and #3) | |
| } | | | |

7.5.1.9.5 Test Requirement

Table 7.5.1.9.4.1-3 and 7.5.1.9.5-1 define the primary level settings including test tolerances for NR SA FR2 radio link monitoring UE scheduling restrictions.

**Table 7.5.1.9.5-1: Cell specific test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| AoA setup | | 1 | Setup 3 defined in A.9.3 | |
| | | | AoA1 | AoA2 |
| Assumption for UE beams Note 1 | | | Rough | Rough |
| TDD configuration | | 1 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | |
| PDSCH Reference measurement channel | | 1 | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.2 TDD | Not sent |
| TRS configuration | | 1 | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state | | 1 | TCI.State.2 | N/A |
| OCNG Pattern | | 1 | OP.5 | Not sent |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | |
| RLM-RS | | 1 | SSB with index 0 | SSB with index 1 |
| $N_{oc}$ | dBm/15kHz | 1 | -94.8 | -94.8 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -85.8 | -85.8 |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 4.1 | 4.1 |
| $\hat{E}_s / I_{ot}$ BB Note 4 | dB | 1 | 2.37 | 2.37 |
| SSB_RP Note3 | dBm/SCS | 1 | -81.7 | -81.7 |
| Io | dBm/95.04 MHz | 1 | -55.65 | -55.65 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in Figure 7.5.1.9.4-1 | |
| Propagation Condition | | 1 | AWGN | AWGN |

Note 1: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

The UE shall be continuously scheduled by PDCCH on the symbols right before each SSB which is not covered by SMTC during the entire length of T1. The UE shall transmit ACK/NACK for every scheduled PDCCH during the time duration T1.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 7.5.1.10 NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx

Editor's Note: This test case is incomplete in following aspects:

- MU and TT are missing
- Message contents may need to be updated
- Test procedure needs to be updated
- Applicability needs to be updated
- Annex E and F need to be updated
- Configuration of 3AoA setup and testability of the device is still FFS
- UE positioning procedure is still FFS

### 7.5.1.10.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements defined in clause 7.5.1.

### 7.5.1.10.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting [fast beam sweeping in multi-Rx].

### 7.5.1.10.3 Minimum conformance requirement

The minimum requirements are specified in clause 7.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.10.

### 7.5.1.10.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 7.5.1.10.4.1-1. The test parameters are given in Tables 7.5.1.10.5-1, and 7.5.1.10.5-2.

There is one cell (Cell 2), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.10.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.10.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and configured with *groupBasedBeamReporting-r17*. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms, in addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1.

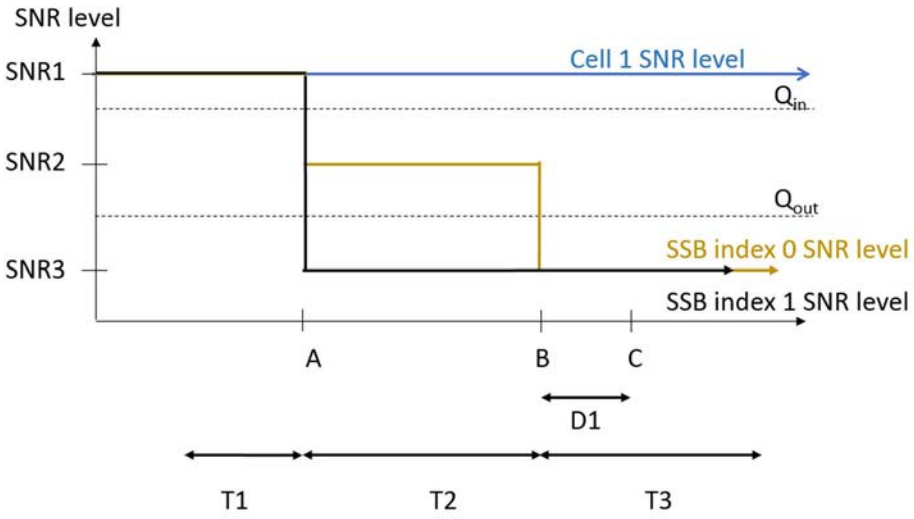



**Figure 7.5.1.10.4-1: SNR variation for out-of-sync testing**

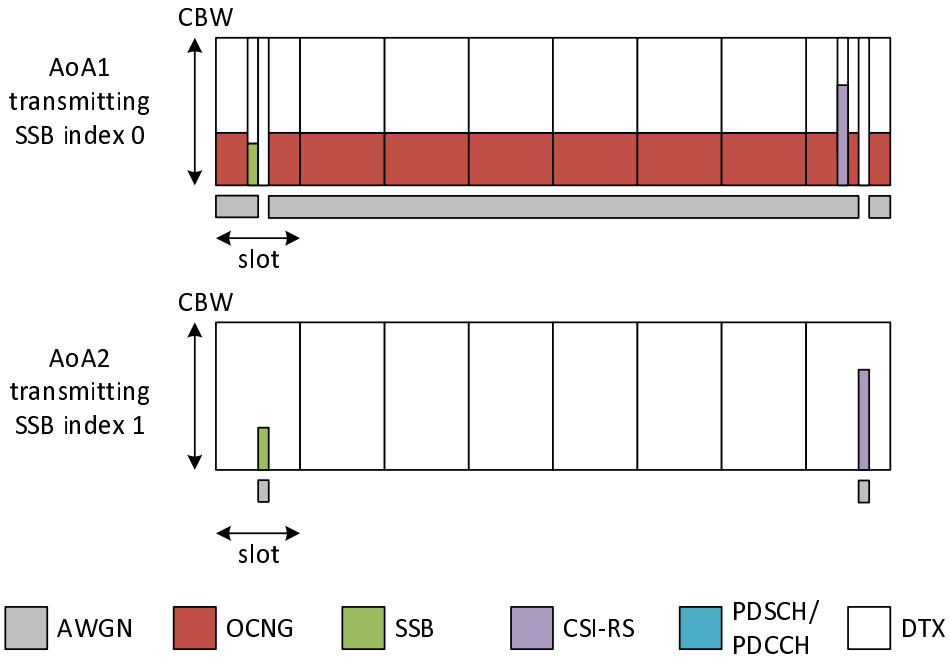



**Figure 7.5.1.10.4-2: Time multiplexed downlink transmissions**

### 7.5.1.10.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.10.4.1-1.

**Table 7.5.1.10.4.1-1: Supported Test Configurations for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Configuration | Description |
|---|---|
| 7.5.1.10-1 | TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.10.4.1-2

**Table 7.5.1.10.4.1-2: Initial conditions for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.1, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.1.10.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.5.1.10.4.3.

2. The power levels and settings for Cell 1 are set according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The test parameters are given in Tables 7.5.1.10.4.1-3, 7.5.1.10.5-1 and 7.5.1.10.5-2 below.

**Table 7.5.1.10.4.1-4: General test parameters for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{PRB,c}$ = 66 |
| Data PRBs allocated | | Config 1 | | 24 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM RS | | Config 1 | | 0,1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *NA* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| reportConfigType | | | | periodic |
| reportQuantity | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 1.2*N +0.08 Note 3 |
| T3 | | | s | 1.2*N +0.08 Note 3 |
| D1 | | | s | 1.2*N +0.04 Note 3 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: N is the value indicated by UE for *fastBeamSweepingMultiRx-r18*. | | | | |

### 7.5.1.10.4.2 Test Procedure

Before the start of T1, the UE shall be fully synchronized with Cell 1. The UE shall be configured for periodic CQI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 7.5.1.10.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity NR*, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. The SS shall transmit an *RRCReconfiguration* message configuring the UE with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, *purpose* set to '*rlf*', and *groupBasedBeamReporting-r17,* as specified in section 7.5.1.10.4.3.

3. The UE shall transmit *RRCReconfigurationComplete* message.

4. Set the parameters according to T1 in Table 7.5.1.10.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.10.5-1. T2 starts.

6.When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.10.5-1. T3 starts.

7. If the SS:
   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH format 2) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C (D1 seconds after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

8. Otherwise, the number of failed tests is increased by one and proceed with Step 10.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.10.5-1.

10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PCell is released, the UE shall be switched off and then on.

11. Repeat steps 1-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.1.10.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.1.10.4.3-1: Common Exception messages for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range)<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-6 with Condition RLM<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition FR2 SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.1.10.4.3-2: RLF-TimersAndConstants for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 7.5.1.10.4 Test Requirement

Tables 7.5.1.10.5-1 and 7.5.1.10.5-2 define the cell specific primary level settings for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx.

**Table 7.5.1.10.5-1: OTA related cell specific test parameters for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | | Setup 5 defined in A.9 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 2+TT Note 6 | -6+TT Note 6 | -15+TT | | | |

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | 2+TT Note 6 | -15+TT | -15+TT |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -92.1+TT | | | -92.1+TT | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 7.5.1.10.4-2 | | | | | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | | | TDL-A 30 ns 75 Hz | | |

NOTE 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is D.4.1.1.
NOTE 5: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
NOTE 6: This value allows up to 1 dB degradation from applied SNR to UE baseband

**Table 7.5.1.10.5-2: Measurement gap configuration for NR SA FR2 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode for UE supporting fast beam sweeping in multi-Rx**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

## 7.5.2 Interruption

### 7.5.2.0 Minimum conformance requirements

#### 7.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 7.5.2.0.1-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 7.5.2.0.1-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 if the active SCell is in the same band as the deactivated SCell.

[TS38.133, clause 8.2.2.2.2]

**Table 7.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | |
|---|---|---|---|
| 0 | 1 | | 1 |
| 1 | 0.5 | | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 |
| | | Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 |
| | | Aggressor cell is on FR1 | 5 |
| 5 | 0.03125 | Aggressor cell is on FR1 | 17 |
| 6 | 0.015625 | Aggressor cell is on FR1 | 33 |

**Table 7.5.2.0.1-2: Interruption duration for SCell activation/deactivation for intra-band CA**

| $\mu$ | NR Slot length (ms) | Interruption length (slots) |
|---|---|---|
| 0 | 1 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 1 | 0.5 | 1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 2 | 0.25 | 2 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 3 | 0.125 | 4 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 5 | 0.03125 | 16+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| 6 | 0.015625 | 32+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$ |
| NOTE 1: $T_{SMTC_duration}$ measured in subframes is<br>- the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and $T_{SMTC\ duration}$ for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If neither SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, $T_{SMTC\ duration}$ for the SCell being activated is 0ms;<br>- the longest SMTC duration among all active servingNOTE 2: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

### 7.5.2.0.2 Minimum conformance requirements for SA interruptions at NR SRS carrier-based switching

[TS 38.133, Clause 8.2.2.2.9]

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;

- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;

- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS 38.331 [13];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [9].

- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD.

- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [13], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101-1 [2] for frequency range 1 and TS 38.101-2 [3] for frequency range 2, the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of per-FR gap, or on active serving cell(s) in FR1 if UE is capable of per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 7.5.2.0.2-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of per-FR gap, or on active serving cell(s) in FR2 if UE is capable of per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 7.5.2.0.2-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of per-FR gap, or on active serving cell(s) in FR1 if UE is capable of per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 7.5.2.0.2-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 7.5.2.0.2-2.

**Table 7.5.2.0.2-1: Interruption length X1 (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for aggressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| 2 | 0.25 | ≤ 200 | 4 | 3 |
| | | 300, 500 | 5 | 4 |
| | | 900 | 7 | 6 |
| 3 | 0.125 | ≤ 200 | 7 | 5 |
| | | 300, 500 | 9 | 7 |
| | | 900 | 12 | 10 |
| 5 | 0.03125 | ≤ 200 | 22 | 15 |
| | | 300, 500 | 31 | 24 |
| | | 900 | 44 | 37 |
| 6 | 0.015625 | ≤ 200 | 42 | 28 |

| | | | | |
|---|---|---|---|---|
| | | 300, 500 | 61 | 47 |
| | | 900 | 87 | 73 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

**Table 7.5.2.0.2-2: Interruption length X2 (slot)**

| $\mu$ | length (ms) of victim cell | switching time (us) Note 1 | Sub carrier spacing for aggressor cell (kHz) | | | |
|---|---|---|---|---|---|---|
| | | | 60 | 120 | 480 | 960 |
| 0 | 1 | ≤ 200 | 2 | 2 | 2 | 2 |
| 1 | 0.5 | ≤ 200 | 2 | 2 | 2 | 2 |
| 2 | 0.25 | ≤ 200 | 3 | 3 | 2 | 2 |
| 3 | 0.125 | ≤ 200 | 4 | 4 | 3 | 3 |
| 5 | 0.03125 | ≤ 200 | 11 | 10 | 8 | 8 |
| 6 | 0.015625 | ≤ 200 | 21 | 18 | 15 | 15 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | | | |

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 7.5.2.0.2-1 and in Table 7.5.2.0.2-2 based on SRS carrier switching time ≤ 200μs shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 7.5.2.0.2-1 and in Table 7.5.2.0.2-2 shall apply.

## 7.5.2.1 NR SA FR2 interruptions during measurements on deactivated NR SCC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 7.5.2.0. Supported test configurations are shown in table 7.5.2.1.4.1-1.

### 7.5.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SA FR2 and 2DL CA.

### 7.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.2.1.

### 7.5.2.1.4 Test description

#### 7.5.2.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.2.1.4.1-1.

**Table 7.5.2.1.4.1-1: Supported test configurations for NR SA FR2 interruptions during measurements on deactivated NR SCC**

| Configuration | Description |
|---|---|
| 7.5.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.2.1.4.1-2.

**Table 7.5.2.1.4.1-2: Initial conditions for NR SA FR2 interruptions during measurements on deactivated NR SCC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.2.1.4.1-3.
2. Message contents are defined in clause 7.5.2.1.4.3.
3. There are two NR cells specified in the test. Cell 1 is the PCell on one NR carrier and Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be initially configured according to annex C.

**Table 7.5.2.1.4.1-3: General test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two NR RF channels |
| Active PCell | | Cell1 | PCell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell2 | Deactivated SCell on NR RF channel number 2. |
| CP length | | Normal | Applicable to Cell1 and Cell2 |
| DRX | | OFF | |
| Measurement gap pattern ID | | OFF | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | |
| T1 | s | 10 | |

### 7.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is NR PCell and Cell2 is the deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1 the UE shall be continuously scheduled on the NR PCell DL.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.5.2.1.4.3.
2. Set the parameters according to values in Table 7.5.2.1.4.1-3 as appropriate. Propagation conditions are set according to clause C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2. Propagation conditions are set according to clause C.2.2.
6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no longer than X consecutive DTXs are observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX", where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. After the RRC connection release, the SS shall:

   9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE, and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b.

   or

   9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 7.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Specific message contents exceptions for Test Configuration 7.5.2.1-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2 |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1;<br><br>Table H.3.1-2 with Condition Deactivated SCell;<br><br>Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1;<br><br>Table H.3.1-4 with A3-offset = -6dB;<br><br>Table H.3.1-7 with Condition Deactivated SCell; |

#### 7.5.2.1.5 Test requirement

Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC.

**Table 7.5.2.1.5-1: NR cell specific test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC**

| Parameter | | Unit | Cell1 | Cell2 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | 66 | |
| Initial DL BWP Configuration | | | DLBWP.0.2[Note4] | |

| | | | | |
|---|---|---|---|---|
| Initial UL BWP Configuration | | | ULBWP.0.2 Note6 | |
| Downlink dedicated BWP Configuration | | | DLBWP.1.1 | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | |
| RMSI CORESET parameters | | | CR.3.1 TDD | |
| Dedicated CORESET parameters | | | CCR.3.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | |
| SSB Configuration | | | SSB.1 FR2 | |
| TCI State | | | TCI.State.0 | |
| TRS Configuration | | | TRS.2.1 TDD | |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Time offset to Cell1 Note 3 | | µs | - | 3 |
| Propagation Condition | | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [8].

**Table 7.5.2.1.5-2: NR cell specific OTA related test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Angle of arrival configuration | | | Setup1 according to table A.9 | Setup 1according to table A.9 |
| Assumption for UE beams Note 6 | | | Rough | Rough |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -104.7 | -104.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -95.7 | -95.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |

| | | | | |
|---|---|---|---|---|
| SSB_RP[Note2] | NR_TDD_FR2_A | dBm/120kHz Note3 | -88.7 | -88.7 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 7 | 7 |
| $\hat{E}_s/I_{ot}$ | | dB | 7 | 7 |
| Io[Note2] | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -58.92 | -58.92 |
| | NR_TDD_FR2_B | | | |
| | NR_TDD_FR2_F | | | |
| | NR_TDD_FR2_G | | | |
| | NR_TDD_FR2_T | | | |
| | NR_TDD_FR2_Y | | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-3.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-4.

**Table 7.5.2.1.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 4 |

**Table 7.5.2.1.5-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

| $\mu$ | NR Slot length (ms) | Interruption length (slot) |
|---|---|---|
| 3 | 0.125 | 8 + SMTC duration |

The rate of correct events observed during repeated tests shall be at least 90%.

### 7.5.2.2 SA interruptions at NR SRS carrier-based switching

Editor's Note: This test case is incomplete in following aspects:

- Test procedure is missing

- Message contents are missing
- TT analysis is missing

#### 7.5.2.2.1 Test purpose

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform SRS carrier-based switching to a carrier not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission. The test will partly verify the interruption requirements on PCell in clause 8.2.2.2.9 in TS 38.133 [6].

#### 7.5.2.2.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward with supporting of *srs-CarrierSwitch*.

#### 7.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.2.2.

#### 7.5.2.2.4 Test description

The test scenario comprises of two cells, Cell 1 and Cell 2. Cell 1 is the FR2 PCell. Cell 2 is an activated FR2 SCell on the TDD SCC which operates in downlink without PUCCH/PUSCH. The UE is configured with the SRS switching between PCell and SCell.

The test consists of two successive time periods, with duration of T1 and T2, respectively. Immediately at the beginning of T2, the UE is triggered for SRS switching by DCI 2_3 scheduling. After T2, the UE is expected to transmit aperiodic SRS on a special slot in the configured TDD UL/DL configuration, as scheduled by DCI 2_3. The UE shall be scheduled on PCell continuously throughout the test.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell.

##### 7.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.2.2.4.1-1.

**Table 7.5.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.2.2.4.1-2.

**Table 7.5.2.2.4.1-2: Initial conditions for FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.2.2.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.2.2.5-1.
2. Message contents are defined in clause 7.5.2.2.4.3.

3. There are two NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.5.2.2.4.1-3: General test parameters for SA interruptions at NR SRS carrier-based switching**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1 |
| Configured SCell | | Cell 2 | Activated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of PCell |
| T1 | s | 5 | |
| T2 | ms | 100 | UE shall perform SRS switching during T2 |

### 7.5.2.2.4.2 Test procedure

TBD

### 7.5.2.2.4.3 Message contents

TBD

### 7.5.2.2.5 Test requirement

Table 7.5.2.2.5-1 defines the NR cell specific test parameters. Table 7.5.2.2.5-2 defines OTA related test parameters, not including test tolerances yet [will update after TT analysis].

**7.5.2.2.5-1: Cell-specific test parameters for SA interruptions at NR SRS carrier-based switching**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | |
| Duplex mode | Config 1 | | TDD | |
| TDD configuration | Config 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP Configuration | Config 1 | | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | Config 1 | | DLBWP.1.1 | |
| Uplink initial BWP configuration | Config 1 | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | Config 1 | | ULBWP.1.1 | |
| SRS configuration | Config 1 | | SRS.6 TDD | |
| TRS configuration | Config 1 | | TRS.2.1 TDD | |
| TCI state | Config 1 | | TCI.State.0 | |
| PDSCH Reference measurement channel | Config 1 | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | |
| RMC CORESET Reference Channel | Config 1 | | CCR.3.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SSB Configuration | | | SSB.1 FR2 | |
| SMTC Configuration | Config 1 | | SMTC.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | |

| | | |
|---|---|---|
| Propagation Condition | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.2.2.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | |
|---|---|---|---|
| | | T1 | T2 |
| Angle of arrival configuration | | Setup 1 according to clause A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note 1 | dBm/15kHz Note 4 | -112 + TT | |
| $N_{oc}$ Note 1 | dBm/SCS Note 3 | -103 + TT | |
| $\hat{E}_s / N_{oc}$ | dB | 4 + TT | |
| SS-RSRP Note 2 | dBm/SCS Note 4 | -99 + TT | |
| $\hat{E}_s / I_{ot}$ | dB | 4 + TT | |
| Io Note2 | dBm/95.04 MHz Note 4 | -68.5 + TT | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.<br>NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.<br>NOTE 6: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation. | | | |

During T2, interruption on PCell due to SRS carrier-based switching between Cell 1 and Cell 2 shall not exceed the required values specified in clause 7.5.2.0.2.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.3 SCell activation and deactivation delay

### 7.5.3.0 Minimum conformance requirements

#### 7.5.3.0.1 Minimum conformance requirements for SCell activation delay for deactivated SCell

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot $n + \frac{T_{HARQ} + T_{activation_time} + T_{CSI_Reporting}}{NR\ slot\ length}$, where:

$T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

$T_{activation_time}$ is the SCell activation delay in milliseconds.

If the SCell is known and belongs to FR1, $T_{activation_time}$ is:

- $T_{FirstSSB}$+ 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.
- $T_{FirstSSB_MAX}$ + $T_{rs}$ + 5ms, if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition $\hat{E}s/Iot \geq -2$ dB is fulfilled, $T_{activation_time}$ is:

- $T_{FirstSSB_MAX} + T_{SMTC_MAX} + 2*T_{rs} + 5ms$.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then $T_{activation_time}$ is $T_{FirstSSB}$+ 5ms provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3,
- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, $T_{activation_time}$ is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- 3ms + max($T_{uncertainty_MAC} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- max ($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC} + T_{RRC_delay}$-$T_{HARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$).

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)}.

Where,

$T_{SMTC_MAX}$:

- In FR1, in case of intra-band SCell activation, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated.
- In FR2, $T_{SMTC_MAX}$ is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.
- $T_{SMTC_MAX}$ is bounded to a minimum value of 10ms.

$T_{rs}$ is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves $T_{rs}$ is applied with $T_{rs}$ = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

$T_{FirstSSB}$: is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$

$T_{FirstSSB_MAX}$: Is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

$T_{L1\text{-}RSRP,\ measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms) or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

$T_{L1\text{-}RSRP,\ report}$ is delay of acquiring CSI reporting resources.

$T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

Longer dekays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max (5*measCycleSCell, 5*DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.
- the SSB measured during the period equal to max (5*measCycleSCell, 5*DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, $T_{SMTC_Scell}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. $T_{SMTC_MAX}$ follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3+T_{SMTC_MAX}+T_{SMTC_duration}}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3+T_{SMTC_MAX}+T_{SMTC_duration}}{NR\ slot\ length}$.

Starting from the slot specified in TS 38.213 [8] clause 4.3 (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in TS 38.213 [8] clause 4.3 (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

#### 7.5.3.0.2 Minimum conformance requirements for SCell deactivation delay for activated SCell

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.3.

### 7.5.3.1 NR SA FR2-FR2 intra-band SCell activation and deactivation delay

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete.

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

#### 7.5.3.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are in FR2 intra-band and SCell is known by the UE at the time of activation.

#### 7.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

#### 7.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.1.

#### 7.5.3.1.4 Test description

##### 7.5.3.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.1.4.1-1.

**Table 7.5.3.1.4.1-1: Supported test configurations for NR SA FR2 SCell activation case**

| Configuration | Description |
|---|---|
| 7.5.3.1-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.1.4.1-2.

**Table 7.5.3.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.3.1.4.1-3.

2. Message contents are defined in clause 7.5.3.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.3.1.4.1-3: General test parameters for NR SA FR2 SCell activation case**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively. |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | 0 | |
| Time alignment error between cell2 and cell1 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | slot | k | k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |

#### 7.5.3.1.4.2 Test procedure

TBD

#### 7.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

#### 7.5.3.1.5 Test requirement

TBD

### 7.5.3.2 NR SA FR1-FR2 inter-band SCell activation and deactivation delay

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram
- Message contents are not complete.
- TT analysis is missing.
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E
- NR FR1 - FR2 OTA testability is still FFS.

#### 7.5.3.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell is in FR1 and SCell is in FR2 and SCell is known by the UE at the time of activation.

#### 7.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

#### 7.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.2.

#### 7.5.3.2.4 Test description

##### 7.5.3.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.2.4.1-1.

**Table 7.5.3.2.4.1-1: Supported test configurations for NR SA FR2 SCell activation case**

| Configuration | Description |
|---|---|
| 7.5.3.2-1 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.3.2-2 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.3.2-3 | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.2.4.1-2.

**Table 7.5.3.2.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.3.2.4.1-3.

2. Message contents are defined in clause 7.5.3.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.3.2.4.1-3: General test parameters for NR SA FR2 SCell activation case**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | 0 | |
| Time alignment error between cell2 and cell1 | µs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 2 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | slot | k | k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]. |

### 7.5.3.2.4.2 Test procedure

TBD

### 7.5.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.3.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

### 7.5.3.2.5 Test requirement

TBD

## 7.5.3.3 SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.5.3.3.1 Test purpose

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are in FR2 inter-band and SCell in FR2 is known by the UE at the time of activation.

### 7.5.3.3.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting 5GS NR SA FR2 and 2DL CA.

### 7.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.3.

### 7.5.3.3.4 Test description

#### 7.5.3.3.4.1 Initial conditions

The supported test configurations are shown in table 7.5.3.3.4.1-1. The general test parameters are described in Tables 7.5.3.3.4.1-3, and cell specific test parameters are described in Tables 7.5.3.3.4.1-4. OTA related test parameters are shown in table 7.5.3.3.4.1-5.

**Table 7.5.3.3.4.1-1: Supported test configurations for FR2 SCell activation in FR2 inter-band**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.3.4.1-2.

**Table 7.5.3.3.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.3 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.3.3.4.1-3.
2. Message contents are defined in clause 7.5.3.3.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.3.3.4.1-3: General test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channels are used for this test. RF channel number 1 is in band 1 and RF channel number 2 is in band 2, where bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2. |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every second subframe |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | ≤8 | A random value from 0µs to 8µs |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 2 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |

### 7.5.3.3.4.2 Test procedure

The test consists of three successive time periods, with duration T1, T2 and T3 respectively. Before the test starts the UE is connected to Cell 1 but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of Cell 2 is increased to same level as for cell 2. During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot $m+T_{L1\text{-}RSRP}$. In the next DL slot after slot $m+T_{L1\text{-}RSRP}$, the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.5.3.3.4.1-3 and 7.5.3.3.4.1-4. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

4. The UE sends a *MeasurementReport* message.

5. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

6. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 7, otherwise go to step 10.

7. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the UE starts sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+$T_{L1\text{-}RSRP}$), where $T_{L1\text{-}RSRP}$ is no larger than

   3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ as defined in TS 38.133 [6] clause 8.3.2.

   For this test case, $T_{FirstSSB_MAX}$=$T_{SMTC_MAX}$=$T_{rs}$=20ms; $T_{L1\text{-}RSRP,\ measure}$=480ms and $T_{L1\text{-}RSRP,\ report}$=5ms, which allows $T_{L1\text{-}RSRP}$ 1000 ms.

   - and CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where $T_{HARQ}$ is defined in Table A.5.5.3.1.1-2

   $T_{activation_time}$ = 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)}, which allows 1030 ms

   $T_{CSI_Reporting}$ = 10ms

   NR slot length is 0.125ms for this test case.

   - and the interruption of PCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{NR slot length}}$, where $T_X$ =20ms.

   - Then the number of successes for the event “Activation” is increased by one. Otherwise, count a fail for the event “Activation” and go to step 10.

8. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T3 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 9, otherwise go to step 10.

9. The UE shall stop sending CSI reports for SCell no later than slot n + $\frac{T_{HARQ}+3\text{ms}}{NR\ slot\ length}$, as defined in clause 8.3 and the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot n + 1 + $\frac{T_{HARQ}}{NR\ slot\ length}$ to n + 1 + $\frac{T_{HARQ}+3\text{ms}}{NR\ slot\ length}$ as defined in clause 8.3. If both conditions are met, then the number of successes for the event “Deactivation” is increased by one. Otherwise, count a fail for the event “Deactivation”.

10. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 7, or Deactivation in step 8 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

12. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
    or
    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat steps 2-12 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 7.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 7.5.3.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell;<br>Table H.3.1-1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.3.3.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.5.3.3.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 7.5.3.3.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.3.4.3-2A: MeasConfig (Table 7.5.3.3.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 7.5.3.3.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.5.3.3.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 7.5.3.3.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 7.5.3.3.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.3.4.3-5: CellGroupConfig-SCell (Table 7.5.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.3.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.3.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.3.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.3.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 7.5.3.3.4.3-7: ServingCellConfig-SCell (Table 7.5.3.3.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 7.5.3.3.5 Test requirement

During T2 the UE shall start sending CSI report for the SCell in the configured slots for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE shall send the first CSI report for SCell after receiving at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k), or in the next available uplink resource for CSI reporting if the slot was subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2, the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+$T_{L1\text{-}RSRP}$), where $T_{L1\text{-}RSRP}$ is no larger than 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ as defined in clause 8.3.2. For this test case, $T_{FirstSSB_MAX}$=$T_{SMTC_MAX}$=$T_{rs}$=20ms; $T_{L1\text{-}RSRP,\ measure}$=480ms and $T_{L1\text{-}RSRP,\ report}$=5ms, which allows $T_{L1\text{-}RSRP}$ =1000ms.

During T2, the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where

- $T_{HARQ}$ is defined in Table A.7.5.3.3.1-2 of TS 38.133 [6]
- $T_{activation_time}$ = 3ms + $T_{FirstSSB_MAX}$ + 15*$T_{SMTC_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ}$ + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + $T_{RRC_delay}$)}, which allows 1030ms
- $T_{CSI_Reporting}$ = 10ms
- NR slot length is 0.125ms for this test case.

During T2, the interruption of PCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{NR slot length}}$, where $T_X$ =20ms.

During T3, the UE shall stop sending CSI reports for SCell no later than slot n + $\frac{T_{HARQ}+3\text{ms}}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

During T3, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot n + 1 + $\frac{T_{HARQ}}{NR\ slot\ length}$ to n + 1 + $\frac{T_{HARQ}+3\text{ms}}{NR\ slot\ length}$ as defined in clause 8.3.

**Table 7.5.3.3.5-1: Cell specific test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter[Note 5] | Unit | T1 | | T2 | | T3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | | TDD | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| Downlink initial BWP Configuration | | DLBWP.0.1 | | DLBWP.0.1 | | DLBWP.0.1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Downlink dedicated BWP Configuration | | DLBWP.1.1 | | DLBWP.1.1 | | DLBWP.1.1 | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | ULBWP.1.1 | | ULBWP.1.1 | |
| TRS configuration | | TRS.2.1 TDD | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state | | TCI.State.0 | | TCI.State.0 | | TCI.State.0 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Parameters | | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Parameters | | CCR.3.1 TDD | - | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| CSI-RS configuration | | NA | NA | NA | CSI-RS.3.1 TDD Note 2 | NA | CSI-RS.3.1 TDD |
| CSI reporting periodicity Note 3 | | NA | 5 | NA | 5 | NA | 5 |
| OCNG Patterns | | OP.1 | | | | | |
| SSB Configuration | | SSB.1 FR2 | | | | | |
| SMTC Configuration | | SMTC.1 | | | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| Propagation conditions | | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot m+$T_{L1\text{-}RSRP}$ during T2.
Note 3: L1-RSRP measurement and reporting are configured to the UE prior to the start of time period T1.

**Table 7.5.3.3.5-2: OTA related test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter Note 6 | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 as specified in clause A.9.3 | | | | | |
| | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 7 | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -97.41 | | | -97.41 | | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -87.04 | | | -87.04 | | |
| $\hat{E}_s / N_{oc}$ | dB | 1.34 | | | 1.34 | | |
| SS-RSRP Note2 | dBm/SCS Note4 | -87.04 | | | -87.04 | | |
| $\hat{E}_s / I_{ot}$ | dB | 1.34 | | | 1.34 | | |
| Io Note2 | dBm/95.04 MHz Note4 | -55.66 | | | -55.66 | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1
Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

## 7.5.3.4 NR SA FR2 direct SCell activation at SCell addition of known SCell

### 7.5.3.4.1 Test Purpose

The purpose of this test is to verify that the delay and interruption for direct SCell activation delay at SCell addition are within the requirements stated in TS 38.133 [6] clause 8.3.4.

### 7.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

### 7.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.4.

### 7.5.3.4.4 Test description

#### 7.5.3.4.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.4.4.1-1.

**Table 7.5.3.4.4.1-1: Supported test configurations for NR SA FR2 SCell activation case**

| Configuration | Description |
|---|---|
| 7.5.3.4-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.4.4.1-2 and Table 7.5.3.4.4.1-3.

**Table 7.5.3.4.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 7.5.3.4.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channels (1,2) in FR2 are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured and activated SCell | | Cell 2 | Configured and activated SCell on NR RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| T1 | s | 7 | During this time the measurement for Cell 2 is configured, and Cell 2 is detected. |
| T2 | s | Ndirect | During this time the UE shall configure and activate Cell 2 as SCell. |
| T3 | ms | 100 | During this time the UE shall report valid CQI for both PCell and SCell. |

| | | | |
|---|---|---|---|
| A3-Offset | dB | -15 | |
| $T_{HARQ}$ | ms | $k_1$*NR slot length | k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8] |
| k | ms | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$ | As specified in clause 4.3 of TS38.213 [8] |

1.The general test parameter settings are set up according to Table 7.5.3.4.4.1-3.

2. Message contents are defined in clause 7.5.3.4.4.3.

3. There are 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

### 7.5.3.4.4.2 Test Procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two FR2 carriers and two NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on carrier #1, but is not aware of Cell 2 on NR carrier #2. Cell 1 and Cell 2 have constant signal levels throughout the test. The UE is monitoring the PCell. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the Cell 2 is monitored by the UE. During T1, Cell 2 should be detected and measured by the UE such that it meets the condition for known cell defined in TS 38.133 [6] clause 8.3.4 for direct SCell activation.

Time period T2 starts when the *RRCReconfiguration* message for the configuration and activation of Cell 2 (the SCell), which is sent from the test equipment, is received at the UE antenna connector in a slot # denoted m. The test equipment shall set the parameter *sCellState* to *activated* for the SCell, which causes Cell 2 to become configured and activated.

Time period T3 starts at ($m + N_{direct}$), at which point UE shall be reporting a valid CQI for both PCell and SCell.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during the activation of SCell. The test equipment verifies the activation time by counting the slots from the time when the SCell activation message is sent until a CQI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.5.3.4.4.1-3 and 7.5.3.4.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

   3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 2, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state as defined in message contents table 7.5.3.4.4.3-5.

6. The UE shall start reporting CSI in PSCell in slot ($m+k+T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.4. UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $m + 1 + \frac{T_{HARQ}+T_1+\text{TRRC_process}+\text{T_(CSI_Reporting)}}{NR\ slot\ length}$,

- or slot $m + 1 + \frac{T_{HARQ} + \text{TRRC_process} + T_(CSI_Reporting) + T_1 + T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{\text{T}_{\text{HARQ}} + T_1 + \text{TRRC_process} + \text{T_(CSI_Reporting)}}{NR\ slot\ length}$ was subject to interruption,

- and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$,

  - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$

- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ} + \text{TRRC_process} + T_1 + T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 7.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 7.5.3.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.5.3.4.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.5.3.4.4.3-2A | |

| | | | |
|---|---|---|---|
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 7.5.3.4.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.4.4.3-2A: MeasConfig (Table 7.5.3.4.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 7.5.3.4.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.5.3.4.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.4.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 7.5.3.4.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.4.4.3-5: CellGroupConfig-SCell (Table 7.5.3.4.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.4.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.4.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| sCellState-r16 | activated | | |
| … | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.4.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.4.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 7.5.3.4.4.3-7: ServingCellConfig-SCell (Table 7.5.3.4.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 7.5.3.4.5 Test requirement

Table 7.5.3.4.5-1 defines the cell specific test parameters and Table 7.5.3.4.5-2 defines OTA related test parameters.

**Table 7.5.3.4.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| SSB ARFCN | | | freq1 | | | freq2 | | |
| Duplex mode | Config 1 | | TDD | | | | | |
| TDD configuration | Config 1 | | TDDConf.3.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 66 | | | | | |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | | | | | |
| Timing offset to Cell 1 | | ms | Not Applicable | | | 0 | | |
| PDSCH Reference measurement channel | Config 1 | | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | Config 1 | | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration | Config 1 | | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| CSI-RS configuration | Config 1 | | CSI-RS.3.1 TDD | | | CSI-RS.3.1 TDD | | |
| CSI reporting periodicity | Config 1 | ms | 5 | | | 5 | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC configuration | | | SMTC.1 | | | | | |
| SSB configuration | Config 1 | | SSB.1 FR2 | | | SSB.1 FR2 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| Propagation condition | | - | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | |

**Table 7.5.3.4.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter[Note 6] | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | | | | | |
| Assumption for UE beams[Note 7] | | Rough | | | Rough | | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -112 | | | -112 | | |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -102.97 | | | -102.97 | | |
| $\hat{E}_s / N_{oc}$ | dB | 14 | | | 14 | | |

| | | | |
|---|---|---|---|
| SS-RSRP[Note2] | dBm/SCS [Note4] | -88.97 | -88.97 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 |
| Io[Note2] | dBm/95.04 MHz [Note4] | -59.81 | -59.81 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall complete the direct activation of the SCell no later than at slot $m + \frac{N_{direct}}{\text{NR slot length}}$.

The UE shall report non-zero CQI for SCell from slot $m + \frac{N_{direct}}{\text{NR slot length}}$ and onwards throughout time period T3.

The interruption on PCell during direct activation of the SCell shall occur within the interruption window specified in TS 38.133 [6] clause 8.3.4 and shall not exceed the length specified in TS 38.133 [6] clause 8.2.2.2.11.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.3.5 NR SA FR2 direct SCell activation at handover with known SCell

### 7.5.3.5.1 Test Purpose

This test is to verify the requirements specified in TS 38.133 [6] sub clause 8.3.5 for the FR2 intra-frequency handover with direct SCell activation.

### 7.5.3.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting 2DL CA and direct SCell activation.

### 7.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.5.

### 7.5.3.5.4 Test description

#### 7.5.3.5.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.5.4.1-1.

**Table 7.5.3.5.4.1-1: Supported test configurations for FR2 handover with direct SCell activation case**

| Configuration | Description |
|---|---|
| 7.5.3.5-1 | SCell: NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode<br>Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.5.4.1-2 and Table 7.5.3.5.4.1-3.

**Table 7.5.3.5.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 7.5.3.5.4.1-3: General test parameters for FR2 handover with direct SCell activation case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two NR radio channels are used for this test, Cell 1 and, Cell2use RF channel 1 and Cell 3 usse RF channel 2 respectively. |
| A3-Offset | | dB | -15 | |
| Time offset between cells | | | 3 μs | Synchronous cells |
| Initial conditions | Source cell | | Cell 1 | Source Cell |
| | Target cell | | Cell 2 | Neighbour cell |
| | SCell | | Cell 3 | SCell is not added and activated |
| Final condition | Source cell | | Cell 2 | Cell 2 is Source cell after handover |
| | Neighbour cell | | Cell 1 | Neighbour cell |
| | SCell | | Cell 3 | SCell is added and activated |

1.The general test parameter settings are set up according to Table 7.5.3.5.4.1-3.

2. Message contents are defined in clause 7.5.3.5.4.3.

3. There are 3 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

### 7.5.3.5.4.2 Test procedure

The test scenario comprises of three FR2 cells, one source PCell (Cell 1), one target PCell (Cell 2) and one SCell (Cell 3). The test consists of three successive time periods, with time durations of T1, T2, and T3 respectively.

At the start of time duration T1, the UE is in connected mode with PCell (Cell 1). Both Cell 2 and Cell 3 are known to UE and UE is reporting CQI for all Cell 1.

Time period T2 starts when UE receives a handover command that initiate handover of UE to Cell2 and also activates Cell 3. This is done using an *RRCReconfiguration* message with parameter *sCellState* set to *activated* for the Cell 3. The message is sent from the test equipment to the UE and is received in a slot number n at the UE antenna connector. The UE shall accomplish the handover, addition and activation of the SCell no later than slot (n +$\frac{N_{direct}}{NR\ slot\ length}$).

Time period T3 starts at (n +$\frac{N_{direct}}{NR\ slot\ length}$), at which point UE shall be reporting a valid CSI for both Cell 2 and Cell 3 as given in tables 7.5.3.5.5-1 and 7.5.3.5.5-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message

2. Set the parameters according to T1 in Tables 7.5.3.5.5-1 and 7.5.3.5.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

   3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 3, the SS activates SCC by sending a *RRCReconfiguration* message to the UE by which it configures the SCell (Cell 3) in activated state as defined in message contents table 7.5.3.5.4.3-5, (it also implies a handover to Cell 2).

6. The UE shall transmit the uplink PRACH channel to Cell 2 less than 62 ms from the beginning of time period T2. The UE shall start reporting CSI in PSCell in slot (m+k+ 1+$T_{interrupt}$ +$T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.5. $T_{interrupt}$ is the interruption time during handover as specified in TS 38.133 [6] clause 6.1.1, $T_2$ is the delay from slot $n + \frac{T_{RRC_Process}+T_{interrupt}}{NR\ slot\ length}$ until UE has obtained a valid TA command for the target PCell and $T_3$ is the delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213[8], UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot m + 1 + $\frac{T_{HARQ}+T_{interrupt}+T_2+T_3+\text{TRRC_process}+\text{T_(CSI_Reporting)}}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+T_{interrupt}+T_2+T_3+\text{T_(CSI_Reporting)}\ +\text{TRRC_process}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot m + 1 + $\frac{T_{HARQ}+T_{interrupt}+T_2+T_3+\text{TRRC_process}+\text{T_(CSI_Reporting)}}{NR\ slot\ length}$ was subject to interruption, where $N_{interruption}$ is the interruption length given in TS 38.133 [6] clause 8.2.

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{N_{direct}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{direct}}{\text{NR slot length}}$.

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{\text{TRRC_process}+T_2+T_3+T_{interrrupt}+T_{HARQ}+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008), and Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

7.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 7.5.3.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table H.3.2-2 with Condition RBConfig_KeyChange |

**Table 7.5.3.5.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.5.3.5.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 7.5.3.5.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.5.4.3-2A: MeasConfig (Table 7.5.3.5.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 7.5.3.5.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.5.3.5.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.5.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 7.5.3.5.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.5.4.3-5: CellGroupConfig-SCell (Table 7.5.3.5.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.5.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.5.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| sCellState-r16 | activated | | |
| … | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.5.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 7.5.3.5.4.3-7: ServingCellConfig-SCell (Table 7.5.3.5.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 7.5.3.5.5 Test requirement

Table 7.5.3.5.5-1 defines the cell specific test parameters and Table 7.5.3.5.5-2 defines OTA related test parameters.

**Table 7.5.3.5.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell**

| **Parameter**[Note 5] | **Unit** | **T1** | | | **T2** | | | **T3** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Cell 1** | **Cell 2** | **Cell 3** | **Cell 1** | **Cell 2** | **Cell 3** | **Cell 1** | **Cell 2** | **Cell 3** |
| SSB ARFCN | | freq1 | freq1 | freq 2 | freq1 | freq1 | freq 2 | freq1 | freq1 | freq2 |
| Duplex mode | | TDD | | | TDD | | | TDD | | |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| Downlink initial BWP Configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Downlink dedicated BWP Configuration | | DLBWP.1.1 | | | DLBWP.1.1 | | | DLBWP.1.1 | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | ULBWP.1.1 | | | ULBWP.1.1 | | |
| TRS configuration | | TRS.2.1 TDD | | | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| TCI state | | TCI.State.0 | | | TCI.State.0 | | | TCI.State.0 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | - | SR.3.1 TDD | | - | SR.3.1 TDD | | |
| RMSI CORESET Parameters | | CR.3.1 TDD | | - | CR.3.1 TDD | | - | CR.3.1 TDD | | |
| Dedicated CORESET Parameters | | CCR.3.1 TDD | | - | CCR.3.1 TDD | | - | CCR.3.1 TDD | | |
| OCNG Patterns | | OP.1 | | | | | | | | |
| SSB Configuration | | SSB.1 FR2 | | | | | | | | |
| SMTC Configuration | | SMTC.1 | | | | | | | | |
| PRACH configuration | | FR2 PRACH configuration 1 | | | | | | | | |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | | | | | | | | |
| reportConfigType | | periodic | | - | periodic | | - | periodic | | - |
| reportQuantity | | cri-RI-PMI-CQI | | - | cri-RI-PMI-CQI | | - | cri-RI-PMI-CQI | | - |
| CSI reporting periodicity | slot | 40 | | - | 40 | | - | 40 | | - |
| CSI reporting offset | slot | 4 | | - | 4 | | - | 4 | | - |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | | | | |

| | | |
|---|---|---|
| EPRE ratio of PDCCH to PDCCH_DMRS | | |
| EPRE ratio of PDSCH_DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation conditions | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Void

**Table 7.5.3.5.5-2: OTA related test parameters for FR2 SCell activation case**

| Parameter Note 6 | Unit | Cell 1 | | | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to table A.9.1 | | | | | | | | |
| Assumption for UE beams Note 7 | | Rough | | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | | | -112 | | | -112 | | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 | | | -102.97 | | | -102.97 | | |
| $\hat{E}_s / N_{oc}$ | dB | 14 | | | 14 | | | 14 | | |
| SS-RSRP Note2 | dBm/SCS Note4 | -88.97 | | | -88.97+TT | | | -88.97 | | |
| $\hat{E}_s / I_{ot}$ | dB | 14 | | | 14+TT | | | 14 | | |
| Io Note2 | dBm/95.04 MHz Note4 | -56.89 | | | -56.89 | | | -59.81 | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void
Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

The UE shall be capable to transmit valid CSI report for PCell (Cell 2) and to the directly activated SCell1 no later than in slot n+ $N_{direct}$.

The SCell activation delay, $N_{direct}$, can be expressed as: $N_{direct} = T_{RRC_process} + T_{interrupt} + T_2 + T_3 + T_{activation_time} + T_{CSI_Reporting}$ - 3ms; Where:

- $T_{RRC_Process}$: RRC procedure delay defined in clause 12 of TS 38.331 [13] and it is equal to 16ms,
- $T_{interrupt}$: Interruption time during handover as specified in TS 38.133 [6] clause 6.1.1. The value to be verified in the test is 52 ms ($T_{interrupt}$ = 0 ms for $T_{search}$ + 10ms for $T_{IU}$ + 20 ms for $T_{processing}$ + 20ms for $T_{\Delta}$ + 2 ms for $T_{margin}$ ms) by assuming known SCell and SMTC.1 configuration.

- $T_2$: Delay from slot $n + \frac{T_{RRC_Process} + T_{Interrupt}}{\text{NR slot length}}$ until UE has obtained a valid TA command for the target PCell,

- $T_3$: Delay for applying the received TA for uplink transmission in the target PCell, and greater than or equal to k+1 slot, where k is defined in clause 4.2 in TS 38.213 [8],

- $T_{activation_time}$ and $T_{CSI_Reporting}$ are specified in TS 38.133[6] clause 8.3.2, where the following definitions of $T_{FirstSSB}$ and $T_{FirstSSB_MAX}$ as defined in TS 38.133 [6] section 8.3.5 shall apply:

During time period T2 of the test, the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot n + $\frac{T_{HARQ} + T_{activtion_time} + T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{SMTC_SCell}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.

During time period T3 of the test, the UE shall stop sending CSI reports for SCell at latest in a slot m + $\frac{T_{HARQ} + 3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

During time period T2 of the test, interruption of PCell / PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ} + 3ms + T_X}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.

During time period T3 of the test, the starting point of interruption of PCell during SCell deactivation shall not happen outside the slot m + 1 + $\frac{T_{HARQ}}{NR\ slot\ length}$ to m + 1 + $\frac{T_{HARQ} + 3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During time period T2 of the test, if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ} + T_{activtion_time} + T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 7.5.3.6 to 7.5.3.12

## 7.5.3.13 NR SA FR2 SCell Activation for SCell in FR2 intra-band in non-DRX

Editor's note: This test case is incomplete in the following aspects:

- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.3.13.1 Test Purpose

The purpose of this test is to verify that the delay and interruption for fast SCell activation delay at SCell addition are within the requirements stated in TS 38.133 [6] clause 8.3.16.

### 7.5.3.13.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards and supporting 2DL CA and fast SCell activation.

### 7.5.3.13.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

### 7.5.3.13.4 Test description

#### 7.5.3.13.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.13.4.1-1.

**Table 7.5.3.13.4.1-1: Supported test configurations for FR2 SCell activation case**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.13.4.1-2 and Table 7.5.3.13.4.1-3.

**Table 7.5.3.13.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.13.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 7.5.3.13.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channel (1, 2) in FR2 are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | μs | 0 | |
| Time alignment error between cell2 and cell1 | μs | ≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 | |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case. |
| $T_{CSI_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331[13] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [8] |

1.The general test parameter settings are set up according to Table 7.5.3.13.4.1-3.

2. Message contents are defined in clause 7.5.3.13.4.3.

3. There are 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

#### 7.5.3.13.4.2 Test Procedure

The test consists of two successive time periods, with duration of T1and T2, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n (where n mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation of SCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.5.3.13.4.1-3 and 7.5.3.13.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 7.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = n + 1 + $\frac{\text{T}_{\text{HARQ}}+3\text{ms}+T_{\text{CSI_Reporting}}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = n + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, where $\text{T}_{\text{activation_time}} = \text{T}_{\text{FirstATRS}}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.16,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

- or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if slot $s_{nonzero_CQI}$ was subject to interruption,

- and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event “Activation” is increased by one. Otherwise, count a fail for the event “Activation” and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

#### 7.5.3.13.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 7.5.3.13.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with Condition Deactivated SCell |

**Table 7.5.3.13.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.5.3.13.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 7.5.3.13.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.13.4.3-2A: MeasConfig (Table 7.5.3.13.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 7.5.3.13.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.5.3.13.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.13.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 7.5.3.13.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.13.4.3-5: CellGroupConfig-SCell (Table 7.5.3.13.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.13.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.13.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.13.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.13.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 7.5.3.13.4.3-7: ServingCellConfig-SCell (Table 7.5.3.13.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |
| } | | | |

### 7.5.3.13.5 Test requirement

Table 7.5.3.13.5-1 defines the cell specific test parameters and Table 7.5.3.13.5-2 defines OTA related test parameters.

**Table 7.5.3.13.5-1: Cell specific test parameters for FR2 SCell activation case**

| Parameter[Note 5] | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| SSB ARFCN | | freq1 | | freq2 | |
| Duplex mode | | TDD | | | |
| TDD configuration | | TDDConf.3.1 | | | |
| Downlink initial BWP Configuration | | DLBWP.0.1 | | | |
| Downlink dedicated BWP Configuration | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | |

| | | | | |
|---|---|---|---|---|
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | |
| TRS configuration | | TRS.2.1 TDD | | |
| TCI state | | TCI.State.0 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 66 | 66 | 66 |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | |
| RMSI CORESET Parameters | | CR.3.1 TDD | - | |
| Dedicated CORESET Parameters | | CCR.3.1 TDD | - | |
| OCNG Patterns | | OP.1 | | |
| SSB Configuration | | SSB.1 FR2 | | |
| Aperiodic CSI-RS for SCell activation | | TRS.2.3 TDD | | |
| gapBetweenBursts | Slot | N/A | | |
| SMTC Configuration | | SMTC.1 | | |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | | |
| reportConfigType | | periodic | N/A | |
| reportQuantity | | cri-RI-PMI-CQI | N/A | |
| CSI reporting periodicity | slot | 40 | N/A | |
| CSI reporting offset | slot | 4 | N/A | |
| EPRE ratio of PSS to SSS | dB | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation conditions | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: Void

**Table 7.5.3.13.5-2: OTA related test parameters for FR2 SCell activation case**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 1 according to table A.9.1 | | Setup 1 according to table A.9.1 | |
| Assumption for UE beams Note 7 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -104.7 | | -104.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note 3 | -95.7 | | -95.7 | |
| $\hat{E}_s / N_{oc}$ | dB | 7 | | 7 | |
| SSB_RP Note2 | dBm/SCS Note4 | -88.7 | | N/A | |
| CSI_RP Note2 | dBm/SCS Note4 | N/A | | -88.7 | |
| $\hat{E}_s / I_{ot}$ | dB | 7 | | 7 | |
| Io Note2 | dBm/95.04 MHz Note4 | -58.92 | | -58.92 | |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | Es/Iot, SSB_RP, CSI_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | Void |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 5: | Void |
| Note 6: | Void |
| Note 7: | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. |

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (n + 1 + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot n + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstATRS}$ + 5ms, as defined in TS 38.133 [6] clause 8.3.16.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.16.

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 7.5.3.14 NR SA FR2 SCell Activation for known SCell in FR2 inter-band

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

### 7.5.3.14.1 Test purpose

The purpose of this test is to verify that the fast SCell activation and deactivation times are within the requirements stated in TS 38.133 [6] clause 8.3.16, when the PCell and SCell are in FR2 inter-band and the SCell in FR2 is known by the UE at the time of activation.

### 7.5.3.14.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards and supporting 2DL CA, and supporting Fast SCell activation.

### 7.5.3.14.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.16.

### 7.5.3.14.4 Test description

#### 7.5.3.14.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.14.4.1-1.

**Table 7.5.3.14.4.1-1: Supported test configurations for FR2 SCell activation in FR2 inter-band**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.14.4.1-2.

**Table 7.5.3.14.4.1-2: Initial conditions for FR2 SCell activation in FR2 inter-band**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.14.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.3.14.4.1-3.
2. Message contents are defined in clause 7.5.3.14.4.3.
3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.3.14.4.1-3: General test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two NR radio channels are used for this test. RF channel number 1 is in band 1 and RF channel number 2 is in band 2, where bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS 38.101-2. |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every second subframe |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | ≤8 | A random value from 0µs to 8µs |
| A3-offset | dB | -15 | A3-offset |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 2 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13] |

#### 7.5.3.14.4.2 Test procedure

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell triggering the aperiodic CSI-RS for fast SCell activation.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m (where m mode 20=1), defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$, as defined in clause 8.3.16. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in clause 8.2

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.5.3.14.5-1 and 7.5.3.14.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.55) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 8.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s$ = m + 1 + $\frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{CSI_Reporting}}}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $s$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s$ or $s'$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{\text{interruption}}$ up to the end of T2

   - Then the number of successes for the event “Activation” is increased by one. Otherwise, count a fail for the event “Activation” and go to step 8.

7. T2 expires.

8 SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

9. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. After the RRC connection release, the SS:
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5),
or
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.3.14.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 7.5.3.14.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with condition Deactivated SCell |

**Table 7.5.3.14.4.3-2: *RRCReconfiguration*: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 7.5.3.14.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 7.5.3.14.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.14.4.3-2A: MeasConfig (Table 7.5.3.14.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 7.5.3.14.4.3-3 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 7.5.3.14.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.14.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 7.5.3.14.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.14.4.3-5: CellGroupConfig-SCell (Table 7.5.3.14.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 7.5.3.14.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| sCellConfigDedicated | ServingCellConfig-SCell | Table 7.5.3.14.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.3.14.4.3-6: ServingCellConfig-SpCell (Table 7.5.3.14.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 7.5.3.14.4.3-7: ServingCellConfig-SCell (Table 7.5.3.14.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 with condition FastActivation_SCell | | |
| servingCellMO | 2 | | |
| } | | | |

### 7.5.3.14.5 Test requirement

Table 7.5.3.14.5-1 and Table 7.5.3.14.5-2 define the primary level settings including test tolerances.

**Table 7.5.3.14.5-1: Cell specific test parameters for FR2 SCell activation in FR2 inter-band**

| **Parameter** Note 5 | **Unit** | **T1** | | **T2** | |
|---|---|---|---|---|---|
| | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| Downlink initial BWP Configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | | DLBWP.1.1 | | DLBWP.1.1 | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | ULBWP.1.1 | |
| TRS configuration | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state | | TCI.State.0 | | TCI.State.0 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Parameters | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Parameters | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| CSI-RS configuration | | NA | NA | NA | CSI-RS.3.1 TDD Note 2 |
| CSI reporting periodicity Note 3 | | NA | 5 | NA | 5 |
| OCNG Patterns | | OP.1 | | | |
| SSB Configuration | | SSB.1 FR2 | | | |
| SMTC Configuration | | SMTC.1 | | | |
| Aperiodic CSI-RS for SCell activation | | - | - | - | TRS.2.3 TDD |

| | | | |
|---|---|---|---|
| gapBetweenBursts | Slot | N/A | 0 |
| cellIndividualOffset | dB | N/A | 16 |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation conditions | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot m+$T_{L1\text{-}RSRP}$ during T2.
Note 3: L1-RSRP measurement and reporting are configured to the UE prior to the start of time period T1.

**Table 7.5.3.14.5-2: OTA related test parameters for FR2 SCell activation in FR2 inter-band**

| Parameter Note 6 | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| AoA setup | | Setup 3 as specified in clause A.3.15 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 7 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -96.7 | | -96.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -87.7 | | -87.7 | |
| $\hat{E}_s / N_{oc}$ | dB | 0+TT | | 0+TT | |
| SS-RSRP Note2 | dBm/SCS Note4 | -87.7 | | N/A | |
| CSI-RSRP Note2 | dBm/SCS Note4 | N/A | | -87.7 | |
| $\hat{E}_s / I_{ot}$ | dB | 0+TT | | 0+TT | |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | | -55.7 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1
Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

During T2 the UE shall start sending CSI report for the SCell in the configured slots for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k). UE shall send the first CSI report for SCell after receiving at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k), or in the next available uplink resource for CSI reporting if the slot was subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PCell in the slot.

During T2, the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where

- $T_{HARQ}$ is defined in Table A.7.5.3.14.1-2
- $T_{activation_time}$ = max($T_{FirstATRS}$ + 5ms, $T_{uncertainty_RRC}$ + $T_{RRC_delay}$-$T_{HARQ}$)
- $T_{CSI_Reporting}$ = 10ms
- NR slot length is 0.125ms for this test case.

During T2, the interruption of PCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}} + N_{\text{interruption}}$, where $T_X$ =4ms.

## 7.5.4 Void

## 7.5.5 Link recovery procedures

### 7.5.5.0 Minimum conformance requirements

#### 7.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.1.

#### 7.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.2.

#### 7.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 5.5.5.0.3.

#### 7.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 5.5.5.0.4.

#### 7.5.5.0.5 TRP specific Minimum conformance requirements

[TS 38.133, clause 8.18.3].

##### 7.5.5.0.5.1 Requirements for TRP specific SSB based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ estimated over the last $T_{\text{Evaluate_BFD_SSB}}$ ms period becomes worse than the threshold $Q_{\text{out_LR_SSB}}$ within $T_{\text{Evaluate_BFD_SSB}}$ ms period.

The value of $T_{\text{Evaluate_BFD_SSB}}$ is defined in Table 7.5.5.0.5.1-1 for FR2 with scaling factor N, where

The value of $T_{\text{Evaluate_BFD_SSB}}$ is defined in Table 8.18.2.2-2 for FR2 with scaling factor N=8

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{\text{identify_CGI}}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{\text{identify_CGI,E-UTRAN}}$ when the UE is requested to decode an LTE CGI.

The values of $P_{TRP}$ defined in Table 7.5.5.0.5.1-1 is defined as 2, if SSB/CSI-RS resource in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ are overlapped, else it is 1.

**Table 7.5.5.0.5.1-1: Evaluation period $T_{\text{Evaluate_BFD_SSB}}$ for FR2**

| Configuration | $T_{\text{Evaluate_BFD_SSB}}$ (ms) |
|---|---|
| no DRX | $\text{Max}(50, \text{Ceil}(5 \times P \times N*P_{TRP}) \times T_{SSB})$ |
| DRX cycle ≤ 320ms | $\text{Max}(50, \text{Ceil}(7.5 \times P \times N*P_{TRP}) \times \text{Max}(T_{DRX}, T_{SSB}))$ |
| DRX cycle > 320ms | $\text{Ceil}(5 \times P \times N*P_{TRP}) \times T_{DRX}$ |
| Note: $T_{SSB}$ is the periodicity of SSB in the two sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$. $T_{DRX}$ is the DRX cycle length. | |

#### 7.5.5.0.5.2 Requirements for TRP specific CSI-RS based beam failure detection

Same as in the clause 5.5.5.0.6.

#### 7.5.5.0.5.3 Requirements for SSB based candidate beam detection

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$,estimated over the last $T_{Evaluate_CBD_SSB}$ ms period becomes better than the threshold $Q_{in_LR}$ provided SSB_RP and SSB $\hat{E}s/Iot$ are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in Table 7.5.5.0.5.3-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB}$ is defined in Table 7.5.5.0.5.3-1 for FR2 with scaling factor N=8.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $P_{CBD}$ used in Table 7.5.5.0.5.3-1 is defined as

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD}$ = 1.

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for PSCell in NR-DC

- $P_{CBD}$ = 2 if UE is configured for candidate beam detection on SCell, 1 otherwise.

For each SSB resource in the sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ configured for a SCell

- $P_{CBD}$ = Z in EN-DC or NE-DC or SA.
- $P_{CBD}$ = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

- $P_{CBD}$ is the number of band(s) on which UE is performing candidate beam detection only for SCell.

The values of $P_{TRP}$ defined in Table 7.5.5.0.5.3-1 is defined as 2, if SSB/CSI-RS resource in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$ are overlapped, else it is 1.

**Table 7.5.5.0.5.3-1: Evaluation period $T_{Evaluate_CBD_SSB}$ for FR2**

| Configuration | $T_{Evaluate_CBD_SSB}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $Max(25, Ceil(3 \times P \times N \times P_{CBD} \times P_{TRP}) \times T_{SSB})$ |
| DRX cycle > 320ms | $Ceil(3 \times P \times N \times P_{CBD} \times P_{TRP}) \times T_{DRX}$ |
| Note: $T_{SSB}$ is the periodicity of SSB in the two sets $\bar{q}_{1,0}$ and $\bar{q}_{1,1}$. $T_{DRX}$ is the DRX cycle length. | |

#### 7.5.5.0.5.4 Requirements for CSI-RS based candidate beam detection

Same as in the clause 5.5.5.0.6.2.

#### 7.5.5.0.5.5 Requirements for TRP specific Beam Failure Recovery

For the UE provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [8], if beam recovery procedure is triggered for any of the TRPs, the UE shall transmit SR for

UL resource followed by MAC CE providing beam index for the corresponding TRP whose radio link quality is worse than $Q_{out,LR}$. The index, $q_{new}$, provided in the TRP specific BFR MAC CE is provided by higher layer for a periodic CSI-RS configuration or for a SSB, as described in clause 5.17 of TS 38.321 [12].

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [8], if beam recovery procedure is triggered for any of TRPs, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for the corresponding TRP whose radio link quality is worse than $Q_{out,LR}$, and the index $q_{new}$ for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS 38.321 [12], if any, for a corresponding TRP

Provided that UE is configured by *schedulingRequestID-BFR-r17* and/or *schedulingRequestID-BFR2-r17*for BFR set 1 (i.e., TRP1) and BFR set 2 (i.e., TRP2) respectively, a configuration for LRR in a PUCCH transmission, after BFR is triggered on any of the TRPs as described in clause 5.17 of TS 38.321 [12], UE shall be capable of transmit PUCCH with a LRR within a period of T on any of the TRPs where BFR running.Where:

- $T = T_1 \times Ceil((T_2+D)/T_1)$ in which $T_1$, $T_2$ and D are defined as
  - $T_1$ is equal to the periodicity of PUCCH configured with *schedulingRequestID-BFR-r17 for* BFR set 1 schedulingRequestID-BFR2-r17 for BFR set 2..
  - $T_2 = T_{Evaluate_CBD}$ is the evaluation period specified in clause 7.5.5.0.5.3 or 7.5.5.0.5.4 for SSB or CSI-RS based candidate beam detection, that is $T_{Evaluate_CBD_SSB}$ or $T_{Evaluate_CBD_CSI-RS}$, depending on the applicable reference signal configured for candidate beam detection.
  - D = [2 ms] is the UE Processing time.

#### 7.5.5.0.5.6 Scheduling availability of UE during TRP specific beam failure detection

Same as in the clause 5.5.5.0.6.4.

#### 7.5.5.0.5.7 Scheduling availability of UE during TRP specific candidate beam detection

Same as in the clause 5.5.5.0.6.5.

### 7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 7.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 7.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

#### 7.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.1.

### 7.5.5.1.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.1.4-2 shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

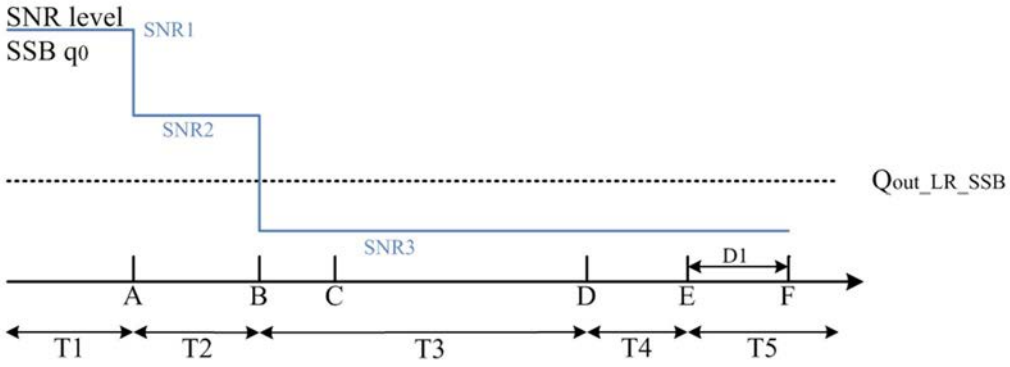



**Figure 7.5.5.1.4-1: SNR variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

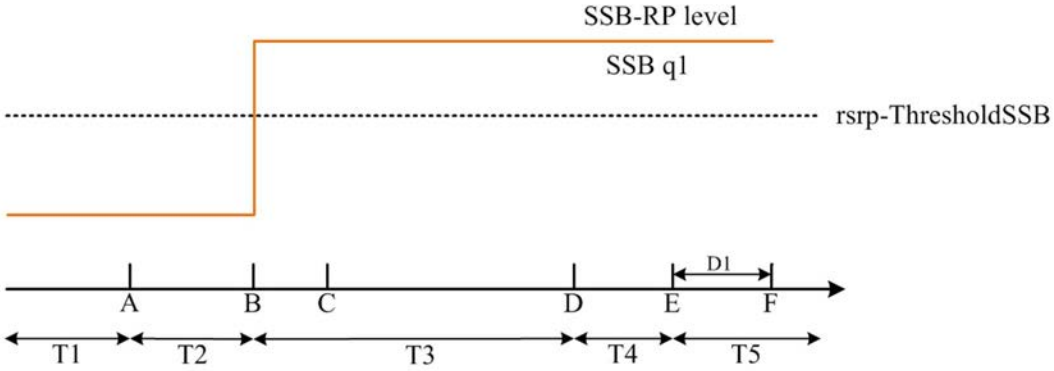



**Figure 7.5.5.1.4-2: SSB_RP level variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

#### 7.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.1.4.1-1.

**Table 7.5.5.1.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 7.5.5.1-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 7.5.5.1-2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.1.4.1-2.

**Table 7.5.5.1.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.1.4.1-3. The measurement gap configuration is according to Table 7.5.5.1.4.1-4.

2. Message contents are defined in clause 7.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.1.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1-2 | | Cell 1 | |
| RF Channel Number | | 1-2 | | 1 | |
| Duplex mode | | 1-2 | | TDD | |
| TDD Configuration | | 1-2 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 | |
| DL initial BWP configuration | | 1-2 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | | 2 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | | 2 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | | 2 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-2 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-2 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 | | SSB.1 FR2 | Table A.3.2-1 |
| | | 2 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-2 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1-2 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | OFF | |
| SSB index assigned as BFD RS ($q_0$) | | 1-2 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | 1-2 | | 1 | |
| SSB index assigned as RLM RS | | 1-2 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |

| | | | | | |
|---|---|---|---|---|---|
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | gp0 | |
| gapOffset | | 1-2 | ms | 0 | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| | | 2 | | -106 Note 3 | |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 2.61 | |
| T3 | | 1-2 | s | 1.64 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 1.01 | |
| D1 | | 1-2 | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2. | | | | | |

**Table 7.5.5.1.4.1-4: Void**

### 7.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.1.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.1.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.1.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set $q_1$ before time point B; and

c) detects preamble on a beam associated with candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one Otherwise, the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.1.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 for until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.1.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED;<br><br>Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br><br>Table H.3.1-4 with a3-offset = -6dB;<br><br>Table H.3.1-6 with condition gapUE and BFD.<br><br>Table H.3.1-8 with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br><br>Table H.3.1-10A<br><br>Table H.3.1-10B |

### 7.5.5.1.5 Test requirement

Tables 7.5.5.1.4.1-3 and 7.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX.

**Table 7.5.5.1.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 2 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 7.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 7.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

#### 7.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.2.

#### 7.5.5.2.4 Test description

There are one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.2.4-2 shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

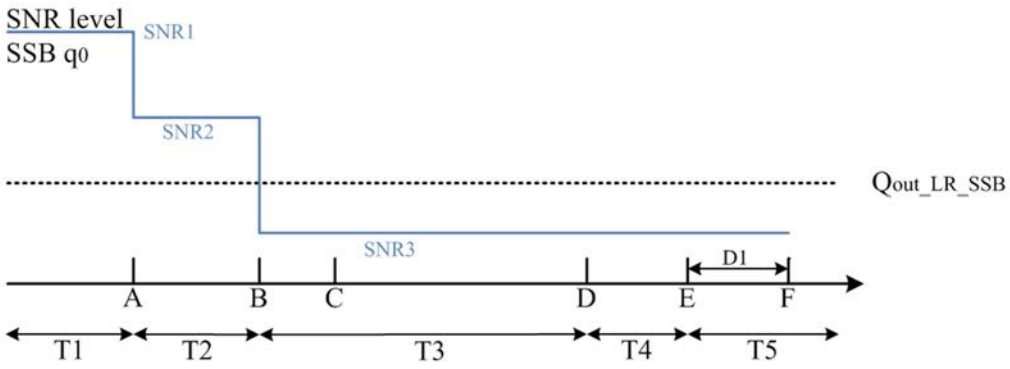



**Figure 7.5.5.2.4-1: SNR variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

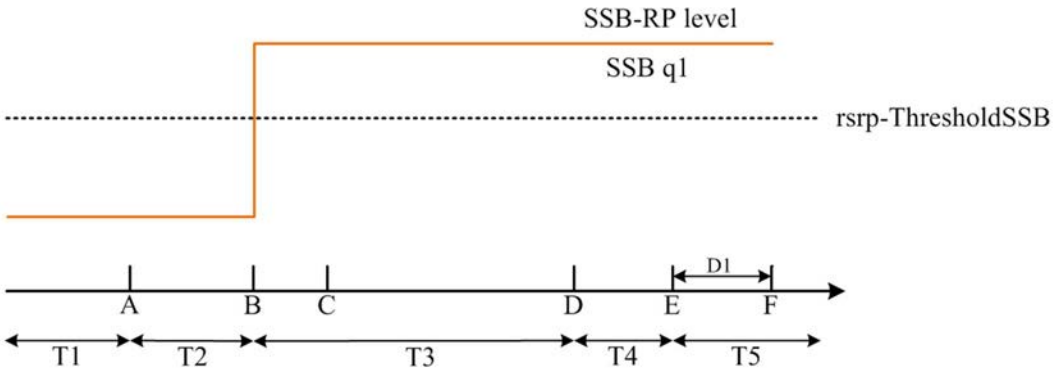



**Figure 7.5.5.2.4-2: SSB_RP level variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

#### 7.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.2.4.1-1.

**Table 7.5.5.2.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 7.5.5.2-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 7.5.5.2-2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.2.4.1-2.

**Table 7.5.5.2.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.2.4.1-3. The DRX configuration is according to Table 7.5.5.2.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.2.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active PCell | 1-2 | | Cell 1 | |
| RF Channel Number | 1-2 | | 1 | |
| Duplex mode | 1-2 | | TDD | |
| TDD Configuration | 1-2 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1-2 | kHz | 120 | |
| DL initial BWP configuration | 1-2 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | 1-2 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | 1-2 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | 1-2 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | 2 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | 2 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | 2 | | CCR.3.7 TDD | |
| OCNG parameters | 1-2 | | OP.1 | Table A.2.1-1 |
| CP length | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | 1-2 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | 1-2 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | 1 | | SSB.1 FR2 | Table A.3.2-1 |
| | 2 | | SSB.2 FR2 | |
| SMTC Configuration | 1-2 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | 1-2 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | 1-2 | | DRX.3 | Table A.5-1 |
| SSB index assigned as BFD RS ($q_0$) | 1-2 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | 1-2 | | 1 | |
| SSB index assigned as RLM RS | 1-2 | | 0,1 | |
| DCI format | 1-2 | | 1-0 | |

| | | | | | |
|---|---|---|---|---|---|
| Beam failure detection transmission parameters | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1-2 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| | | 2 | | -106 Note 3 | |
| powerControlOffsetSS | | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1-2 | | periodic | |
| reportQuantity | | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1-2 | slot | 40 | |
| CSI reporting offset | | 1-2 | slot | 4 | |
| T310 | | 1-2 | ms | 1000 | |
| N310 | | 1-2 | | 2 | |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 3.37 | |
| T3 | | 1-2 | s | 2.8 | |
| T4 | | 1-2 | s | 0 | |
| T5 | | 1-2 | s | 0.61 | |
| D1 | | 1-2 | s | 0.57 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2 | | | | | |

**Table 7.5.5.2.4.1-4: Void**

### 7.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.2.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with candidate beam set $q_1$ before time point B; and

c) detects preamble on a beam associated with candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.2.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.2.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.1-10B<br>Table H.3.7-1 with condition DRX.3 |

#### 7.5.5.2.5 Test requirement

Tables 7.5.5.2.4.1-3 and 7.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in DRX.

**Table 7.5.5.2.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SNR_SSB of set $q_1$ | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 2 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.2.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 7.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

### 7.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS-based RLM and link recovery.

#### 7.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.3.

#### 7.5.5.3.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.3.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

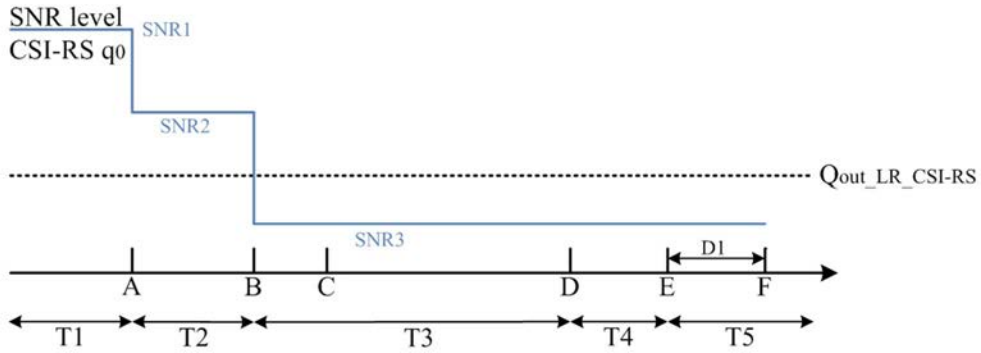



**Figure 7.5.5.3.4-1: SNR variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

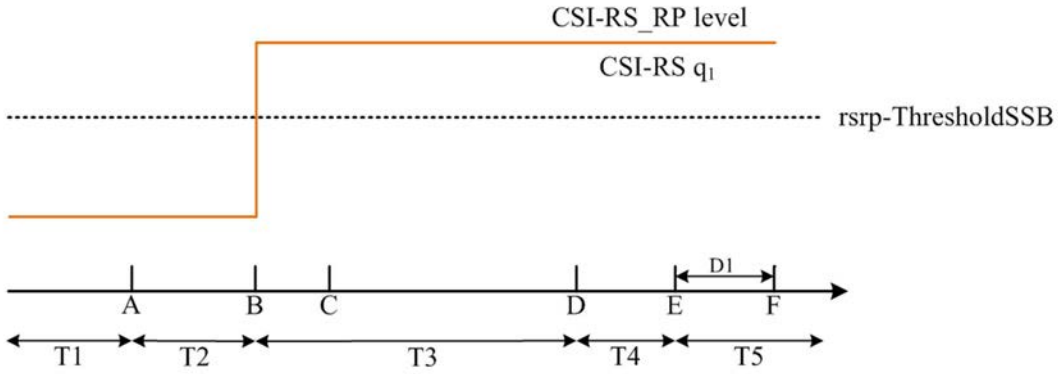



**Figure 7.5.5.3.4-2: CSI-RS_RP level variation for NR SA FR2 CSI-RS based beam failure detection and link recovery in non-DRX**

#### 7.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.3.4.1-1.

**Table 7.5.5.3.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 7.5.5.3-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.3.4.1-2.

**Table 7.5.5.3.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.3.4.1-3.

2. Message contents are defined in clause 7.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.3.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1 | | Cell 1 | |
| RF Channel Number | | 1 | | 1 | |
| Duplex mode | | 1 | | TDD | |
| TDD Configuration | | 1 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 | |
| DL initial BWP configuration | | 1 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | | 1 | | OP.1 | Table A.2.1-1 |
| CP length | | 1 | | Normal | |
| PDSCH/PDCCH TCI state | | 1 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 | | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1 | | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1 | | OFF | |
| CSI-RS configuration for BFD/CBD/RLM | | 1 | | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| CSI-RS index assigned as RLM RS | | 1 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | N/A | |
| rlmInSyncOutOfSyncThreshold | | 1 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | 1 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | | 1 | | periodic | |
| reportQuantity | | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1 | slot | 40 | |
| CSI reporting offset | | 1 | slot | 4 | |
| T310 | | 1 | ms | 1000 | |
| N310 | | 1 | | 2 | |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1 | s | 1.17 | |
| T3 | | 1 | s | 0.9 | |
| T4 | | 1 | s | 0 | |
| T5 | | 1 | s | 0.31 | |
| D1 | | 1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2. | | | | | |

### 7.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect a preamble on a beam associated with candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with candidate beam set $q_1$ beforetime point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.5.3.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br><br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A |

### 7.5.5.3.5 Test requirement

Tables 7.5.5.3.4.1-3 and 7.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table 7.5.5.3.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.3.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. |
| Note 10: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 11: | This value allows up to 1dB degradation from applied SNR to UE baseband. |
| Note 12: | Including test tolerance given in Annex F.1.3.2. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 =260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 7.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

### 7.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and CSI-RS-based RLM and link recovery and long DRX cycle.

### 7.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.4.

#### 7.5.5.4.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.4.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

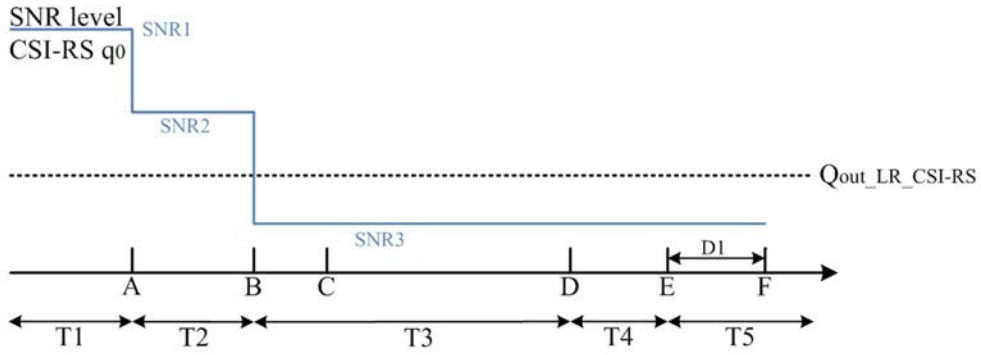



**Figure 7.5.5.4.4-1: SNR variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

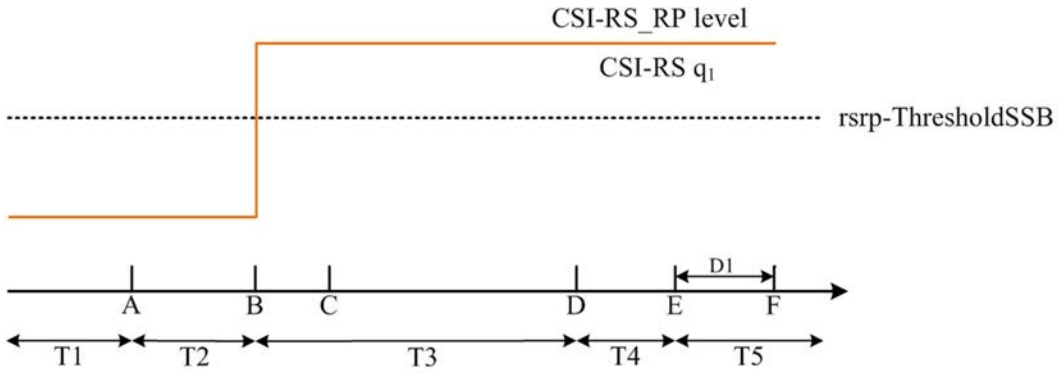



**Figure 7.5.5.4.4-2: CSI-RS_RP level variation for NR SA FR2 CSI-RS based beam failure detection and link recovery in DRX**

#### 7.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.4.4.1-1.

**Table 7.5.5.4.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Configuration | Description |
|---|---|
| 7.5.5.4-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.4.4.1-2.

**Table 7.5.5.4.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.5.5.3.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.4.4.1-3. The DRX configuration for is according to Table 7.5.5.4.4.1-3. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.4.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1 | | Cell 1 | |
| RF Channel Number | | 1 | | 1 | |
| Duplex mode | | 1 | | TDD | |
| TDD Configuration | | 1 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 | |
| DL initial BWP configuration | | 1 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| OCNG parameters | | 1 | | OP.1 | Table A.2.1-1 |
| CP length | | 1 | | Normal | |
| PDSCH/PDCCH TCI state | | 1 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | Table A.1.4A.2.1-1 |
| SSB Configuration | | 1 | | SSB.1 FR2 | Table A.3.2-1 |
| SMTC Configuration | | 1 | | SMTC.3 | Table A.4-1 |
| PRACH Configuration | | 1 | | PRACH.4 FR2 | Table A.7.2-1 |
| DRX configuration | | 1 | | DRX.3 | Table A.5-1 |
| CSI-RS configuration for BFD/CBD/RLM | | 1 | | CSI-RS.3.2 TDD | Table A.1.4.2-3 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| CSI-RS index assigned as RLM RS | | 1 | | 0,1 | |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | N/A | |

| | | | | |
|---|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | 1 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | 1 | dBm/SCS | -109Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | 1 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | 1 | | periodic | |
| reportQuantity | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1 | slot | 40 | |
| CSI reporting offset | 1 | slot | 4 | |
| T310 | 1 | ms | 1000 | |
| N310 | 1 | | 2 | |
| T1 | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1 | s | 5.43 | |
| T3 | 1 | s | 5.16 | |
| T4 | 1 | s | 0 | |
| T5 | 1 | s | 0.31 | |
| D1 | 1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | |

**Table 7.5.5.4.4.1-4: Void**

### 7.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.4.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.4.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br><br>Table H.3.1-10 with Condition CSI-RS<br><br>Table H.3.1-10A<br><br>Table H.3.7-1 with Condition DRX.3 |

### 7.5.5.4.5 Test requirement

Tables 7.5.5.4.4.1-3 and 7.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 7.5.5.4.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.4.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. |
| Note 10: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 11: | This value allows up to 1dB degradation from applied SNR to UE baseband. |
| Note 12: | Including test tolerance given in Annex F.1.3.2. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.5 NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is incomplete. Following aspects are pending:

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

BFD RS configuration and test procedure require further analysis based on recent changes in TS38.133.

TS 38.133 requirement regarding UE behavior check during T3 needs to be updated.

### 7.5.5.5.1 Test purpose

The purpose of this test is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

### 7.5.5.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

### 7.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.5.

### 7.5.5.5.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.5.4-1 shows the variation of the downlink SNR of the SSB index 0 in the active cell to emulate SSB based beam failure. Figure 7.5.5.5.4-2 shows the variation of the downlink L1-RSRP of the SSB index 1 used for link recovery.

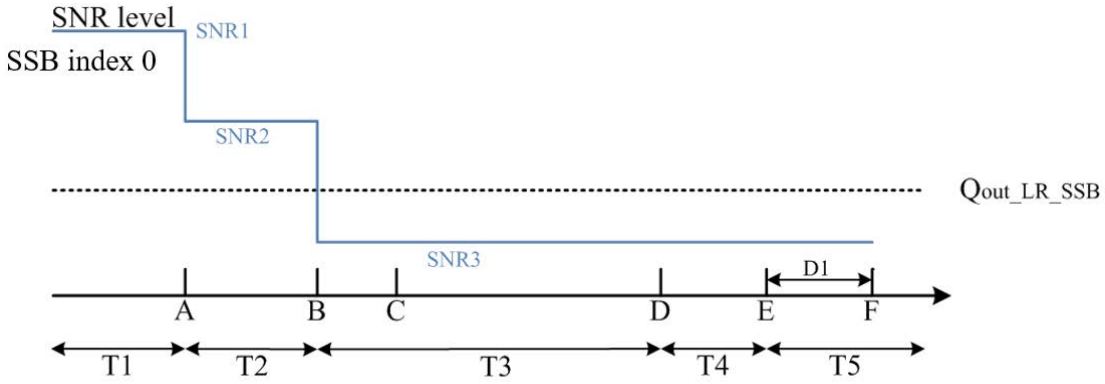



**Figure 7.5.5.5.4-1: SNR variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

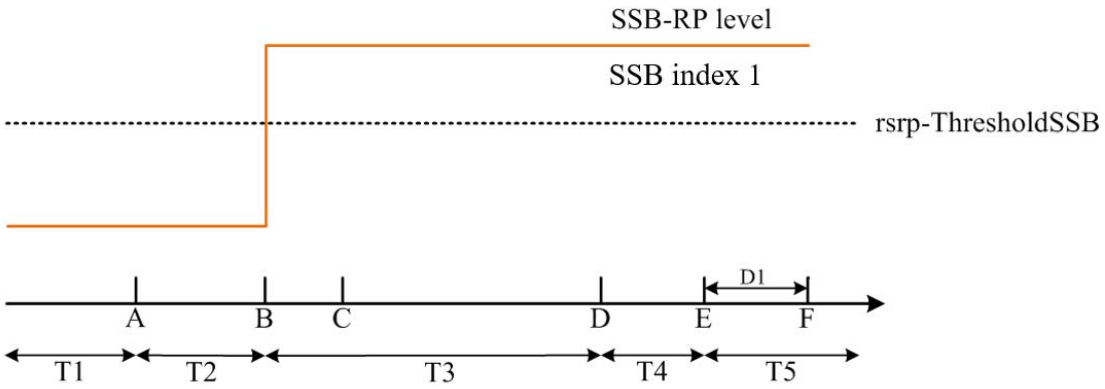



**Figure 7.5.5.5.4-2: SSB_RP level variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

### 7.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.5.4.1-1.

**Table 7.5.5.5.4.1-1: Supported test configurations for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Configuration | Description |
|---|---|
| 7.5.5.5-1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.5.5.5-2 | NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.5.4.1-2.

**Table 7.5.5.5.4.1-2: Initial conditions for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.5.4.1-3.
2. Message contents are defined in clause 7.5.5.5.4.3.
3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.5.4.1-3: General test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1-2 | | Cell 1 | |
| RF Channel Number | | 1-2 | | 1 | |
| Duplex mode | | 1-2 | | TDD | |
| TDD Configuration | | 1-2 | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | 1-2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1-2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 | |
| DL initial BWP configuration | | 1-2 | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | 1-2 | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | 1-2 | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | 1-2 | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | | 2 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | | 2 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | | 2 | | CCR.3.7 TDD | |
| OCNG parameters | | 1-2 | | OP.1 | Table A.2.1-1 |
| CP length | | 1-2 | | Normal | |
| PDSCH/PDCCH TCI state | | 1-2 | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | 1-2 | | TRS.2.1 TDD | |
| SSB Configuration | | 1 | | SSB.1 FR2 | Table A.3.2-1 |
| | | 2 | | SSB.2 FR2 | |
| SMTC Configuration | | 1-2 | | SMTC.1 | Table A.4-1 |
| PRACH Configuration | | 1-2 | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | 1-2 | | OFF | |
| Beam failure detection transmission parameters | DCI format | 1-2 | | 1-0 | |
| | Number of Control OFDM symbols | 1-2 | | 2 | |
| | Aggregation level | 1-2 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 | |
| | DMRS precoder granularity | 1-2 | | REG bundle size | |
| | REG bundle size | 1-2 | | 6 | |
| Gap pattern ID | | 1-2 | | N/A | |

| | | | | |
|---|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | 1-2 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | 1 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| | 2 | | -106 Note 3 | |
| powerControlOffsetSS | 1-2 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1-2 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | 1-2 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1-2 | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| reportConfigType | 1-2 | | periodic | |
| reportQuantity | 1-2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1-2 | slot | 40 | |
| CSI reporting offset | 1-2 | slot | 4 | |
| T310 | 1-2 | ms | 1000 | |
| N310 | 1-2 | | 2 | |
| T1 | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1-2 | s | 2.6 | |
| T3 | 1-2 | s | 1.64 | |
| T4 | 1-2 | s | 0 | |
| T5 | 1-2 | s | 1.01 | |
| D1 | 1-2 | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2. | | | | |

### 7.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.5.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D

   and

   b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.5.4.3-1: Common Exception messages for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A |

### 7.5.5.5.5 Test requirement

Table 7.5.5.5.4.1-3 and 7.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX.

**Table 7.5.5.5.5-1: NR Cell specific test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| AoA Setup | | | Setup1 defined in A.9.1 | | | | |
| Assumption for UE beams Note 10 | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SSB index assigned as BFD RS ($q_0$) | Config 1-2 | | 0 | 0 | Note 13 | | |
| SSB index assigned as CBD RS ($q_1$) | Config 1-2 | | 1 | 1 | 1 | 1 | 1 |
| SNR of SSB index 0 | Config 1-2 | dB | 13.7 Note 11,12 | 5.7 Note 11,12 | -12 | -12 | -12 |
| SNR of SSB index 1 | Config 1-2 | dB | 0.2 | 0.2 | 20 Note 12 | 20 Note 12 | 20 Note 12 |
| SSB_RP of SSB index 1 | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.7 Note 12 | -84.7 Note 12 | -84.7 Note 12 |
| | Config 2 | | -101.5 | -101.5 | -81.7 Note 12 | -81.7 Note 12 | -81.7 Note 12 |
| $N_{oc}$ | Config 1 | dBm/120kHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.5.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4. |
| Note 10: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 11: | This value allows up to 1dB degradation from applied SNR to UE baseband. |
| Note 12: | Including test tolerance given in Table F.1.3.2-4 |
| Note 13: | BFD RS (q0) is configured as SSB index 0 at the start of T3, and it is reconfigured by RRC as SSB index 1 after the UE transmits the preamble on a beam associated with the candidate beam set q1. |

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in TS 38.133 [6] clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

## 7.5.5.6 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

### 7.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

### 7.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

### 7.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.6.

### 7.5.5.6.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.6.4-1 shows the variation of the downlink SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure

7.5.5.6.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

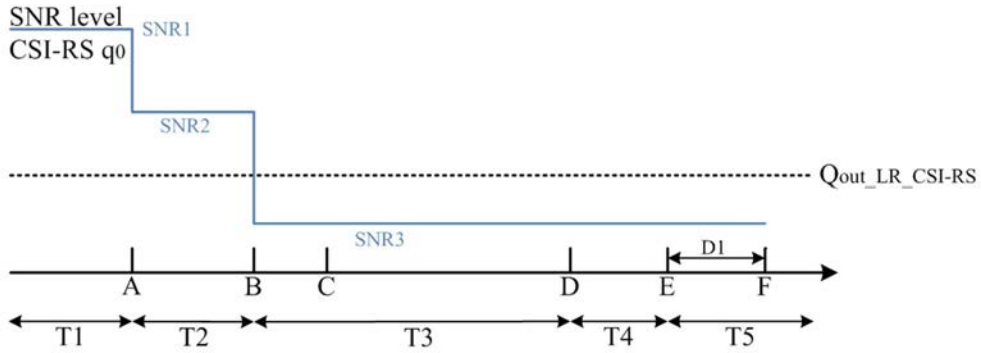



**Figure 7.5.5.6.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

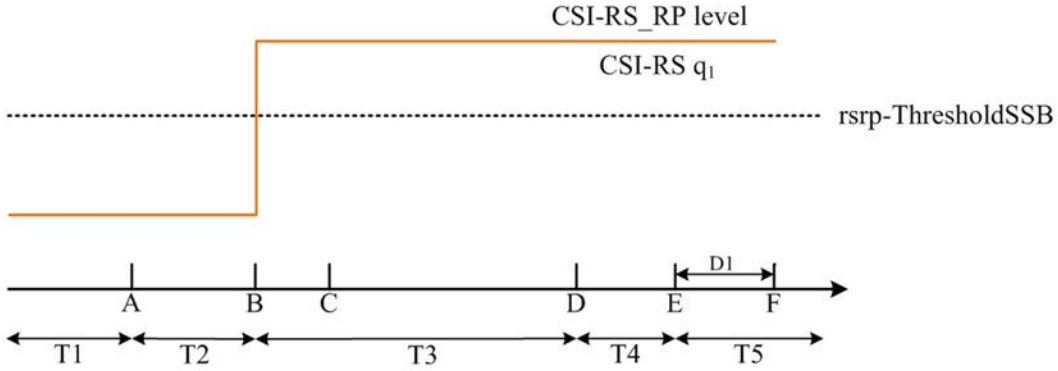



**Figure 7.5.5.6.4-2: CSI-RS_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

### 7.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.6.4.1-1.

**Table 7.5.5.6.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in non-DRX**

| Configuration | Description |
|---|---|
| 7.5.5.6-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.6.4.1-2.

**Table 7.5.5.6.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.5.5.6.4.1-3.
2. Message contents are defined in clause 7.5.5.6.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1 | | Cell 1 | |
| RF Channel Number for PCell | | 1 | | 1 | |
| Active SCell | | 1 | | Cell 2 | |
| RF Channel Number for SCell | | 1 | | 2 | |
| Duplex mode | | 1 | | TDD | |
| TDD Configuration | | 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 | |
| DL initial BWP configuration | | 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | | 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | 1 | | ULBWP.1.1 | |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | |
| OCNG parameters | | 1 | | OP.1 | A.2.1 |
| CP length | | 1 | | Normal | |
| PDSCH/PDCCH TCI state | | 1 | | TCI.State.0 | |
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | |
| SSB Configuration | | 1 | | SSB.3 FR2 | A.3 |
| SMTC Configuration | | 1 | | SMTC.3 | A.4 |
| PRACH Configuration | | 1 | | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1 | | OFF | |
| CSI-RS configuration for BFD/CBD on SCell | | 1 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| CSI-RS configuration for RLM on PCell | | 1 | | CSI-RS.3.2 TDD | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | N/A | |
| schedulingRequestID-BFR-SCell-r16 | | 1 | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 40 | 5ms |

| | | | | |
|---|---|---|---|---|
| Offset of PUCCH for SR configuration for BFR on SCell | 1 | slot | 4 | |
| PUCCH parameters for SR configuration for BFR on SCell | 1 | | Table 8.3.3.1.2-1 in [28] | |
| rlmInSyncOutOfSyncThreshold | 1 | | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | 1 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | 1 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1 | | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | 1 | | periodic | |
| reportQuantity | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1 | slot | 40 | |
| CSI reporting offset | 1 | slot | 4 | |
| T310 | 1 | ms | 1000 | |
| N310 | 1 | | 2 | |
| T1 | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1 | s | 1.17 | |
| T3 | 1 | s | 0.9 | |
| T4 | 1 | s | 0 | |
| T5 | 1 | s | 0.31 | |
| D1 | 1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | |

### 7.5.5.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.6.4.3. NR *RRCReconfiguration* message is contained in *RRCConnectionReconfiguration* and NR *RRCReconfigurationComplete* message is contained in *RRCConnectionReconfigurationComplete*.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).
4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.6.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.6.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.6.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.6.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-2 [18] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect PUCCH with LRR before time point B, and

c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.6.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.6.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-12 on Cell 3<br>Table H.3.1-13 on Cell 3 |

**Table 7.5.5.6.4.3-2: MAC-CellGroupConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId | | |
| } | | | |

**Table 7.5.5.6.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

#### 7.5.5.6.5 Test requirement

Tables 7.5.5.6.4.1-3 and 7.5.5.6.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX.

**Table 7.5.5.6.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Cell1 | Cell2 Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AoA setup | | | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.7 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

### 7.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

### 7.5.5.7.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

### 7.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.7.

### 7.5.5.7.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.7.4-1 shows the variation of the downlink SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.7.4-2 shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

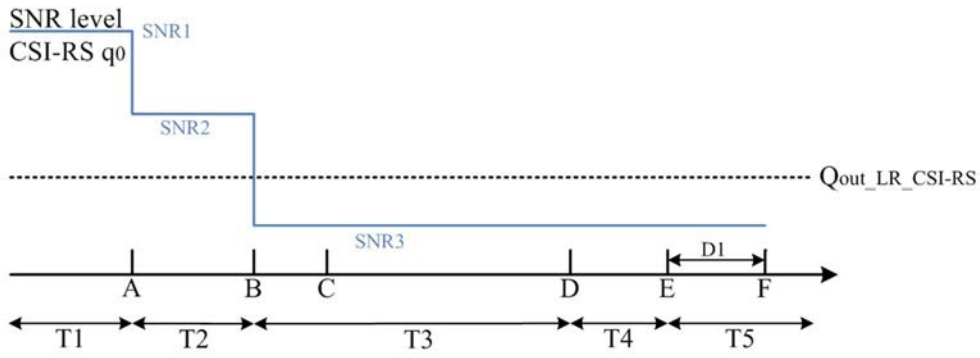



**Figure 7.5.5.7.4-1: SNR variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode**

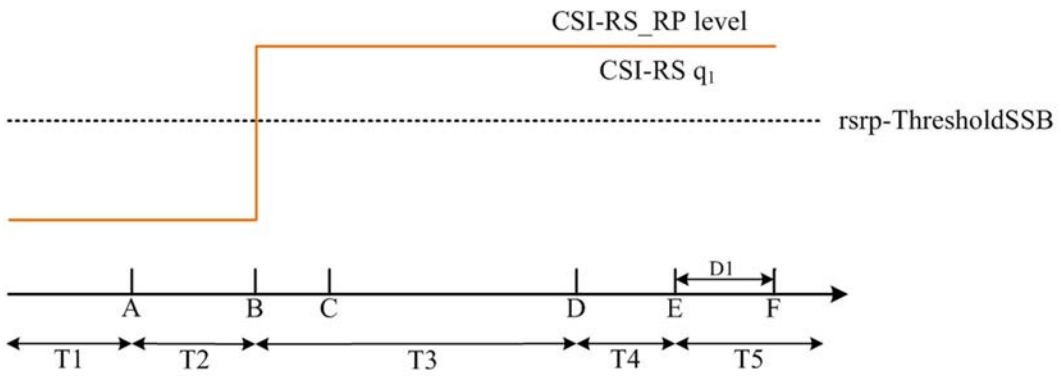



**Figure 7.5.5.7.4-2: CSI-RS_RP level variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode**

### 7.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.7.4.1-1.

**Table 7.5.5.7.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in DRX**

| Configuration | Description |
|---|---|
| 7.5.5.7-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.7.4.1-2.

**Table 7.5.5.7.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.7.4.1-3.
2. Message contents are defined in clause 7.5.5.7.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active PCell | 1 | | Cell 1 | |
| RF Channel Number for PCell | 1 | | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| Active SCell | | 1 | | Cell 2 | |
| RF Channel Number for SCell | | 1 | | 2 | |
| Duplex mode | | 1 | | TDD | |
| TDD Configuration | | 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 | |
| DL initial BWP configuration | | 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | | 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | 1 | | ULBWP.1.1 | |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | A.1.2.2 |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | |
| OCNG parameters | | 1 | | OP.1 | A.2.1 |
| CP length | | 1 | | Normal | |
| PDSCH/PDCCH TCI state | | 1 | | TCI.State.0 | |
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | |
| SSB Configuration | | 1 | | SSB.3 FR2 | A.3 |
| SMTC Configuration | | 1 | | SMTC.3 | A.4 |
| PRACH Configuration | | 1 | | FR2 PRACH configuration 4 | Table A.7.2-1 |
| DRX configuration | | 1 | | DRX.3 | A.5 |
| CSI-RS configuration for BFD/CBD on SCell | | 1 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| CSI-RS configuration for RLM on PCell | | 1 | | CSI-RS.3.2 TDD | A.1.4.2 |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | N/A | |
| schedulingRequestID-BFR-SCell-r16 | | 1 | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | 1 | slot | 4 | |
| PUCCH parameters for SR configuration for BFR on SCell | | 1 | | Table 8.3.3.1.2-1 in [28] | |
| rlmInSyncOutOfSyncThreshold | | 1 | | absent | Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]). |
| rsrp-ThresholdSSB | | 1 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | 1 | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 | | CSI-RS.3.1 TDD | A.1.4.2 |
| reportConfigType | | 1 | | periodic | |
| reportQuantity | | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1 | slot | 40 | |

| | | | | |
|---|---|---|---|---|
| CSI reporting offset | 1 | slot | 4 | |
| T310 | 1 | ms | 1000 | |
| N310 | 1 | | 2 | |
| T1 | 1 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | 1 | s | 5.43 | |
| T3 | 1 | s | 5.16 | |
| T4 | 1 | s | 0 | |
| T5 | 1 | s | 0.31 | |
| D1 | 1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2 | | | | |

### 7.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.7.4.3. NR *RRCReconfiguration* message is contained in *RRCConnectionReconfiguration* and NR *RRCReconfigurationComplete* message is contained in *RRCConnectionReconfigurationComplete*.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-12 on Cell 3<br>Table H.3.1-13 on Cell 3<br>Table H.3.7-1 with condition DRX.3 |

**Table 7.5.5.7.4.3-2: MAC-CellGroupConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-SCell-r16 | SchedulingRequestId | | |
| } | | | |

**Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

#### 7.5.5.7.5 Test requirement

Tables 7.5.5.7.4.1-3 and 7.5.5.7.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

**Table 7.5.5.7.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Unit | Cell1 | Cell2 Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9.1 | Setup 1 defined in A.9.1 | | | | |
| Assumption for UE beams[Note 10] | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1 | dB | 5 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | Config 1 | dBm/120kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 7.5.5.8 FFS

FFS.

### 7.5.5.9 NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TS 38.522 applicability spec update is pending

#### 7.5.5.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure and link recovery in the sets $\bar{q}_{0,0}$ and $\bar{q}_{1,0}$ for TRP1 when DRX is used for an FR2 active SCell requirements in TS38.133[6] clause 8.18.

#### 7.5.5.9.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific SCell BFR.

#### 7.5.5.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.9.

#### 7.5.5.9.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.9.4-1shows the variation of the downlink SNR of the CSI-RS in set $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ in the active SCell for TRP0 and TRP1 respectively. Figure 7.5.5.9.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in $\bar{q}_{1,0}$ for TPR0.

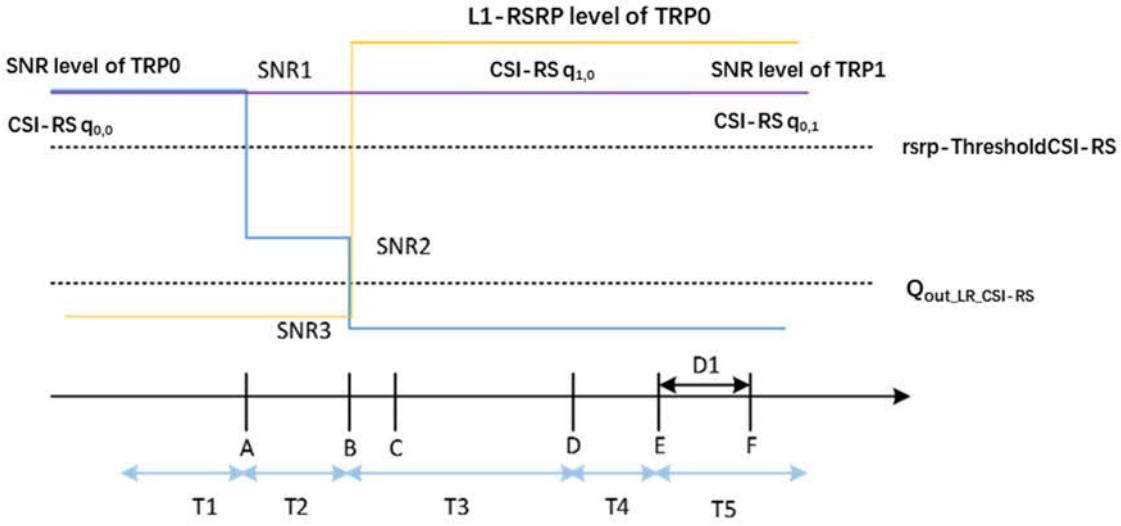



**Figure 7.5.5.9.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode**

#### 7.5.5.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.9.4.1-1.

**Table 7.5.5.9.4.1-1: Supported test configurations for FR2 PCell and SCell**

| Configuration | Description |
|---|---|
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.9.4.1-2.

**Table 7.5.5.9.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing in DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.9.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.9.4.1-3.
2. Message contents are defined in clause 7.5.5.9.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.9.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number for PCell | | | 1 | |
| Active SCell | | | Cell 2 | |
| RF Channel Number for SCell | | | 2 | |
| Duplex mode | Config 1 | | TDD | |
| BW channel | Config 1 | | 100: $N_{RB,c}$ = 66 | |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | Config 1 | | SSB.3 FR2 | A.3.11 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.3.10 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 kHz | |
| PRACH Configuration | Config 1 | | Table A.3.8.3.1-1 | |
| CSI-RS configuration for TRP0 | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for TRP1 | Config 1 | | CSI-RS.3.6 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.3.14.2 |
| TRS configuration | Config 1 | | TRS.2.1 TDD | |
| TCI configuration | Config 1 | | CSI-RS.Config.0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.3 | |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | Slot | 40 | 5ms |

| | | | | |
|---|---|---|---|---|
| Offset of PUCCH for SR configuration for BFR on SCell | | Slot | 5 | |
| PUCCH parameters for SR configuration for BFR on SCell | | | Table 8.3.3.1.2-1 in [13] | |
| csi-RS-Index assigned as BFD RS in set (q00) | | | 0 | |
| csi-RS-Index assigned as BFD RS in set (q01) | | | 2 | |
| CSI-RS index assigned as RLM RS | | | 0, 1 | |
| CSI-RS Index assigned as CBD RS in set (q10) | | | 1 | |
| CSI-RS Index assigned as CBD RS in set (q11) | | | 3 | |
| SSB index assigned as RLM RS | | | 0, 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1 | dBm/SCS | -109 Note 2 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 10.81 | |
| T3 | | s | 10.28 | |
| T4 | | s | 0 | |
| T5 | | s | 0.57 | |
| D1 | | s | 0.53 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 2: Including test tolerance given in Annex F.1.3.2. | | | | |

### 7.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.9.4.3. NR *RRCReconfiguration* message is contained in *RRCConnectionReconfiguration* and NR *RRCReconfigurationComplete* message is contained in *RRCConnectionReconfigurationComplete*.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.9.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.9.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.9.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.9.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.9.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{10}$ and $q_{11}$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD<br>Table H.3.1-12A on Cell 3<br>Table H.3.1-13 on Cell 3 with condition SpCell<br>Table H.3.7-1 with condition DRX.3 |

**Table 7.5.5.7.4.3-2: *MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

**Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sl40 | 4 | | |
| } | | | |
| } | | | |

7.5.5.9.5 Test requirement

Tables 7.5.5.9.4.1-3 and 7.5.5.9.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

**Table 7.5.5.9.5.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | Unit | Cell1 | Cell2 | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 3 as specified in clause A.9.1 | | | | | |
| Assumption for UE beams Note 10 | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | | |
| SNR_CSI-RS of set $q_{0,0}$ | dB | 13.7 | 13.7 | 5.7 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_{0,1}$ | dB | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| SNR_CSI-RS of set $q_{1,0}$ | dB | 0.2 | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_{0,1}$ | dBm/ SCS kHz | -104.5 | -104.5 | -104.5 | -84.7 | -84.7 | -847 |
| $N_{oc}$ | dBm/120 kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | TDL-A 30ns 75Hz | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause TS38.133 A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: AoA1 for PCell and TRP1 of SCell, AoA2 for TRP2 of SCell

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.7.5.5.9.1 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP0 and TRP1.

During the period from time point A to time point B the UE shall transmit uplink signal in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP0.

During T3 the UE shall detect beam failure and initiate link recovery for TRP0. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$.

No later than time point F occurring no later than D1 = [520]+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{0,1}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.10 NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TS 38.522 applicability spec update is pending

### 7.5.5.10.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific SSB-based beam failure and link recovery in the sets $\bar{q}_{0,0}$ and $\bar{q}_{1,0}$ for TRP0 with *schedulingRequestID-BFR-r17* configured, when no DRX is used for an FR2 serving cell requirements in TS38.133[6] clause 8.18.

### 7.5.5.10.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific PCell BFR.

### 7.5.5.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.10.

### 7.5.5.10.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.10.4-1 shows the variation of the downlink SNR of the SSB in set $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ for TRP0 and TRP1 respectively. Figure 7.5.5.10.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $\bar{q}_{1,0}$ for TPR0.

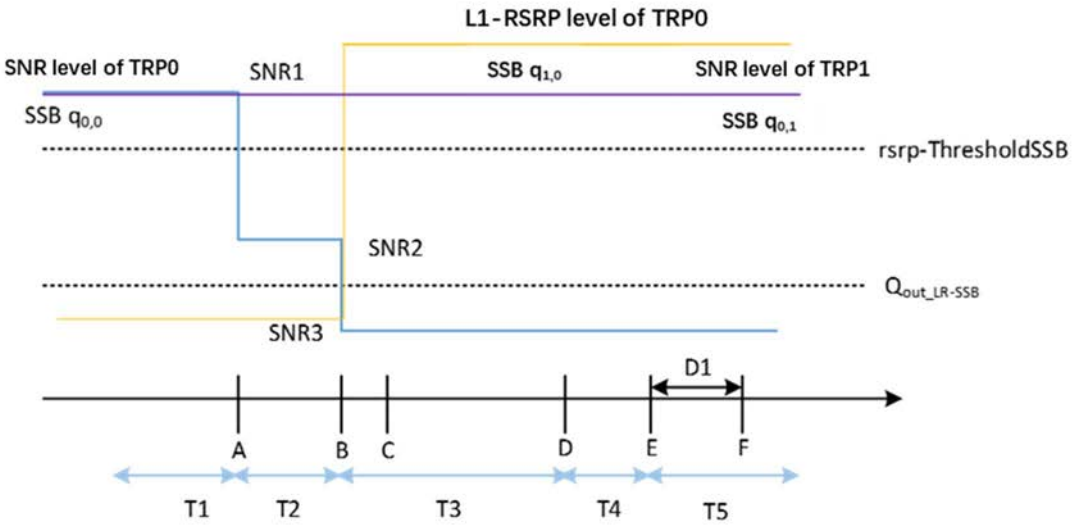



**Figure 7.5.5.10.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 7.5.5.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.10.4.1-1.

**Table 7.5.5.10.4-1: Supported test configurations for FR2 PCell**

| Configuration | Description |
|---|---|
| 1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.10.4.1-2.

**Table 7.5.5.10.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.10.4.1-3.
2. Message contents are defined in clause 7.5.5.10.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.5.10.4.1-3: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | Same configuration for both TRP wherever applicable |
| Active PCell | | | Cell 1 | |
| RF Channel Number for PCell | | | 1 | |
| Duplex mode | Config 1,2 | | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | |
| BW channel | Config 1,2 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1,2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 120 | |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | |
| PDSCH Reference Channel | Config 1 | | SR.3.2 TDD | |
| | Config 2 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | |
| | Config 2 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD | |
| | Config 2 | | CCR.3.7 TDD | |
| OCNG parameters | Config 1,2 | | OP.1 | |
| CP length | Config 1,2 | | Normal | |
| PDSCH/PDCCH TCI state | Config 1,2 | | TCI.State.0 | |
| CSI-RS for tracking | Config 1,2 | | TRS.2.1 TDD | |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.3.1 TDD | |
| reportConfigType | Config 1,2 | | periodic | |
| reportQuantity | Config 1,2 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2 | slot | 40 | |
| CSI reporting offset | Config 1,2 | slot | 4 | |
| SSB Configuration for TRP0 | Config 1 | | SSB.1 FR2 | |
| | Config 2 | | SSB.2 FR2 | |
| SSB Configuration for TRP1 | Config 1 | | SSB.9 FR2 | |
| | Config 2 | | SSB.10 FR2 | |
| SMTC Configuration | Config 1,2 | | SMTC.3 | |
| PRACH Configuration | Config 1,2 | | FR2 PRACH configuration 2 | |
| DRX configuration | Config 1,2 | | OFF | |
| SSB Index assigned as BFD RS (q0,0) | Config 1,2 | | 0 | |
| SSB Index assigned as CBD RS (q1,0) | Config 1,2 | | 1 | |
| SSB Index assigned as BFD RS (q0,1) | Config 1,2 | | 2 | |
| SSB Index assigned as CBD RS (q1,1) | Config 1,2 | | 3 | |
| SSB Index assigned as RLM RS | Config 1,2 | | 0,1,2,3 | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |

| | | | | |
|---|---|---|---|---|
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| Gap pattern ID | | | gp0 | |
| gapOffset | | | 0 | |
| schedulingRequestID-BFR- r17 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on PCell | | slot | 40 | 5ms |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. |
| rsrp-ThresholdSSB | Config 1 | dBm/SCS | -109 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 2 | | -106 | |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 2.61 | |
| T3 | | s | 1.64 | |
| T4 | | s | 0 | |
| T5 | | s | 1.01 | |
| D1 | | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 7.5.5.10.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.10.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.10.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.10.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.10.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.10.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect a preamble on a beam associated with candidate beam set $q_{10}$before time point B; and

c) detects preamble on a beam associated with candidate beam set $q_{10}$before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.10.5-1.
9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.5.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.10.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD<br><br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.7-1 with Condition TRP-SPECIFIC-BFD |

**Table 7.5.5.10.4.3-2: *MAC-CellGroupConfig for R17 BFR***

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

### 7.5.5.10.5 Test requirement

Tables 7.5.5.10.4.1-3 and 7.5.5.10.5-1 define the primary level settings including test tolerances for TRP specific NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table7.5.5.10.5-1: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 3 as specified in clause A.9.1 Note 12 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_{0,0}$ | Config 1-2 | dB | 13.7 Note 11 | 5.5 Note 11 | -12 | -12 | -12 |
| SNR_SSB of set $q_{0,1}$ | Config 1-2 | dB | 13.7 Note 11 | 13.7 Note 11 | 13.7 Note 11 | 13.7 Note 11 | 13.7 Note 11 |
| SNR_SSB of set $q_{1,0}$ | Config 1-2 | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| SSB_RP of set $q_{1,0}$ | Config 1 | dBm/ SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 2 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | Config 1,2 | dBm/120 kHz | -104.7+TT | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: AoA1 for TRP1 and AoA2 for TRP2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP 0 and TRP1.

During the period from time point A to time point B the UE shall transmit uplink signal for TRP0 and TRP1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission for TRP 1.

During T3 the UE shall detect beam failure and initiate link recovery for TRP 0. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{0,1}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{0,1}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.5.11 to 7.5.5.13

## 7.5.5.14 NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode

Editor's Note:

- MU and TT are missing
- Message contents may need to be updated
- Test procedure needs to be updated
- Applicability needs to be updated
- Annex E and F need to be updated
- Configuration of 3AoA setup and testability of the device is still FFS
- UE positioning procedure is still FFS
- Core alignment is needed for Table 7.5.5.14.4.1-3 as per latest TS 38.133 [6] changes

### 7.5.5.14.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure and link recovery in the sets $\bar{q}_{0,0}$ and $\bar{q}_{1,0}$ for TRP0 and sets $\bar{q}_{0,1}$ and $\bar{q}_{1,1}$ for TRP1 when DRX is used for an FR2 PCell requirements in clauses 7.5.5.0.5.2, 7.5.5.0.5.4 and 7.5.5.0.5.5.

### 7.5.5.14.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting [TRP specific CSI-RS based BFD and link recovery in multi-Rx operation].

### 7.5.5.14.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.14.

### 7.5.5.14.4 Test description

The test parameters are given in Tables 7.5.5.14.4-1, 7.5.5.14.4-3 and 7.5.5.14.5-1. Cell 1 is the active PCell in the test. PCell is configured with two TRPs. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.14.1-3 shows the variation of the downlink SNR of the CSI-RS in set $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ in the PCell for TRP0 and TRP1 respectively. Figure 7.5.5.14.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in $\bar{q}_{1,0}$ for TRP0. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms.

In the test, UE is capable of multi-Rx operation and configured with group-based beam reporting (GBBR) on the cell 1. During T1, UE shall be able to report via beam pair associated with sets $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1. After T5, UE shall be able to report via new beam pair associated with sets $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1

During T2 and T3, for beam failure detection, CSI-RS resources in the two sets $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1 are overlapped on the same OFDM symbol according to CSI-RS configuration in table 7.5.5.14.4.1-3 and A.1.4.2-3, and the conditions in clause 7.5.5.0.5.2 are met, at least including:

- Both CSI-RSs are not in any CSI-RS resource set with repetition ON
- The CSI-RS in set $\bar{q}_{0,0}$ has same QCL source as the active TCI state of one PDSCH, and the CSI-RS in set $\bar{q}_{0,1}$ has same QCL source as the active TCI state of the other PDSCH
- Resources of the active TCI states for the two PDSCHs have been reported as a resource group in Rel-17 group-based RSRP report.

During T4 and T5, for candidate beam detection, CSI-RS resources in the two sets $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1 are also overlapped according to CSI-RS configuration in table 7.5.5.14.4.1-3 and and A.1.4.2-3.

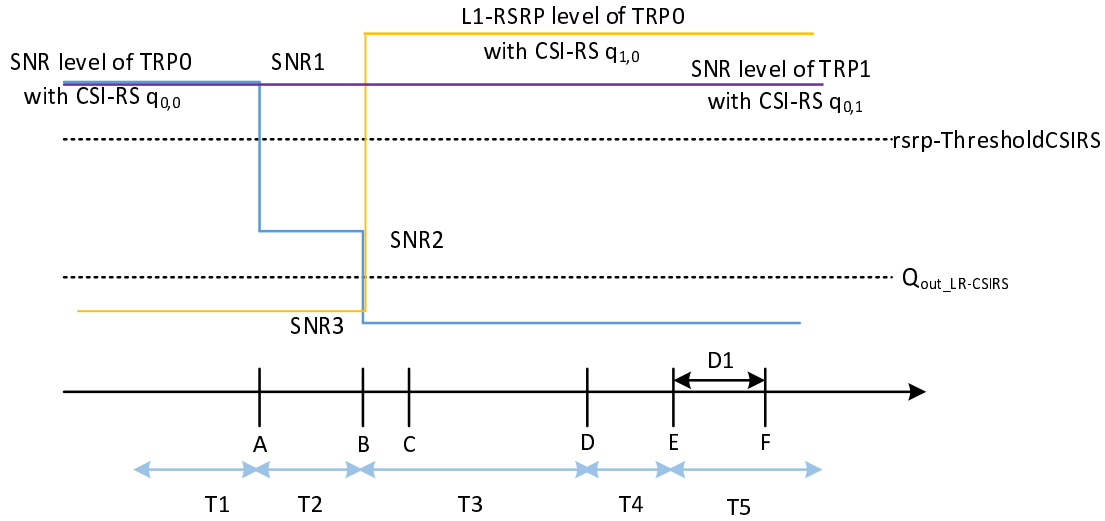



**Figure 7.5.5.14.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for PCell in DRX mode**

### 7.5.5.14.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.14.4.1-1.

**Table 7.5.5.14.4-1: Supported test configurations for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Configuration | Description |
|---|---|
| 7.5.5.14-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.14.4.1-2.

**Table 7.5.5.14.4.1-2: Initial conditions for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.5.14.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.5.14.4.1-3.
2. Message contents are defined in clause 7.5.5.14.4.3.
3. There is one NR cell specified in the test. Cell 1 is the active PCell cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.5.5.14.4.1-3: General test parameters for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number for PCell | | | 1 | |
| Duplex mode | Config 1 | | TDD | |
| BW channel | Config 1 | | 100: $N_{PRB,c}$ = 66 | |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.1.2 |
| SSB Configuration | Config 1 | | SSB.3 FR2 | A.3 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.4 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz | |
| PRACH Configuration | Config 1 | | PRACH.1 FR2 | Table A.7.2-1 |
| CSI-RS configuration for TRP0 | Config 1 | | CSI-RS.3.2 TDD | A.1.4.2 |
| CSI-RS configuration for TRP1 | Config 1 | | CSI-RS.3.6 TDD | A.1.4.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.1.4.2 |
| TRS configuration | Config 1 | | TRS.2.1 TDD | |
| TCI configuration | Config 1 | | CSI-RS.Config.0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| OCNG parameters | | | OP.1 | A.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.3 | |
| Gap pattern ID | | | N/A | |
| schedulingRequestID-BFR-SCell-r16 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | Slot | 40 | 5 ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | Slot | 5 | |
| PUCCH parameters for SR configuration for BFR on SCell | | | Table 8.3.3.1.2-1 in [28] | |
| CSI-RS Index assigned as BFD RS in set ($q_{0,0}$) | | | 0 | |
| CSI-RS Index assigned as CBD RS in set ($q_{1,0}$) | | | 1 | |
| CSI-RS Index assigned as BFD RS in set ($q_{0,1}$) | | | 2 | |
| CSI-RS Index assigned as CBD RS in set ($q_{1,1}$) | | | 3 | |
| CSI-RS index assigned as RLM RS | | | 0, 1 | |
| SSB index assigned as RLM RS | | | 0, 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 in [6]). |
| rsrp-ThresholdCSI-RS | Config 1 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_CSI-RS}$ |

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |
| powerControlOffsetSS | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | n1 | see TS 38.321 12], clause 5.17 |
| beamFailureDetectionTimer | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| T310 Timer | ms | 1000 | |
| N310 | | 2 | |
| T1 | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 (BFD time +CBD time +margin) | s | 5.69 | |
| T3 (BFD time +margin) | s | 5.16 | |
| T4 | s | 0 | |
| T5 (CBD time +margin) | s | 0.57 | |
| D1 (CBD time +margin) | s | 0.53 | |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 7.5.5.14.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 configuring UE with *groupBasedBeamReporting-r17* on Cell 1 and periodic CSI reporting.
3. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
4. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.14.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.14.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.14.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.14.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.14.5-1. T5 starts.
9. If the SS:

   a) detects uplink power at least in all subframes configured for CSI transmission on Cell 1 with sets $\bar{q}_{0,0}$ for TRP0 and sets $\bar{q}_{0,1}$ for TRP1 (UE reports via beam pair assoiated with sets $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1) during time periods T1, T2; and

   b) detects uplink power on NR carrier in each slot configured for CSI transmission according to the configured periodic CSI reporting for Cell 1 during the period from time point A to time point B; and

   c) detects uplink power at least in all subframes configured for CSI transmission on Cell 1 with sets $\bar{q}_{0,1}$ for TRP1 from time point B to time point F; and

   d) does not detect a preamble on a beam associated with candidate beam set $\bar{q}_{1,0}$ for TRP0 earlier than time point B; and

e) detects PUCCH with LRR, followed by BFR MAC CE containing beam associated with the candidate beam with sets $\bar{q}_{1,0}$ for TRP0 before time point F (D1 after the start of T5); and

f) detects uplink power on NR carrier in all subframes configured for CSI transmission on Cell 1 with sets $\bar{q}_{0,1}$ for TRP1 during time priods T3, T4 and T5,

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.14.5-1.

11. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

12. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat steps 2-12 until the confidence level according to Annex G clause G.2.3 is achieved.

### 7.5.5.14.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.5.14.4.3-1: Common Exception messages for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8A with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.7-1 with Condition DRX.3 |

**Table 7.5.5.14.4.3-2: *MAC-CellGroupConfig* for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| schedulingRequestID-BFR-r17 | Not present | | |
| schedulingRequestID-BFR2-r17 | Not present | | |
| schedulingRequestConfig-v1700 | SchedulingRequest-Config | | |
| } | | | |

### 7.5.5.14.5 Test requirement

Tables 7.5.5.14.4.1-3 and 7.5.5.14.5-1 define the primary level settings including test tolerances for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode.

**Table7.5.5.14.5-1: Cell specific test parameters for NR SA FR2 PCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in multi-Rx operation and DRX mode**

| Parameter | Unit | Cell 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 6 as specified in clause A.9.6 Note 11 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |

| Parameter | Unit | Cell 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR_CSI-RS of set $q_{0,0}$ | dB | 5+TT | -3+TT | -12+TT | -12+TT | -12+TT |
| SNR_CSI-RS of set $q_{0,1}$ | dB | 5+TT | 5+TT | 5+TT | 5+TT | 5+TT |
| SNR_CSI-RS of set $q_{1,0}$ | dB | 0.2+TT | 0.2+TT | 20.2+TT | 20.2+TT | 20.2+TT |
| CSI-RS_RP of set $q_{1,0}$ | dBm/ SCS kHz | -104.5+TT | -104.5+TT | -84.5+TT | -84.5+TT | -84.5+TT |
| $N_{oc}$ | dBm/120 kHz | -104.7+TT | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Void
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.14.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
NOTE 10: Information about types of UE beam is given in clause B.2.1.3 and does not limit UE implementation or test system implementation.
NOTE 11: AoA1 and AoA3 are for TRP0 of PCell, AoA2 is for TRP1 of PCell. AoA1 and A0A2 are from the set of qualified AoA pairs according to A.3.15.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 with sets $\bar{q}_{0,0}$ for TRP0 and sets $\bar{q}_{0,1}$ for TRP1. During T1, UE reports via beam pair assoiated with sets $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1.

During the period from time point A to time point B the UE shall transmit uplink signal in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 with sets $\bar{q}_{0,1}$ for TRP1.

During T3 the UE shall detect beam failure and initiate link recovery for TRP0. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate sets $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1.

No later than time point F occurring no later than D1 after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing beam associated with the candidate beam with sets $\bar{q}_{1,0}$ for TRP0. The UE shall not transmit PUCCH with an LRR with candidate beam set $\bar{q}_{1,0}$ for TRP0 earlier than time point B.

After T5, UE shall be able to report via new beam pair associated with sets $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{0,1}$ for TRP1.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90 %.

## 7.5.6 Active BWP switch delay

### 7.5.6.1 DCI-based and time-based active BWP switch

#### 7.5.6.1.0 Minimum conformance requirements

[TS 38.133, clause 8.6.2]

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot n+ $T_{BWPswitchDelay}$.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 7.5.6.1.0-1.

**Table 7.5.6.1.0-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

### 7.5.6.1.1 NR SA FR2 DCI-based DL active BWP switch in non-DRX

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

#### 7.5.6.1.1.1 Test purpose

FFS

#### 7.5.6.1.1.2 Test applicability

FFS

#### 7.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.1.

7.5.6.1.1.4 Test description

7.5.6.1.1.4.1 Initial conditions

FFS

7.5.6.1.1.4.2 Test procedure

FFS

7.5.6.1.1.4.3 Message contents

FFS

7.5.6.1.1.5 Test requirements

FFS

### 7.5.6.1.2 NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

*- NR FR1 - FR2 OTA testability is still FFS.*

7.5.6.1.2.1 Test purpose

FFS

7.5.6.1.2.2 Test applicability

FFS

7.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.2.

7.5.6.1.2.4 Test description

7.5.6.1.2.4.1 Initial conditions

FFS

7.5.6.1.2.4.2 Test procedure

FFS

7.5.6.1.2.4.3 Message contents

FFS

7.5.6.1.2.5 Test requirements

FFS

### 7.5.6.1.3 NR SA FR2 DCI-based DL active BWP switch in non-DRX

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Test tolerance analysis is missing*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

#### 7.5.6.1.3.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6

#### 7.5.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

#### 7.5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.3.

#### 7.5.6.1.3.4 Test description

There is one cell configured in this test. Cell 1 is PCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

##### 7.5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.6.1.3.4.1-1.

**Table 7.5.6.1.3.4.1-1: Supported test configurations for NR SA FR2 DCI-based DL active BWP switch in non-DRX**

| Config | Description |
|---|---|
| 7.5.6.1.3-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: A UE which fulfils the requirements in test case 7.5.6.1.1 or 7.5.6.1.2 can skip the test cases in 7.5.6.1.3. | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

**Table 7.5.6.1.3.4.1-2: Initial conditions for NR SA FR2 DCI-based DL active BWP switch in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 5.5.5.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.6.1.3.4.1-3.
2. Message contents are defined in clause 7.5.6.1.3.4.3.

3. There is one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.5.6.1.3.4.1-3: General test parameters for NR SA FR2 DCI-based DL active BWP switch in non-DRX**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

#### 7.5.6.1.3.4.2 Test procedure

FFS

#### 7.5.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.6.1.3.4.3-1: Common Exception messages for NR SA FR2 DCI-based DL active BWP switch in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

#### 7.5.6.1.3.5 Test requirements

FFS

### 7.5.6.2 RRC-based active BWP switch

#### 7.5.6.2.0 Minimum conformance requirements

FFS

#### 7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX

*Editor's note: This test case is incomplete. The following aspects are either missing or TBD*

*- Message contents are TBD*

*- Cell mapping is TBD*

*- Test procedure is TBD*

*- Test applicability needs to be added to TS 38.522*

#### 7.5.6.2.1.1 Test purpose

FFS

#### 7.5.6.2.1.2 Test applicability

FFS

#### 7.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.2.1.

#### 7.5.6.2.1.4 Test description

##### 7.5.6.2.1.4.1 Initial conditions

FFS

##### 7.5.6.2.1.4.2 Test procedure

FFS

##### 7.5.6.2.1.4.3 Message contents

FFS

#### 7.5.6.2.1.5 Test requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs right after the beginning of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k_1$.

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in [12].

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 7.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | 1 |
| Active DL BWP-1 Configuration | | DLBWP.0.2 |
| Active DL BWP-2 Configuration | | DLBWP.1.1 |
| Active UL BWP-1 Configuration | | ULBWP.1.3 |
| Active UL BWP-2 Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State | | TCI.State.0 |
| TRS Configuration | | TRS.2.1 TDD |
| Antenna Configuration | | 1x2 |
| Propagation Condition | | AWGN |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |

| Parameter | Unit | Cell 1 |
|---|---|---|
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. | | |

**Table 7.5.6.2.1.5-2: OTA related test parameters for BWP switching test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | According to table A.9 |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -112 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -103 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note3 | -85 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $\hat{E}_s / I_{ot}$ | | dB | 18 |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone | | | |

## 7.5.6.3 Simultaneous DCI-based and timer-based active BWP switch on multiple CCs

### 7.5.6.3.0 Minimum conformance requirements

#### 7.5.6.3.0.1 Minimum conformance requirements for active BWP switch on multiple SCells with non-DRX in SA

##### 7.5.6.3.0.1.1 Simultaneous DCI based BWP switch delay on multiple CCs

[TS 38.133, Clause 8.6.2A.1]

The delay requirements for simultaneous DCI based BWP switch on multiple CCs in this clause apply only if the timing difference among the first symbol of slot carrying DCI for all CCs is received within the MRTD for inter-band CA as defined in clause 7.6.4 in TS 38.133 [6].

For DCI-based BWP switch on multiple CCs, after the UE receives BWP switching request, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where slot n is slot which UE receives the earliest BWP switching request among CCs on which UE is performing simultaneous DCI-based BWP switching.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths on any serving cell.

UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay} + Y$, which is defined as:

$$T_{MultipleBWPswitchDelay} = T_{BWPswitchDelay} + D*(N-1)$$

Where:

- $T_{BWPswitchDelay}$ is the BWP switching delay on single CC defined in Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* in TS 38.331 [13]. $T_{BWPswitchDelay}$ shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, $T_{BWPswitchDelay}$ shall be based on the smallest SCS among all SCS values of all involved CCs.

- D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* in TS 38.306 [11] for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* for switching between non-dormant and dormant BWPs.

- For UE which is capable of per-FR gap, and no BWP switch involves SCS change, N is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing, N is the number of CCs undergoing simultaneous BWP switch.

- Y=0, if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell.

  Y equals to the length of one slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change,

- if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 kHz.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in TS 38.133 [6] in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered on multiple CCs simultaneously within or outside DRX active time, and one of the two BWPs on each CC in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within the time duration of

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay}+X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or

- $T_{DormantMultipleBWPswitchDelay} = T_{MultipleBWPswitchDelay} +X+Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- $T_{MultipleBWPswitchDelay}$ is defined above corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 kHz.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where DCI for dormancy indication is received.

The number of CCs, N, on which the UE can simultaneously switch BWPs while still meeting the requirements, if any, related to allocations on downlink, uplink, or transmission of HARQ-ACK, depends on the UE reported capabilities related to BWP switching, the network configuration and the BWP switch method.

#### 7.5.6.3.0.1.2 Simultaneous timer-based BWP switch delay on multiple CCs

[TS 38.133, Clause 8.6.2B.1]

The delay requirements for simultaneous timer-based BWP switch on multiple CCs in this clause apply only if the timing difference among the beginning of the slot where timer-based BWP switching starts for all CCs is within the MRTD for inter-band CA as defined in clause 7.6.4 in TS 38.133 [6].

For timer-based BWP switch on multiple CCs, UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (in FR1) or DL half-subframe (in FR2) immediately after the earliest BWP-inactivity timer *bwp-InactivityTimer* defined in TS 38.331[13] expiration occurs on multiple serving cells, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{MultipleBWPswitchDelay}$ which starts from the beginning of DL slot n, where $T_{MultipleBWPswitchDelay}$ is defined in 7.5.6.3.0.1.1.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{MultipleBWPswitchDelay}$ after *bwp-InactivityTimer* (TS 38.331 [13]) expires on the cell where timer-based BWP switch occurs.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in TS 38.133 [6] in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in TS 38.133 [6] in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

#### 7.5.6.3.0.1.3 Interruptions due to active BWP switching requirement

[TS 38.133, Clause 8.2.2.2.5]

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause

apply for each BWP switch. Further, the requirements in this clause are applicable to UE capable of independent beam management in FR2 inter-band CA and UE capable of FR2 intra-band CA and FR1.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2, the UE is allowed to cause interruption of up to X slots to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 7.5.6.3.0.1.3-1. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 in TS 38.133 [6] when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ +Y as defined in clause 7.5.6.3.0.1.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 7.5.6.3.0.1.3-1. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 in TS 38.133 [6] when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ as defined in clause 8.6.2B.1 in TS 38.133 [6] when BWP switch occurs on multiple CCs simultaneously or $T_{MultipleBWPswitchDelayTotal}$ as defined in clause 8.6.2B.2 in TS 38.133 [6] when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 7.5.6.3.0.1.3-1. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ defined in clause 8.6.3 in TS 38.133 [6] when BWP switch occurs on a single CC. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ + $D_{RRC}$*(N-1) as defined in clause 8.6.3A in TS 38.133 [6] when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures (TS 38.321 [12]), UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 7.5.6.3.0.1.3-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 7.5.6.3.0.1.3-1. The starting time of interruption is only allowed within the UL BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 in TS 38.133 [6]. Interruptions are not allowed during BWP switch involving other parameter change.

**Table 7.5.6.3.0.1.3-1: Interruption length X**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| 5 | 0.03125 | 17 |
| 6 | 0.015625 | 33 |
| Note1: void | | |

**Table 7.5.6.3.0.1.3-2: Parameters which cause interruption other than SCS**

| Parameters | Comment |
|---|---|
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* | |
| *maxMIMO-Layers-r16* | |

### 7.5.6.3.1 Active BWP switch on multiple SCells with non-DRX in SA

Editor's Note: This test case is incomplete in following aspects:

- Test procedure is missing
- Message contents are missing

#### 7.5.6.3.1.1 Test purpose

The purpose of this test is to verify fulfilment of DL BWP switch delay requirement defined in clauses 8.6.2A.1 and 8.6.2B.1, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5 in TS 38.133 [6].

#### 7.5.6.3.1.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting bwp-SwitchingMultiCCs-r16, either type1-r16 or type2-r16, as well as the corresponding r15 BWP switch capabilities from legacy tests (support of at least 2 active BWPs).

#### 7.5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5.6.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.3.1.

#### 7.5.6.3.1.4 Test description

The supported test configurations are shown in Table 7.5.6.3.1.4.1-1 below. The test scenario comprises one PCell (Cell 1) and two SCells (Cell 2 and Cell 3) as given in Table 7.5.6.3.1.4.1-3. NR cell-specific parameters are provided in Table 7.5.6.3.1.5-1, and OTA related test parameters in Table 7.5.6.3.1.5-2.

The test consists of three consecutive time periods with durations T1, T2 and T3, respectively.

PDCCHs indicating new transmissions shall be transmitted in PCell, SCell1 and SCell2 throughout time periods T1 and T3 to ensure that UE sends ACK/NACKs for PDSCH reception in PCell, SCell1 and SCell2. During T2, there shall be scheduling on PDSCH in PCell only.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (SCell1) on radio channel 2 (SCC1), and Cell 3 (SCell2) on radio channel 3 (SCC2).

UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 1 (PCell). BWP-0 includes the bandwidth of the initial DL BWP and SSB.

UE is configured with two different UE-specific downlink bandwidth parts, BWP-1 and BWP-2, for Cell 2 (SCell1). BWP-1 and BWP-2 include the bandwidth of the initial DL BWP and SSB.

UE is configured with two different UE-specific downlink bandwidth parts, BWP-3 and BWP-4, for Cell 3 (SCell2). BWP-3 and BWP-4 include the bandwidth of the initial DL BWP and SSB.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PCell.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell1.

UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-3 in SCell2.

UE is configured with a *bwp-InactivityTimer* timer value for SCell1 and SCell2, respectively.

All cells have constant signal levels throughout the test.

Time period T1 starts when the UE simultaneously receives DCI format 1_1 commands for DL BWP switch in SCell1 and SCell2, respectively, in a slot # denoted *m*. The UE shall switch its SCell1 bandwidth part from BWP-1 to BWP-2, and its SCell2 bandwidth part from BWP-3 to BWP-4. The UE shall be able to receive PDSCH in SCell1 and SCell2 starting from the first DL slot that occurs after slot ($m+T_{MultipleBWPswitchDelay}$) as defined in clause 7.5.6.3.0.1.1, and to transmit ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after ($m+T_{BWPswitchDelay}+k1$) where *k1* is specified in TS 38.321 [12]. The UE shall be continuously scheduled in SCell1 BWP-2 and SCell2 BWP-4 no later than in the first DL slot that occurs after slot ($m+T_{MultipleBWPswitchDelay}$). The starting time of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall occur within the BWP switching delay. The length of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall fulfill requirements in clause 7.5.6.3.0.1.3.

Time period T2 starts when the test equipment ceases to schedule the UE on PDSCH in SCell1 and SCell2, thereby causing the *bwp-InactivityTimer* timers for SCell1 and SCell2 to be running until expiry.

Time period T3 starts at the beginning of the first DL half-subframe immediately after the earliest of the *bwp-InactivityTimer* timers expires, in a slot # denoted *n*. The UE shall switch its SCell1 bandwidth part from BWP-2 to BWP-1, and its SCell2 bandwidth part from BWP-4 to BWP-3. The UE shall be able to receive PDSCH in SCell1 and SCell2 starting from the first DL slot that occurs after slot ($n+T_{MultipleBWPswitchDelay}$) as defined in clause 7.5.6.3.0.1.2, and to transmit ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after slot ($n+T_{MultipleBWPswitchDelay}+k1$). The UE shall be continuously scheduled in SCell1 BWP-1 and SCell2 BWP-3 no later than in the first DL slot that occurs after slot ($n+T_{MultipleBWPswitchDelay}$). The starting time of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall occur within the BWP switching delay. The length of any interruption on PCell due to DL BWP switching of SCell1 and SCell2 shall fulfill requirements in clause 7.5.6.3.0.1.3.

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch commands are received or *bwp-InactivityTimer* timers expire until ACK/NACKs are sent in SCell1 and SCell2, respectively.

The test equipment verifies that potential interruptions of PCell due to DL BWP switching on SCell1 and SCell2 are carried out within the correct time span, and are within the correct length, by monitoring ACK/NACKs sent in PCell for PCell.

#### 7.5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.6.3.1.4.1-1.

**Table 7.5.6.3.1.4.1-1: DL BWP switch supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.3.1.4.1-2.

**Table 7.5.6.3.1.4.1-2: Initial conditions for FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.6.3.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.6.3.1.5-1.

2. Message contents are defined in clause 7.5.6.3.1.4.3.

3. There are two NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.5.6.3.1.4.1-3: General test parameters for DL BWP switch in SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2, 3 | Three NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active SCell1 | | Cell 2 | SCell1 on RF channel number 2. |
| Active SCell2 | | Cell 3 | SCell2 on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | |
| *sCellDeactivationTimer* | ms | --- | Same value applies for SCell1 and SCell2. The value infinity is applied. |
| *bwp-InactivityTimer* | ms | 200 | Same value applies for SCell1 and SCell2. |
| Cell2 timing offset to Cell1 | µs | 0 | Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. |
| Cell3 timing offset to Cell1 | µs | 0 | |
| T1 | s | 0.2 | During T1, DCI-based simultaneous BWP switching of SCell1 and SCell2 is carried out. |
| T2 | s | 0.2 | During T2 bwp-InactivityTimer timers shall run to expiry. |
| T3 | s | 0.2 | During T3, timer-based simultaneous BWP switching of SCell1 and SCell2 is carried out. |

### 7.5.6.3.1.4.2 Test procedure

TBD

### 7.5.6.3.1.4.3 Message contents

TBD

### 7.5.6.3.1.5 Test requirement

Table 7.5.6.3.1.5-1 defines the NR cell specific test parameters. Table 7.5.6.3.1.5-2 defines OTA related test parameters.

**7.5.6.3.1.5-1: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | FR2 | | |
| NR RF channel | | 1 | 2 | 3 |
| Duplex mode | | TDD | | |
| TDD configuration | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | |
| Active Downlink BWP ID | | 0 | 1, 2 | 3, 4 |
| Downlink initial BWP Configuration | | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 |
| Uplink initial BWP Configuration | | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 |
| Downlink active BWP-0 Configuration | | DLBWP.1.1 | --- | --- |
| Downlink active BWP-1 Configuration | | --- | DLBWP.1.1 | --- |
| Downlink active BWP-2 Configuration | | --- | DLBWP.1.3 | --- |
| Downlink active BWP-3 Configuration | | --- | --- | DLBWP.1.1 |
| Downlink active BWP-4 Configuration | | --- | --- | DLBWP.1.3 |
| Uplink active BWP-0 Configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |

| | | | | |
|---|---|---|---|---|
| PDSCH Reference measurement channel | | SR.3.1 TDD | | |
| TRS configuration | | TRS.2.1 TDD | | |
| TCI state | | TCI.State.0 | | |
| RMSI CORESET parameters | | CR.3.1 TDD | | |
| Dedicated CORESET parameters | | CCR.3.1 TDD | | |
| OCNG Patterns | | OP.1 | | |
| SSB Configuration | | SSB.3 FR2 | | |
| SMTC Configuration | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| Propagation Condition | | AWGN | AWGN | AWGN |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| Note 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 7.5.6.3.1.5-2: OTA related test parameters for BWP switching test case**

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in clause A.3.15.1 in TS 38.133 [6] | | |
| Assumtion for UE beams Note4 | | Fine | Fine | Fine |
| *Noc* Note1 | dBm/15kHz | -111.7 | -111.7 | -111.7 |
| *Noc* Note1 | dBm/SCS | -102.7 | -102.7 | -102.7 |
| *Ês/Noc* | dB | 7 | 7 | 7 |
| SSB-RP Note2 | dBm/SCS | -95.7 | -95.7 | -95.7 |
| *Ês/Iot* | dB | 7 | 7 | 7 |
| Io Note3 | dBm/95.04 MHz | -65.9 | -65.9 | -65.9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | |
| Note 4: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation. | | | | |

During T1, the UE shall start to send ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after the beginning of DL slot ($m+T_{MultipleBWPswitchDelay}+k1$).

During T3, the UE shall start to send ACK/NACKs in SCell1 and SCell2 from the first UL slot that occurs after the beginning of DL slot ($n+T_{MultipleBWPswitchDelay}+k1$).

During T1 and T3, the start of any interruption on PCell due to active BWP switching on SCell1 and SCell2 shall not happen outside the BWP switching delay $T_{MultipleBWPswitchDelay}$, and the length of any interruption shall not exceed the length specified in clause 7.5.6.3.0.1.3.

All of the above test requirements shall be fulfilled in order for the observed active BWP switch delays in SCell1 and SCell2 to be considered correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

### 7.5.6.5.0 Minimum conformance requirements

#### 7.5.6.5.0.1 Minimum conformance requirements for active BWP switch on multiple SCells with non-DRX in SA

[TS38.133, Clause 8.6.3A]

The requirements in this clause only apply to the case when the same type of BWP switch (RRC based BWP switch) is performed on multiple CCs simultaneously or over partially overlapping time period.

The requirements in this clause shall apply:

- Active BWP switching or parameter change of its active BWPs for SpCell

- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCells

Requirements in this clause apply only if RRC based BWP switching on multiple CCs for NR-CA is triggered by a single RRC command.

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWPs, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWPs on the serving cells on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}+D_{RRC}*(N-1)}{NR\ slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ and $T_{BWPswitchDelayRRC}$ are defined in Clause 8.6.3 in TS 38.133 [6], and

$D_{RRC} = 0$ for UE which is capable of type 1 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [TS 38.331, 13]. $D_{RRC} = D$ for UE which is capable of type 2 BWP switching delay depending on UE capability *bwp-SwitchingDelay* [TS 38.331, 13], where D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability [TS 38.306, 11].

N is the number of CCs within the NR-CA configured for performing simultaneous BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC} * (N-1)$ on the cells where RRC-based BWP switch occurs.

### 7.5.6.5.1 Active BWP switch on multiple SCells with non-DRX in SA

Editor's note: This test case is incomplete in following aspects:

- Message contents need more work

#### 7.5.6.5.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for simultaneous RRC-based BWP switch on multiple CCs defined in clause 8.6.3A in 38.133 [6].

#### 7.5.6.5.1.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting bwp-SwitchingMultiCCs-r16, either type1-r16 or type2-r16, as well as the corresponding r15 BWP switch capabilities from legacy tests (support of at least 2 active BWPs).

#### 7.5.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.5.1.

#### 7.5.6.5.1.4 Test description

##### 7.5.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for NR PCell and SCell are shown in Table 7.5.6.5.1.4.1-1.

**Table 7.5.6.5.1.4.1-1: DL BWP switch supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD -TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.5.1.4.1-2.

**Table 7.5.6.5.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.6.5.1.4.1-3.
2. Message contents are defined in clause 7.5.6.5.1.4.3.
3. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The power levels and settings for Cell 1 and Cell 2 are configured according to clause C.1.2 and C.1.3.
4. By step 4 of the test procedure:
   - UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (SCell) on radio channel 2 (SCC).
   - UE has dedicated bandwidth part BWP-1 in its RRC configuration for PCell (Cell 1) and SCell (Cell 2)
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell (Cell 1) and SCell (Cell 2).

**Table 7.5.6.5.1.4.1-3: General test parameters for DL BWP switch in SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2, 3 | Three NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |

| | | | |
|---|---|---|---|
| Active SCell | | Cell 2 | SCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell2 timing offset to Cell1 | µs | 0 | Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. |
| T1 | s | 0.2 | During T1, RRC-based simultaneous BWP switching of PCell and SCell is carried out. |

#### 7.5.6.5.1.4.2 Test procedure

The test consists of 1 time period with duration of T1. All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. NR Cell 3 is added as the SCell and activated.

2. Set the parameters according to Tables 7.5.6.5.1.4.1-3, Table 7.5.6.5.1.5-1 and Table 7.5.6.5.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* on NR Cell 1 and NR Cell 2. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 7.5.6.5.1.5-1 and Table 7.5.6.5.1.5-2 for NR Cell 1 and NR Cell 2.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

6. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PCell and SCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 7.5.6.5.1.5-1 and Table 7.5.6.5.1.5-2.

7. T1 starts from the end of the slot (denote as slot #i) in which the UE receives the RRC message reconfiguring PCell and SCell BWP, then it reconfigures its bandwidth part with the updated bandwidth part configuration.

   If the SS observes that,

   a) the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$; and

   b) the UE starts to report valid ACK/NACK for SCell from the first UL slot that occurs after the beginning of the DL slot $(i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC} + D_{RRC}}{\text{NR slot length}} + k_1)$,

   then count a success for the test, otherwise count a fail for the test.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS shall transmit *RRCConnectionReconfiguration* message to add NR cell (SCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 8 or step 9 fails, switch off and on the UE and go to step 1.

10. Repeat steps 3-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.6.5.1.4.3-1: Common Exception messages**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1 |

**Table 7.5.6.5.1.4.3-2: *RRCReconfiguration* (Test procedure, step 3 and step 6)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 7.5.6.5.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.6.5.1.4.3-3: *CellGroupConfig* (Table 7.5.6.5.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig | Table 7.5.6.5.1.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | Entry 1 | |
| sCellIndex | ServCellIndex of NR SCell | | |
| sCellConfigDedicated | ServingCellConfig | Table 7.5.6.5.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.6.5.1.4.3-4: *ServingCellConfig* (Table 7.5.6.5.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 7.5.6.5.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |

| | | | |
|---|---|---|---|
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1<br>Table 7.5.6.5.1.4.3-6 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.6.5.1.4.3-5: *BWP-Downlink* (Table 7.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

**Table 7.5.6.5.1.4.3-6: BWP-Uplink (Table 7.5.6.5.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 6 |
| } | | | |
| } | | | |

### 7.5.6.5.1.5 Test requirements

Tables 7.5.6.5.1.4.1-3, 7.5.6.5.1.5-1 and 7.5.6.5.1.5-2 define the primary level settings including test tolerances.

**Table 7.5.6.5.1.5-1: NR Cell specific test parameters for DL BWP switch in SA**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Frequency Range | | FR2 | |
| NR RF channel | | 1 | 2 |
| Duplex mode | | TDD | |

| | | | | |
|---|---|---|---|---|
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| Active Downlink BWP ID | | | 0 | 1 |
| Downlink initial BWP Configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Uplink initial BWP Configuration | | | ULBWP.0.2 | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | | DLBWP.1.3 | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | | ULBWP.1.3 | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | | DLBWP.1.1 | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | |
| TRS configuration | | | TRS.2.1 TDD | |
| TCI state | | | TCI.State.0 | |
| RMSI CORESET parameters | | | CR.3.1 TDD | |
| Dedicated CORESET parameters | | | CCR.3.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SSB Configuration | | | SSB.3 FR2 | |
| SMTC Configuration | | | SMTC.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| Propagation Condition | | | AWGN | AWGN |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 1x2 Low |

Note 1: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 7.5.6.5.1.5-2: OTA related test parameters for BWP switching test case**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in clause A.3.15.1 | |
| Assumtion for UE beams Note4 | | Fine | Fine |
| *Noc* Note1 | dBm/15kHz | -111.7 | -111.7 |
| *Noc* Note1 | dBm/SCS | -102.7 | -102.7 |
| *Ês/Noc* | dB | 7 | 7 |
| SSB-RP Note2 | dBm/SCS | -85 | -85 |
| *Ês/Iot* | dB | 18 | 18 |

| | | | |
|---|---|---|---|
| $Io^{Note3}$ | dBm/95.04 MHz | -56 | -56 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | |

During T1, the UE shall be ready for the reception of uplink grant for PCell and SCell in the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$).

All of the above test requirements shall be fulfilled in order for the observed PCell and SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.7 PSCell addition and release delay

### 7.5.7.0 Minimum conformance requirements

#### 7.5.7.0.1 Minimum conformance requirements for PSCell addition delay

Upon receiving PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards PSCell in FR2 no later than in subframe $n + T_{config_PSCell}$:

Where:

$T_{config_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing} = 40$ ms.

$T_{search}$ is the time for AGC settling and PSS/SSS detection. If the target cell is known, $T_{search} = 0$ ms. If the target cell is unknown and the target cell $\hat{E}s/Iot \geq -2$dB, $T_{search} = 24*$ Trs ms.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = 1*$Trs ms for a known or unknown PSCell.

$T_{PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{PSCell_DU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the PSCell configuration command:

- the UE has sent a valid measurement report for the PSCell being configured and
- One of the SSBs measured from the PSCell being configured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell configuration delay $T_{config_PSCell}$ according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

Otherwise, it is unknown.

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.2.

#### 7.5.7.0.2 Minimum conformance requirements for PSCell release delay

The requirements in this clause shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [13] no later than in subframe $n+ T_{RRC_delay}$:

Where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.3.

### 7.5.7.1 NR SA FR2 addition and release delay of known PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure
- Connection diagram
- Message contents are not complete.
- Test Requirements (still brackets in core-spec for PRACH preamble time [112] ms and CSI report time [20] ms)
- TT analysis is missing.
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E
- NR FR1 - FR2 OTA testability is still FFS.

#### 7.5.7.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is known to the UE at the time of addition.

#### 7.5.7.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.1.

7.5.7.1.4 Test description

7.5.7.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.1.4.1-1.

**Table 7.5.7.1.4.1-1: Supported test configurations for NR SA FR2 PSCell**

| Config | Description |
|---|---|
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.7.1.4.1-2.

**Table 7.5.7.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3.. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.7.1.4.1-3.

2. Message contents are defined in clause 7.5.7.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.7.1.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test |
| Active PCell | | | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell | | | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| A4 | Hysteresis | dB | 0 | Hysteresis for event A4 |
| | **Threshold RSRP** | dBm | -97 | Threshold for event A4 |
| | **Time to Trigger** | S | 0 | Time to trigger for event A4 |
| DRX | | | OFF | For both PCell and PSCell once activated |
| Measurement gap pattern ID | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration in Cell 2 | | | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | | ms | [2] | |
| T1 | | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell 2 and report event B1. |
| T3 | | s | 3.5 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |

| | | | |
|---|---|---|---|
| T4 | s | 1 | During this time the UE adds the PSCell. |
| T5 | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T6 | s | 1 | During this time the UE releases the PSCell. |

#### 7.5.7.1.4.2 Test procedure

TBD

#### 7.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.7.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

### 7.5.7.1.5 Test requirement

TBD

## 7.5.7.2 NR SA FR2 addition and release delay of unknown PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure
- Connection diagram
- Message contents are not complete
- Test Requirements (still brackets in core-spec for PRACH preamble time [572] ms and CSI report time [20] ms)
- TT analysis is missing
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E
- NR FR1 - FR2 OTA testability is still FFS.

### 7.5.7.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is unknown to the UE at the time of addition.

### 7.5.7.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.2.

7.5.7.2.4 Test description

7.5.7.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.2.4.1-1.

**Table 7.5.7.2.4.1-1: Supported test configurations for NR SA FR2 PSCell**

| Config | Description |
|---|---|
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.73.2.4.1-2.

**Table 7.5.7.2.4.1-2: Initial conditions for NR SA FR2 PSCell addition and release delay**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.3.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.7.2.4.1-3.
2. Message contents are defined in clause 7.5.7.2.4.3.
3. There are two NR carriers, and 2 NR Cells specified in the test. Cell 1 is the PCell, and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.7.2.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell | | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| DRX | | OFF | For both PCell and PSCell once activated |
| PRACH configuration in Cell 2 | | FR2 PRACH configuration 2 | PRACH configuration as specified in clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | ms | [2] | |
| T1 | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | s | 1 | During this time the UE adds the PSCell. |
| T3 | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | s | 1 | During this time the UE releases the PSCell. |

7.5.7.2.4.2 Test procedure

TBD

#### 7.5.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.5.7.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

#### 7.5.7.2.5 Test requirement

TBD

## 7.5.8 Active TCI state switch delay

### 7.5.8.0 Minimum conformance requirements

#### 7.5.8.0.0 Known conditions for TCI state

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remains detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state ≥ -3dB

Otherwise, the TCI state is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 8.10.2.

#### 7.5.8.0.1 Minimum conformance requirements for MAC-CE based active TCI state switch

If the target TCI state is known (according to clause 7.5.8.0.0), upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.Where $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];

- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB\text{-}proc}$ = 2 ms;
- $TO_k$ = 1 if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown (according to clause 7.5.8.0.0), upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ +$3N_{slot}^{subframe,\mu}$ + $T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$+ $T_{SSB\text{-}proc}$) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

Where

- $T_{L1\text{-}RSRP}$ = 0 in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
- $T_{L1\text{-}RSPR_Measurement_Period_SSB}$ for SSB as specified in TS 38.133 [6] clause 9.5.4.1,
  - with the assumption of M=1
  - with $T_{Report}$ = 0
- $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in TS 38.133 [6] clause 9.5.4.2
  - configured with higher layer parameter *repetition* set to ON
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with $T_{Report}$ = 0
- $TO_{uk}$ = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD
- $TO_{uk}$ = 1 when TCI state switching involves other QCL types only
- $T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;
- The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

The normative reference for this requirement is TS 38.133 [6] clause 8.10.3.

### 7.5.8.0.2 Minimum conformance requirements for RRC based active TCI state switch

If the target TCI state is known (according to clause 7.5.8.0.0), UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ ($T_{RRC_processing}$ +$TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$)) / *NR slot length*, The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in Clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].
- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state.
- $T_{SSB\text{-}proc}$ and $TO_k$ are defined in Ts 38.133 [6] clause 8.10.3.

If the target TCI state is unknown (according to clause 7.5.8.0.0), UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ ($T_{RRC_processing}$ +$T_{L1\text{-}RSRP}$ +$TO_{uk}$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$)) / *NR slot length*, The UE is not required to receive PDCCH/PDSCH/CSI-RS or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in clause 12 of TS 38.331 [13].

- $T_{first\text{-}SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing time at the UE for other QCL types;

  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

- $T_{L1\text{-}RSRP}$, $TO_{uk}$ and $T_{SSB\text{-}proc}$ are defined in TS 38.133 [6] clause 8.10.3.

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When $T_{HARQ} > T_{RRC_processing}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.10.5.

#### 7.5.8.0.3 Minimum conformance requirements for MAC-CE based active TCI state switch in HST FR2

For FR2 power class 6 UE, if the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the symbol m of the first slot that is after slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$ + $TO_k$*($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$ + $T_{rs}$ + $T_{rs\text{-}proc}$) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.Where $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];

- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;

- $T_{SSB\text{-}proc}$ = 2 ms;

- $T_{rs}$ is time to the first TRS or SSB transmission after the SSB transmission in the definition of $T_{first\text{-}SSB}$ is processed by the UE;

- $T_{rs\text{-}proc}$ = 2 ms;

- $TO_k$ = 1, m = 0 if target TCI state is not in the active TCI state list for PDSCH; otherwise $TO_k$ = 0, m = 1.

When *highSpeedMeasFlagFR2-r17* is configured and *highSpeedLargeOneStepUL-TimingFR2-r17* is enabled for UE supporting FR2 power class 6 and *ue-OneShotUL-TimingAdj-r17 largeOneStepUL-timingFR2-r17* capability, the following requirements apply to the UE:

If the UE also indicates to support *tci-StateSwitchInd-r18* and *cross-RRH TCI state indicator for UE-specific PDCCH MAC-CE* as specified in Clause 6.1.3.77 of TS 38.321 [12] is indicated as '1' for the TCI state switch

- the UE transmit timing immediately after TCI state switch shall be $T_{new} - (N_{TA} + N_{TA\,offset}) + 2\times(T_{old} - T_{new})$ and clause 7.1.2 of TS 38.133 [6] requirements don't apply.

  - The UE UL transmission timing error after the TCI state switching procedure shall be less than or equal to $\pm T_e$ as specified in clause 7.1.2 of TS 38.133 [6] if the new target TCI state is within active TCI state list, otherwise ±7*64*$T_c$, and the reference point is $T_{new} - (N_{TA} + N_{TA\,offset}) + 2\times(T_{old} - T_{new})$.

If the UE also indicates to support *tci-StateSwitchInd-r18* and *cross-RRH TCI state indicator for UE-specific PDCCH MAC*-CE as specified in Clause 6.1.3.77 of TS 38.321 [12] is indicated as '0' for the TCI state switch

- the requirement in clause 7.1.2 of TS 38.133 [6] apply to the first UL transmission after a TCI state switch.

If the UE does not indicate to support *tci-StateSwitchInd-r18* or cross-RRH TCI state indicator for UE-specific PDCCH MAC-CE as specified in Clause 6.1.3.77 of TS 38.321 [12] is not indicated for the TCI state switch

- If the absolute value $|T_{old} - T_{new}| \leq [CP/4]$, the requirement in clause 7.1.2.1 of TS 38.133 [6] apply to the first UL transmission after a TCI state switch.

- Otherwise, the UE transmit timing immediately after TCI state switch shall be $T_{new} - (N_{TA} + N_{TA\,offset}) + 2\times(T_{old} - T_{new})$ and clause 7.1.2.1 of TS 38.133 [6] requirements don't apply.

- The UE UL transmission timing error after the TCI state switching procedure shall be less than or equal to $\pm T_e$ as specified in clause 7.1.2 if the new target TCI state is within active TCI state list, otherwise $\pm 7*64*T_c$,, and the reference point is $T_{new} - (N_{TA} + N_{TA\,offset}) + 2 \times (T_{old} - T_{new})$.

Above,

- $T_{new}$ (in $T_c$ units) is the DL timing defined as the time when UE receives downlink frame with new target TCI state.
- $T_{old}$ (in $T_c$ units) is the DL timing defined as the time when UE receives downlink frame with old source TCI state.

#### 7.5.8.0.4 Known conditions for TCI state for UE operating in FR2-1 and configured with groupBasedBeamReporting-r17

Editor's note: FFS whether additional conditions are needed for tests.

Dual TCI states will be indicated in one or two TCI state switch commands. The dual target TCI states are known if the following conditions are met:

- Dual target TCI states are QCL-ed with typeD to reference signals in a resource group in the latest Rel-17 group based beam report
- The dual target TCI states and all the RSs in the two QCL chains remain detectable during the TCI state switching period
- SNR of the TCI state ≥ -3dB
- RS resource group configured for dual target TCI states is reported in the last 1280 ms.

#### 7.5.8.0.5 DCI based dual DL TCI state switching delay for mDCI for UE operating in FR2-1 and configured with groupBasedBeamReporting-r17

For mDCI, if the dual target TCI states are known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* from two TRPs which is set as 'enabled' for the DCIs scheduling two PDSCHs at slot n1 and n2 respectively, UE shall be able to receive PDSCHs with target TCI states of the serving cell on which TCI state switch occurs at the first slot that is after slot n1 + *timeDurationForQCL* and slot n2 + *timeDurationForQCL* respectively, where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and apply spatial QCL information received in DCI for PDSCHs processing as described in TS 38.214 [19], the value of *timeDurationForQCL* is defined in TS 38.331 [13]. UE shall be able to simultaneously receive PDSCHs with target TCI states after slot max(n1, n2) + *timeDurationForQCL*.

For mDCI, if the dual target TCI states are known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* from one TRP which is set as 'enabled' for the DCI scheduling PDSCHs at slot n1, while the indicated TCI for the other TRP remains unchanged, UE shall be able to simultaneously receive PDSCHs with target dual TCI states of the serving cell on which TCI state switch occurs at the first slot that is after slot n1 + *timeDurationForQCL*.

The known condition for dual target TCI states defined in clause 7.5.8.0.4 is applied.

#### 7.5.8.0.6 DCI based dual DL TCI state switching delay for sDCI for UE operating in FR2-1 and configured with groupBasedBeamReporting-r17

For sDCI, if the dual target TCI states are known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* from one TRP which is set as 'enabled' for the CORESET scheduling two PDSCHs at slot n, UE shall be able to receive PDSCHs with target TCI states of the serving cell on which TCI state switch occurs at the first slot that is after slot n+*timeDurationForQCL*, where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and apply spatial QCL information received in DCI for PDSCHs processing as described in TS 38.214 [19], the value of *timeDurationForQCL* is defined in TS 38.331 [13].

The known condition for dual target TCI states defined in clause 7.5.8.0.4 is applied.

### 7.5.8.1 NR SA FR2 MAC-CE based active TCI state switch

### 7.5.8.1.1 NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state

#### 7.5.8.1.1.1 Test purpose

The purpose of this test is to verify the MAC-CE based active TCI state switch delay requirement specified in clause 7.5.8.0.1.

#### 7.5.8.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

#### 7.5.8.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.1.1.

#### 7.5.8.1.1.4 Test description

##### 7.5.8.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.1.1.4.1-1.

**Table 7.5.8.1.1.4.1-1: Supported test configurations for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Config | Description |
|---|---|
| 7.5.8.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.1.1.4.1-2.

**Table 7.5.8.1.1.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.5.8.1.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.5.8.1.1.4.1-3.

**Table 7.5.8.1.1.4.1-3: General test parameters for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |

#### 7.5.8.1.1.4.2 Test procedure

The test scenario comprises of one NR PCell (Cell 1) as given in Table 7.5.8.1.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.1.1.5-1. The OTA related test parameters for FR2 are shown in Table 7.5.8.1.1.5-2.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCIstate 1 (QCL'd to SSB1), in Cell 1 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure 7.5.8.1.1.5-1 and Figure 7.5.8.1.1.5-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 till n+ $T_{HARQ}$ +3 ms. The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ $T_{HARQ}$ +3 ms + ($T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$).

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.1.1.5-1. Propagation conditions are set according to clause C.2.3.
3. The SS transmits an *RRCReconfiguration* message to configure 2 different TCI states for Cell 1, PDCCH TCI state 0 (QCL'd to SSB0) and TCIstate 1 (QCL'd to SSB1), as indicated in clause 7.5.8.1.1.4.3. This message does not configure *tci-PresentInDCI* in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.
4. The UE transmits an *RRCReconfigurationComplete* message.
5. The SS shall send a MAC-CE to the UE indicating TCI state 0 as the active PDCCH TCI state. The SS shall continuously transmit PDCCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.
6. T1 starts. During T1 only SSB0, to which PDCCH TCI-state 0 is QCL'd, is transmitted.
7. When T1 expires the SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reports for both SSB0 and SSB1 as indicated in clause 7.5.8.1.1.4.3. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.1.1.5-2 and SSB1, corresponding to TCI state 1, starts transmitting. T2 starts.
8. The SS sends, in slot n, a MAC-CE to indicate switch to TCI-state 1 as the active PDCCH TCI state. Slot n is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
9. During T2, if the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 until slot n + $T_{HARQ}$ +3 ms, and
   b) Receives ACK/NACK on TCI-state 1 corresponding to the next scheduled DL slot after n + $T_{HARQ}$ +5 ms + $T_{first\text{-}SSB}$, where $T_{first\text{-}SSB}$ is the time to the first SSB transmission immediately after the MAC-CE command,

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

10. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI-state 0.

11. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI-state 0 continue to step 12. Otherwise switch the UE off and on and continue to step 1.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.8.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.8.1.1.4.3-1: Common Exception messages for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.8.1.1.4.3-2: *ControlResourceSet* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 2 entries | | |
| TCI-StateId[0] | 0 | TCI.State.2 | |
| TCI-StateId[1] | 1 | TCI.State.3 | |
| } | | | |
| tci-PresentInDCI | Not present | | |
| } | | | |

**Table 7.5.8.1.1.4.3-3: *PDSCH-Config* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-Config ::= SEQUENCE { | | | |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 | |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 | |
| } | | | |
| } | | | |

**Table 7.5.8.1.1.4.3-4: *TCI-State* for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | 2 entries | | |
| { | | | |
| tci-StateId | 0 | TCI.State.2 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |

| | | | |
|---|---|---|---|
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| }, | | | |
| { | | | |
| tci-StateId | 1 | TCI.State.3 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| } | | | |
| } | | | |
| Note 1: Both TRS.2.1 TDD and TRS.2.2 TDD are configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, TRS.2.2 TDD = {4,5,6,7}, so resource #4 for each set corresponds to index 3 and 7, accordingly. | | | |

7.5.8.1.1.5 Test requirement

Tables 7.5.8.1.1.4.1-3, 7.5.8.1.1.5-1 and 7.5.8.1.1.5-2 define the primary level settings including test tolerances for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state.

**Table 7.5.8.1.1.5-1: NR Cell specific test parameters for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.2 |
| TCI State 1 | | TCI.State.3 |
| TRS Configuration | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |

| | | |
|---|---|---|
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | |

**Table 7.5.8.1.1.5-2: OTA related test parameter for NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| SS B_RP Note 2 | dBm/ SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| $\hat{E}_s / I_{otBB}$ Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.71 | -55.71 | - Infinity | -55.71 |
| Note 1: Void<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.<br>Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | | |

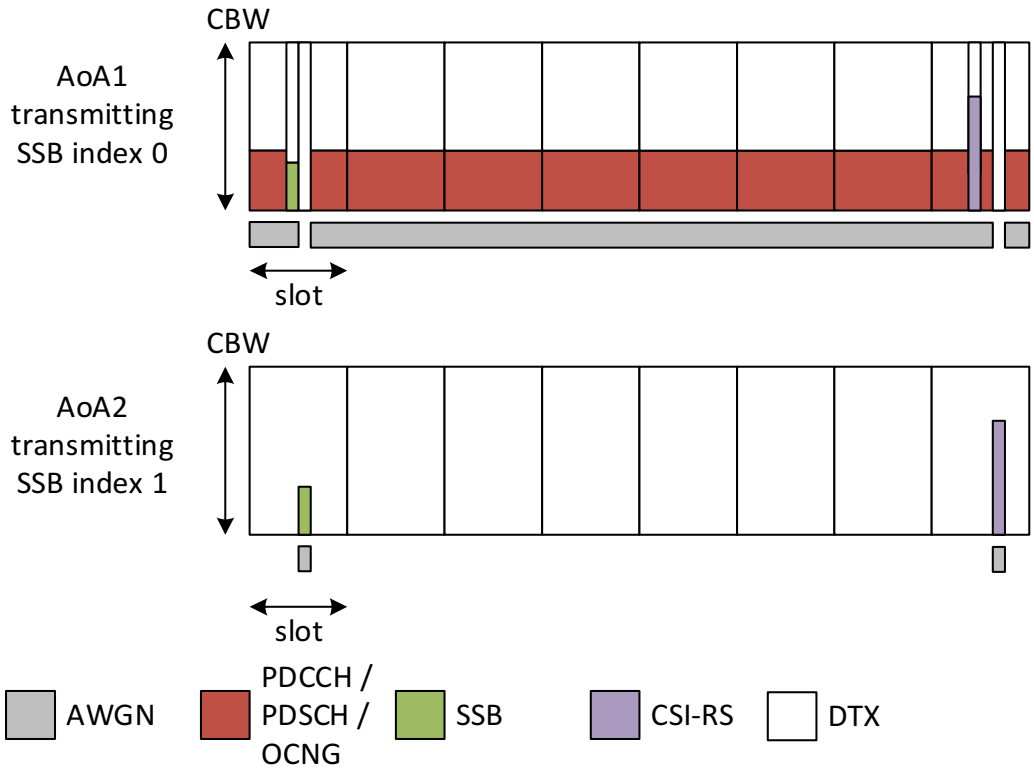



**Figure 7.5.8.1.1.5-1: Time multiplexed downlink transmissions during T1**

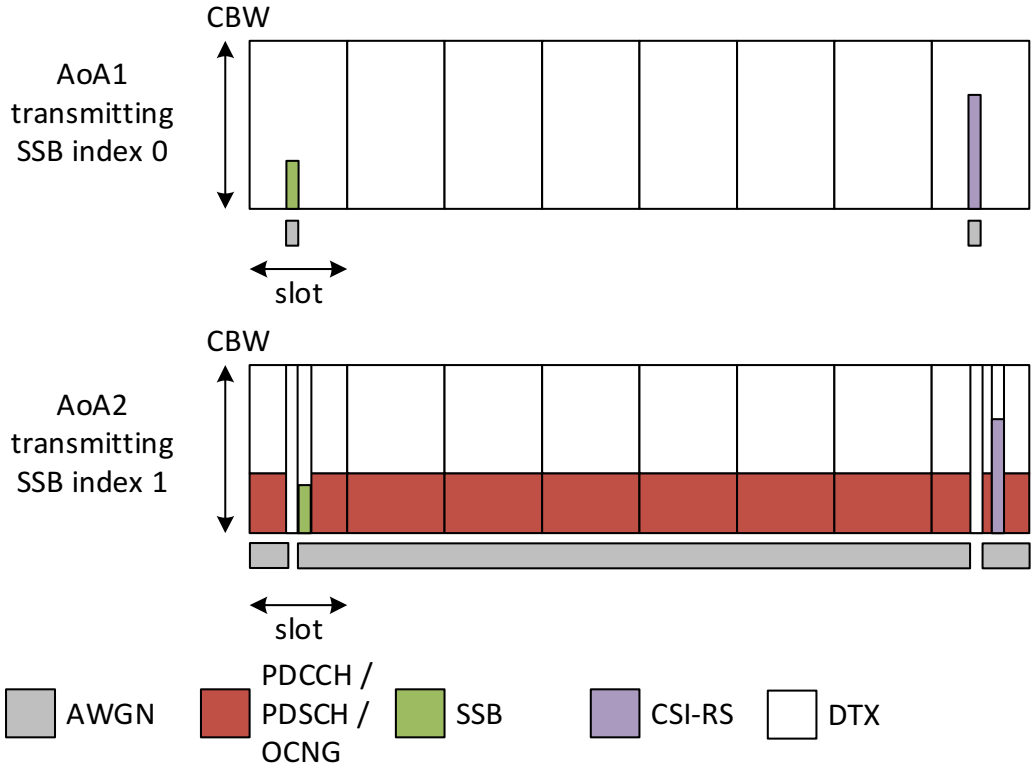



**Figure 7.5.8.1.1.5-2: Time multiplexed downlink transmissions during T2**

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ $T_{HARQ}$ +3 ms
- be able to start receiving on TCI state 1 after n+ $T_{HARQ}$ +5 ms + $T_{first-SSB}$

## 7.5.8.2 NR SA FR2 RRC based active TCI state switch

### 7.5.8.2.1 NR SA PCell FR2 RRC based active TCI state switch for a known TCI state

#### 7.5.8.2.1.1 Test purpose

The purpose of this test is to verify the RRC based active TCI state switch delay requirement specified in clause 7.5.8.0.2.

#### 7.5.8.2.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

#### 7.5.8.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.2.1.

#### 7.5.8.2.1.4 Test description

##### 7.5.8.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.2.1.4.1-1.

**Table 7.5.8.2.1.4.1-1: Supported test configurations for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Config | Description |
|---|---|
| 7.5.8.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.2.1.4.1-2.

**Table 7.5.8.2.1.4.1-3: General test parameters for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.5.8.2.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.5.8.2.1.4.1-3.

**Table 7.5.8.2.1.4.1-3: General test parameters for NR SA Pcell FR2 RRC based active TCI state switch for a known TCI state**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

#### 7.5.8.2.1.4.2 Test procedure

The test scenario comprises of one NR PCell (Cell 1) as given in Table 7.5.8.2.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.2.1.5-1. The OTA related test parameters for FR2 is shown in Table 7.5.8.2.1.5-2.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 1 TCI state for PCell, PDCCH-TCI-state0 (QCL'd to SSB0)
- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure 7.5.8.2.1.5-1 and Figure 7.5.8.2.1.5-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+ $T_{RRC_processing}$ + $T_{first\text{-}SSB}$ + 2ms.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.2.1.5-1. Propagation conditions are set according to clause C.2.3.
3. The SS transmits an *RRCReconfiguration* message to configure 1 TCI state for Cell 1, PDCCH TCI state 0 (QCL'd to SSB0) and indicating TCI state 0 as the active PDCCH TCI state, as indicated in clause 7.5.8.2.1.4.3. This message does not configure *tci-PresentInDCI* in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.
4. The UE transmits an *RRCReconfigurationComplete* message.
5. The SS shall continuously transmit PDCCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.
6. T1 starts. During T1 only SSB0, to which PDCCH TCI-state 0 is QCL'd, is transmitted.
7. When T1 expires the SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reports for both SSB0 and SSB1 as indicated in clause 7.5.8.2.1.4.3. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.2.1.5-2 and SSB1, corresponding to TCI state 1, starts transmitting. T2 starts.
8. The SS sends, in slot n, an *RRCReconfiguration* message to indicate switch to TCI-state 1 as the active PDCCH TCI state, as indicated in clause 7.5.8.2.1.4.3. Slot n is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
9. The UE transmits an *RRCReconfigurationComplete* message.

10. During T2, if the SS receives ACK/NACK on TCI-state 1 corresponding to the next scheduled DL slot after n + $T_{first-SSB}$ + 12 ms, where $T_{first-SSB}$ is the time to the first SSB transmission immediately after the RRC processing by the UE, the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

11. When T2 expires the SS shall sends an *RRCReconfiguration* message to indicate switch to TCI-state 0 as the active PDCCH TCI state and releasing TCI-state 1.

12. The UE transmits an *RRCReconfigurationComplete* message.

13. Wait 2s for the UE to switch TCI-state 0. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI-state 0 continue to step 14. Otherwise switch the UE off and on and continue to step 1.

14. Repeat steps 2-13 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.8.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.8.2.1.4.3-1: Common Exception messages for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.8.2.1.4.3-2: *ControlResourceSet* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 1 entry | 1 entry configured at a time (steps 3 and 8) | |
| TCI-StateId[0] | 0 | TCI.State.2 | Step 3 |
| TCI-StateId[1] | 1 | TCI.State.3 | Step 8 |
| } | | | |
| tci-PresentInDCI | Not present | | |
| } | | | |

**Table 7.5.8.2.1.4.3-3: *PDSCH-Config* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-Config ::= SEQUENCE { | | | |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 1 entry | 1 entry configured at a time (steps 3 and 8) | |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 | Step 3 |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 | Step 8 |
| } | | | |
| } | | | |

**Table 7.5.8.2.1.4.3-4: *TCI-State* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| TCI-State ::= SEQUENCE { | 1 entry | 1 entry configured at a time (steps 3 and 8) | |
| { | | | |
| tci-StateId | 0 | TCI.State.2 | Step 3 |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| } | | | |
| } | | | |
| Note 1: TRS.2.1 TDD is configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, so resource #4 for the set corresponds to index 3, correspondingly. | | | |

**Table 7.5.8.2.1.4.3-5: *TCI-State* for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state (step 8)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | 1 entry | 1 entry configured at a time (steps 3 and 8) | |
| { | | | |
| tci-StateId | 1 | TCI.State.3 | Step 8 |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| } | | | |
| } | | | |
| Note 1: TRS.2.2 TDD is configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.2 TDD = {4,5,6,7}, so resource #4 for the set corresponds to index 7, correspondingly. | | | |

### 7.5.8.2.1.5 Test requirement

Tables 7.5.8.2.1.4.1-3, 7.5.8.2.1.5-1 and 7.5.8.2.1.5-2 define the primary level settings including test tolerances for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state.

**Table 7.5.8.2.1.5-1: NR Cell specific test parameters for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |

| | | |
|---|---|---|
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.2 |
| TCI State 1 | | TCI.State.3 |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 640 |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | |

**Table 7.5.8.2.1.5-2: OTA related test parameter for NR SA PCell FR2 RRC based active TCI state switch for a known TCI state**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| SS B_RP Note 2 | dBm/ SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| $\hat{E}_s / I_{otBB}$ Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.71 | -55.71 | - Infinity | -55.71 |

| | |
|---|---|
| Note 1: | Void |
| Note 2: | SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | Void |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone. |
| Note 6: | Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 7: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. |

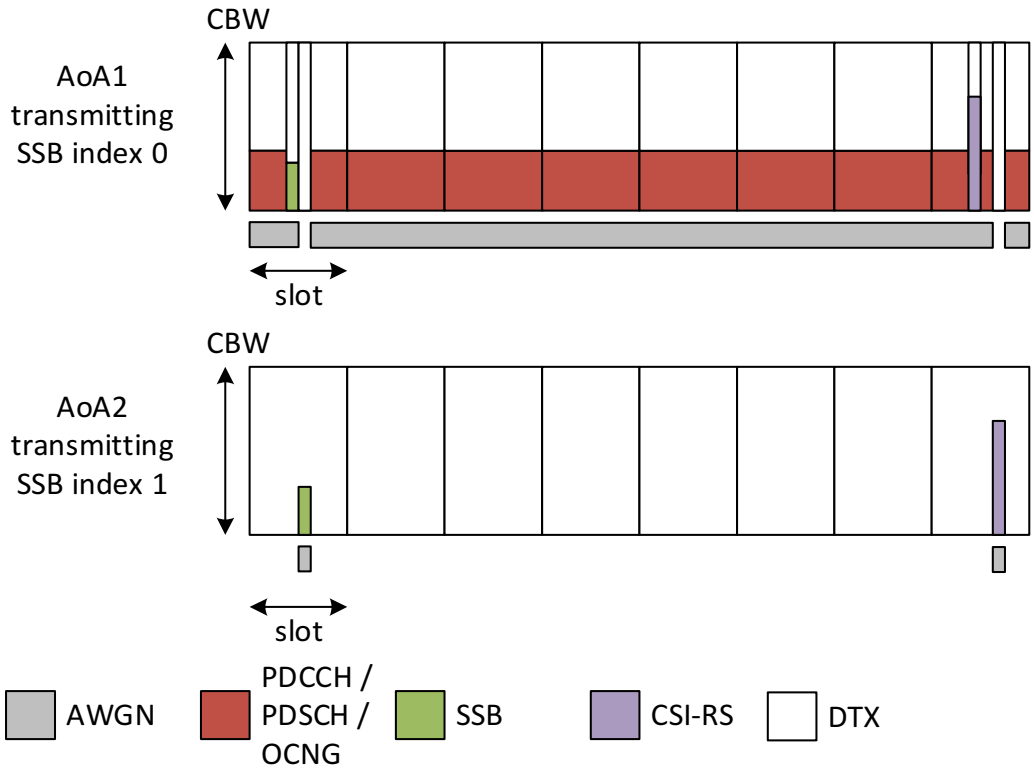



**Figure 7.5.8.2.1.5-1: Time multiplexed downlink transmissions during T1**

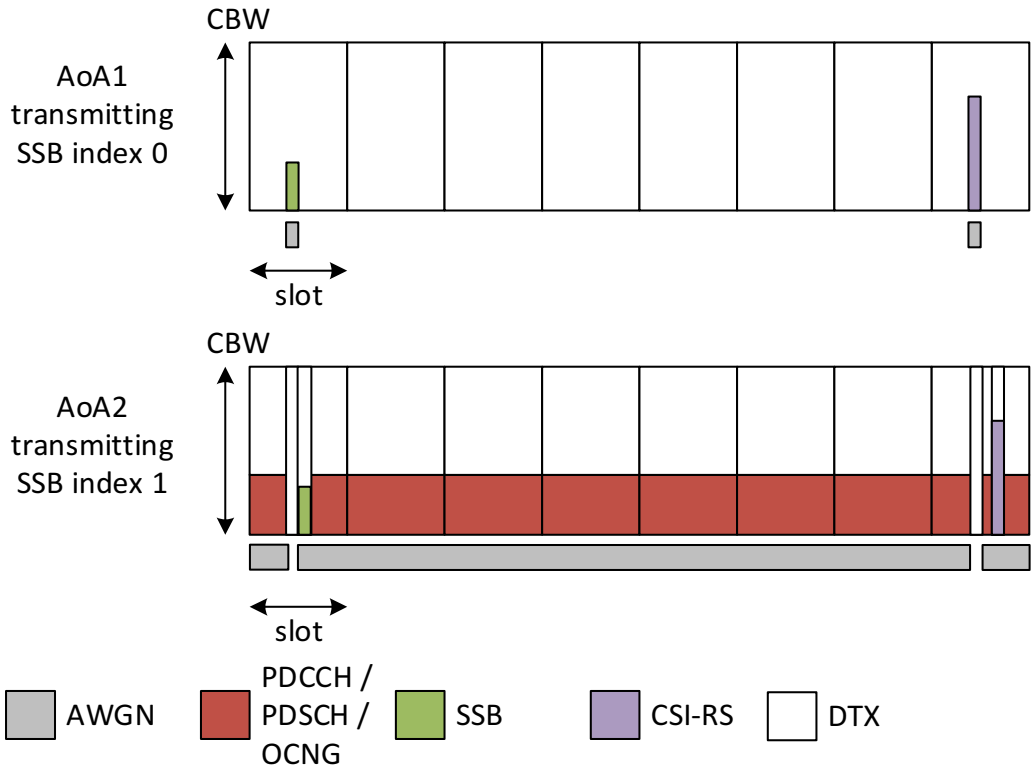



**Figure 7.5.8.2.1.5-2: Time multiplexed downlink transmissions during T2**

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+ $T_{RRC_processing}$ + $T_{first-SSB}$ + 2ms.

## 7.5.8.3 MAC-CE based active TCI state switch for HST FR2 scenario

### 7.5.8.3.1 NR SA FR2 HST active TCI state switch for a known TCI state

Editor's note: This test case is incomplete. The following aspects are either missing or TBD:

- Test tolerance and measurement uncertainty analysis are missing

#### 7.5.8.3.1.1 Test Purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133[6] clause 8.10.13A for FR2 power class 6 UE. Furthermore, the purpose of this test is also to verify the one shot large timing adjustment requirement as specified in TS 38.133[6] section 7.1.2.3.

#### 7.5.8.3.1.2 Test Applicability

This test applies to all types of NR UE power class 6 release 17 onwards that supports one shot UL large timing adjustment *largeOneStepUL-timingFR2-r17*.

#### 7.5.8.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.3.

The normative reference for this requirement is TS 38.133 [6] clauses 7.1.2.3, 8.10.13A and A.7.5.8.3.1.

#### 7.5.8.3.1.4 Test description

Supported test configurations are shown in table 7.5.8.3.1.4.1-1. The test parameters are given in Tables 7.5.8.3.1.4.1-2, 7.5.8.3.1.4.1-3 and 7.5.8.3.1.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of two successive time periods, with time duration of T1 and T2. Figure 7.5.8.3.1.4-1 and Figure 7.5.8.3.1.4-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting, which has the relative timing delay compared to TCI state 0 by the absolute value of the one-way differential propagation time [$|T_{old} - T_{new}| = 2.33\ \mu s$].

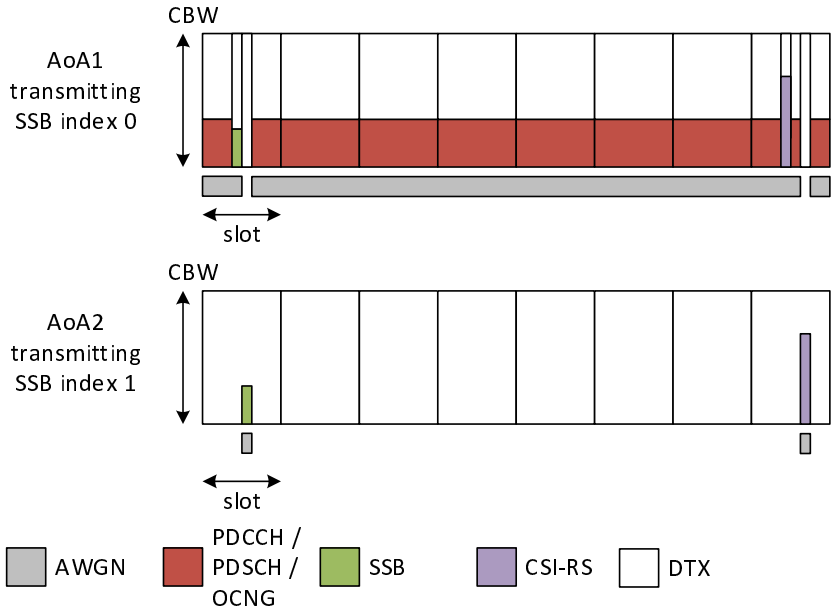



**Figure 7.5.8.3.1.4-1: Time multiplexed downlink transmissions during T1**

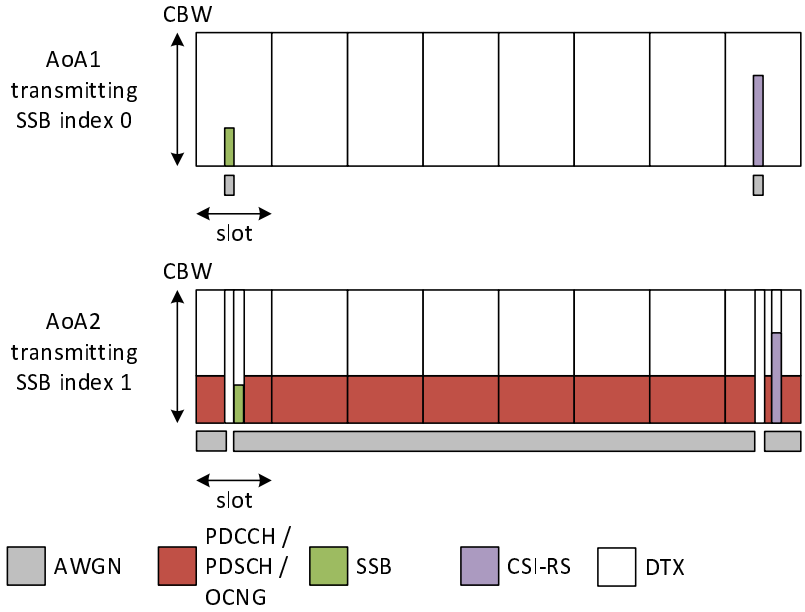



**Figure 7.5.8.3.1.4-2: Time multiplexed downlink transmissions during T2**

7.5.8.3.1.4.1 Initial conditions

**Table 7.5.8.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.5.8.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCI state 1 (QCL'd to SSB1), in Cell 1 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state.

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

**Table 7.5.8.3.1.4.1-2: Initial conditions for Active TCI state switch delay for HST FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.5.8.3.1.4.1-3: General test parameters for TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |

1. The general test parameter settings are set up according to Table 7.5.8.3.1.4.1-3.
2. Message contents are defined in clause 7.5.8.3.1.4.3.
3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.
4. The Rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

### 7.5.8.3.1.4.2 Test procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.5.8.3.1.5-2.
3. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting, which has the relative timing delay compared to TCI state 0 by the absolute value of the one-way differential propagation time [$|T_{old} - T_{new}| = 2.33\ \mu s$].
4. The UE shall start sending periodic L1-RSRP reports.

5. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

6. After the TCI state switch, the UE transmit timing accuracy shall be measured by the test equipment by using the SRS defined in Table 7.5.8.3.1.5-3.

7. Repeat steps 2-6 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.8.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-169 in 38.508-1 [14] with condition R17 HST FR2 |
| Specific message contents exceptions for Test Configuration 7.5.8.3.1-1 | |

### 7.5.8.3.1.5 Test requirements

Table 7.5.8.3.1.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.5.8.3.1.5-1: NR Cell specific test parameters for TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |

| | | |
|---|---|---|
| Propagation Condition | | AOA1: No external noise (Note 2)<br>AOA2: No external noise (Note 2) with 19444 Hz frequency offset |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | |

**Table 7.5.8.3.1.5-2: OTA related test parameters for TCI state switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_S$ | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SSB_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| $\hat{E}_s/I_{ot}$ BB Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |
| Note 1: Void<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.<br>Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.6-4. | | | | | |

**Table 7.5.8.3.1.5-3: Sounding Reference Symbol Configuration**

| Field | Value | Comment |
|---|---|---|
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 | |
| b-hop | 0 | |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=0 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 | |
| repetitionFactor | n1 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After the TCI state switch, the UE transmission timing immediately after TCI state switch shall follow the requirements as specified in clause 7.5.8.3.1.0.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ $T_{HARQ}$ +3 ms
- be able to start receiving on TCI state 1 after n+ $T_{HARQ}$ +7 ms + $T_{first\text{-}SSB+}$ $T_{rs}$

The rate of correct events observed during repeated tests shall be at least [90]%.

### 7.5.8.3.2 NR SA FR2 HST active TCI state switch for PC6 UE supporting *tci-StateSwitchInd-r18* a known TCI state

Editor's note: This test case is incomplete. The following aspects are either missing or TBD:

- Test tolerance and measurement uncertainty analysis are missing

#### 7.5.8.3.2.1 Test Purpose

The purpose of this test is to verify the active TCI state switch delay and timing adjustment applicable for FR2 power class 6 UE supporting *tci-StateSwitchInd-r18* capability as defined in clause 7.5.8.0.3 by configuring *highSpeedMeasFlagFR2-r17* and cross-RRH TCI state indicator for UE-specific PDCCH MAC CE as defined in clause 6.1.3.77 of TS 38.321 [12] is set to 0.

#### 7.5.8.3.2.2 Test Applicability

This test applies to all types of NR UE power class 6 release 18 onwards that support *tci-StateSwitchInd-r18.*

#### 7.5.8.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.3.

The normative reference for this requirement is TS 38.133 [6] clauses 7.1.2.3, 8.10.3A and A.7.5.8.3.2.

#### 7.5.8.3.2.4 Test description

The supported test configuration is shown in Table 7.5.8.3.2.4.1-1. The test parameters are given in Tables 7.5.8.3.2.4.1-2, 7.5.8.3.2.4.1-3 and 7.5.8.3.2.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

During the test, *highSpeedMeasFlagFR2-r17* is configured to be *set2* and broadcast to UE. PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

The test consists of two time periods, T1 and T2. Figure 7.5.8.3.2.4-1 and Figure 7.5.8.3.2.4-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. From the beginning of T2, the SSB corresponding to TCI state 1 is transmitted. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1 with cross-RRH TCI state indicator for UE-specific PDCCH *MAC CE* set as '0'. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state. After the TCI state switch, the UE transmit timing accuracy shall be measured by the test equipment by using the SRS defined in Table 7.5.8.3.2.5-3. TCI state 1 has relative timing delay of 4.5*64*Tc compared to TCI state 0.

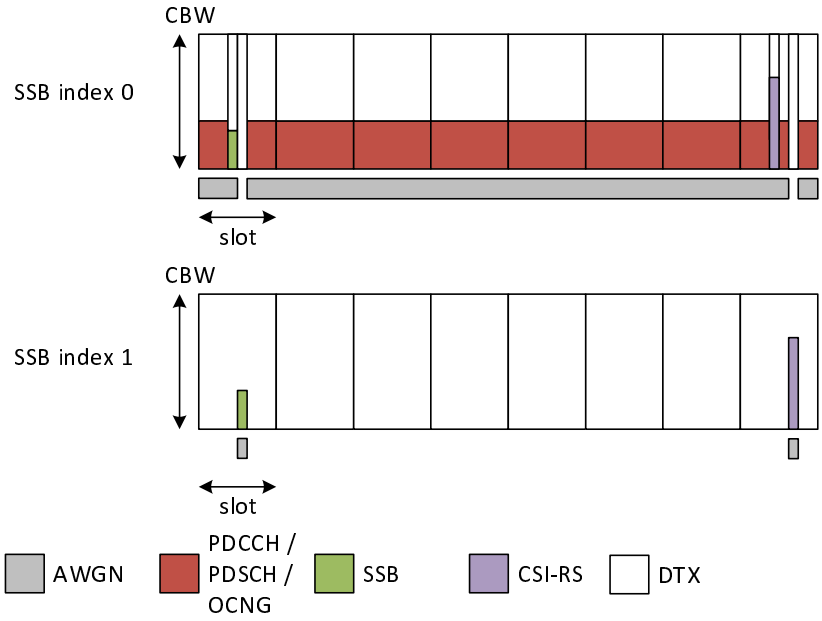



**Figure 7.5.8.3.2.4-1: Time multiplexed downlink transmissions during T1**

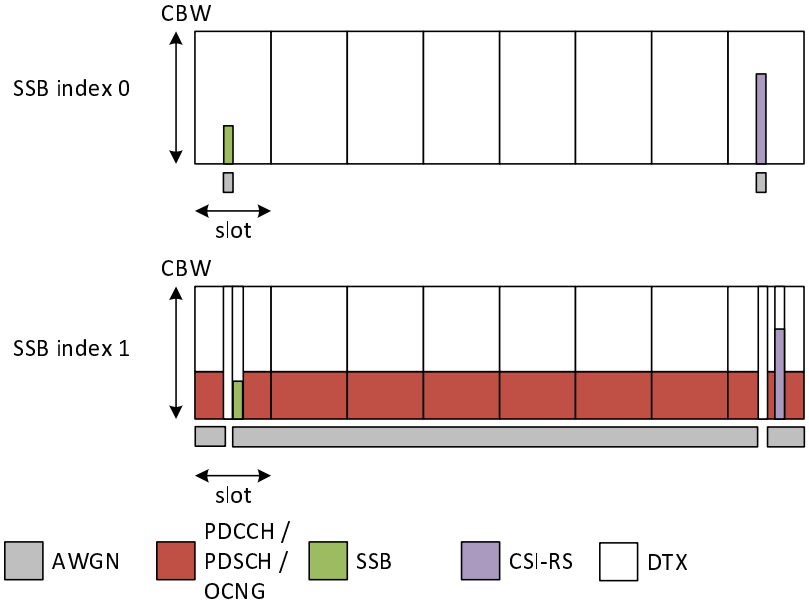



**Figure 7.5.8.3.2.4-2: Time multiplexed downlink transmissions during T2**

### 7.5.8.3.2.4.1 Initial conditions

**Table 7.5.8.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.5.8.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCI state 1 (QCL'd to SSB1), in Cell 1 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.3.2.4.1-2.

**Table 7.5.8.3.2.4.1-2: Initial conditions for Active TCI state switch delay for HST FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.5.8.3.2.4.1-3: General test parameters for TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |

1. The general test parameter settings are set up according to Table 7.5.8.3.2.4.1-3.

2. Message contents are defined in clause 7.5.8.3.2.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

### 7.5.8.3.2.4.2 Test procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.8.3.2.5-2.

3. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting, which has relative timing delay of 4.5*64*Tc compared to TCI state 0

4. The UE shall start sending periodic L1-RSRP reports.

5. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1 with with cross-RRH TCI state indicator for UE-specific PDCCH MAC CE indicated as '0'. tci-PresentInDCI is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

6. After the TCI state switch, the UE transmit timing accuracy shall be measured by the test equipment by using the SRS defined in Table 7.5.8.3.2.5-3.

7. Repeat steps 2-6 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved

#### 7.5.8.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-169 in 38.508-1 [14] with condition R17 HST FR2 |
| Specific message contents exceptions for Test Configuration | |

### 7.5.8.3.2.5 Test requirements

Table 7.5.8.3.2.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.5.8.3.2.5-1: NR Cell specific test parameters for TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | [AWGN with 9722 Hz frequency offset] |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.8.3.2.5-2: OTA related test parameters for TCI state switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9.3 | | | |
| Assumption for UE beams Note 4 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.6+TT | -80.6+TT | Infinity | -80.6+TT |
| SSB_RP Note 1 | dBm/ SCS | -80.6+TT | -80.6+TT | Infinity | -80.6+TT |
| $\hat{E}_s/I_{ot_{BB}}$ Note 5 | dB | 8.3+TT | 8.3+TT | Infinity | 8.3+TT |
| Io Note1 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | Infinity | -56.0+TT |
| Note 1: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 3: As observed with 0dBi gain antenna at the center of the quiet zone.<br>Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.<br>Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.6-4. | | | | | |

**Table 7.5.8.3.2.5-3: Sounding Reference Symbol Configuration**

| Field | Value | Comment |
|---|---|---|
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 | |
| b-hop | 0 | |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=0 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 | |
| repetitionFactor | n1 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After the TCI state switch, the UE transmission timing immediately after TCI state switch shall follow the requirements as specified in clause 7.5.8.0.3.

After receiving, TCI state switch command with cross-RRH TCI state indicator for UE-specific PDCCH MAC CE set to '0' in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ $T_{HARQ}$ +3 ms
- be able to start receiving on TCI state 1 after n+ $T_{HARQ}$ +5 ms + $T_{first\text{-}SSB}$.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.8.4 NR SA FR2 DCI based active TCI state switch with m-DCI for simultaneous reception

Editor's note: This test case is incomplete. The following aspect is either missing or TBD:

- Test tolerance analysis and measurement uncertainty are missing

- Configuration of 3AoA setup and testability of the device is still FFS

- UE positioning procedure is still FFS

### 7.5.8.4.1 Test Purpose

The purpose of this test is to verify the DCI based active TCI state switch delay requirement specified in clause 7.5.8.0.5.

### 7.5.8.4.2 Test Applicability

This test applies to all types of NR UE release 18 onwards supporting SA FR2, more than one TCI state configuration, more than one simultaneously trackable TRS resource set, multi-DCI based multi-TRP, simultaneous reception with different QCL Type D, and group based beam reporting.

### 7.5.8.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.4 and 7.5.8.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.4.

### 7.5.8.4.4 Test description

#### 7.5.8.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.4.4.1-1.

**Table 7.5.8.4.4.1-1: Supported test configurations for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Config | Description |
|---|---|
| 7.5.8.4-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.4.4.1-2.

**Table 7.5.8.4.4.1-2: Initial conditions for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.5.8.4.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.5.8.4.4.1-3.

**Table 7.5.8.4.4.1-3: General test parameters for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.8 | |
| T2 | s | 0.2 | |

### 7.5.8.4.4.2 Test procedure

The test scenario comprises of one NR PCell (Cell 1) as given in Table 7.5.8.4.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.4.5-1. The OTA related test parameters for FR2 are shown in Table 7.5.8.4.5-2.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

The UE is configured with the following TCI states: TCI state 0 (QCL'd to SSB0), TCI state 1 (QCL'd to SSB1), TCI state 2 (QCL'd to SSB2) and TCI state 3 (QCL'd to SSB3).

- UE is indicated with the following TCI states for Cell 1 (PCell):
- PDCCH TCI state 0 (QCL'd to SSB0), PDSCH TCI state 0 (QCL'd to SSB0) for CORESETPoolIndex 0, and
- PDCCH TCIstate 1 (QCL'd to SSB1), PDSCH TCI state 1 (QCL'd to SSB1) for CORESETPoolIndex 1.
- UE is configured with groupBasedBeamReporting-r17 for SSB index 3 and SSB index 4.
- tci-PresentInDCI is configured in the PDSCH configuration.

The test consists of two time periods, T1 and T2. During T1, the time multiplexed (allocation in Frequency is symbolic) downlink transmissions are scheduled from each Angle of Arrival (AoA1, AoA2 and AoA3) as shown in Figure A.7.5.8.4.1-1. UE is configured to transmit periodic L1-RSRP group-based beam reports on SSB index 2 and SSB index 3. After UE transmits the first L1-RSRP group-based beam report with SSB index 2 and SSB index 3 as a beam pair, TE sends TCI state activation MAC-CEs to activate TCI state 2 and TCI state 3 for PDSCHs.

T2 starts at a time that is not earlier than active TCI state list update delay (as defined in section 8.10E.6.2) from the time UE has received the TCI state activation MAC-CEs. At the beginning of T2, at slot n, UE receives DCI to switch PDSCH TCI state on CORESETPoolIndex 0 for indicating the TCI state switch of PDSCH to TCI state 3. At slot n+1, UE receives DCI to switch PDSCH TCI state on CORESETPoolIndex 1 for indicating the TCI state switch of PDSCH to TCI state 2. During T2, the time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival is shown in Figure A.7.5.8.4.1-2.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 2 and TCI state 3 simultaneously after slot n + 1 + timeDurationForQCL

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.4.5-1. Propagation conditions are set according to clause C.2.3.

3. The SS transmits an *RRCReconfiguration* message to configure 2 different TCI states for Cell 1, PDCCH TCI state 0 (QCL'd to SSB0) and TCI state 1 (QCL'd to SSB1), as indicated in clause 7.5.8.4.4.3. This message also configures tci-PresentInDCI in the PDSCH configuration. This message also configures 4 different TCI states for Cell 1 PDSCH, TCI

state 0 (QCL'd to SSB0), TCI state 1 (QCL'd to SSB1), TCI state 2 (QCL'd to SSB2) and TCI state 3 (QCL'd to SSB3).

4. The UE transmits an *RRCReconfigurationComplete* message.

5. The SS shall send a MAC-CE to the UE indicating TCI state 0 and TCI state 1 as the active PDCCH TCI states, and TCI state 0 and TCI state 1 as the active PDSCH TCI states. The SS shall continuously transmit PDCCHs and PDSCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.

6. T1 starts. UE is configured to transmit periodic L1-RSRP group-based beam reports for SSB index 2 and SSB index 3. The UE transmits the first L1-RSRP group-based beam report with SSB index 2 and SSB index 3 as a resource group.

7. The SS sends TCI state activation MAC-CEs to activate TCI state 3 and TCI state 4 for PDSCHs. The SS shall continuously transmit PDCCHs and PDSCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.

8. When T1 expires the SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reports for both SSB2 and SSB3 as indicated in clause 7.5.8.4.4.3. The start of T2 is the instant when the last TTI containing the RRCReconfiguration message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.4.5-2 and SSB2, and SSB3, corresponding to TCI state 2, and TCI state3, starts transmitting. T2 starts.

9. The SS sends, in slot n, DCI to switch PDSCH TCI state on CORESETPoolIndex 0 for indicating the TCI state switch of PDSCH to TCI state 2. Slot n is within 1280 ms of UE providing group-based L1-RSRP report with results for SSB2 and SSB3 as a reference group.

10. The SS sends, in slot n+1, DCI to switch PDSCH TCI state switch on CORESETPoolIndex 1 for indicating the TCI state switch of PDSCH to TCI state 3.

11. During T2, if the SS receives ACK/NACK on TCI state 2 and TCI state 3, corresponding to the next scheduled DL slot after slot n + 1 + timeDurationForQCL, the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

12. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI state 2 and TCI state 3 continue to step 13. Otherwise switch the UE off and on and continue to step 1.

13. Repeat steps 2-12 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.8.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.8.4.4.3-1: Common Exception messages for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP and groupBasedBeamReporting enabled<br>Table H.3.6-3 with condition SSB |

**Table 7.5.8.4.4.3-2: ControlResourceSet for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 2 entries | | |
| TCI-StateId[0] | 0 | TCI.State.2 | |
| TCI-StateId[1] | 1 | TCI.State.3 | |
| } | | | |
| tci-PresentInDCI | present | | |
| } | | | |

**Table 7.5.8.4.4.3-3: PDSCH-Config for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-Config ::= SEQUENCE { | | | |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 4 entries | | |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 | |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 | |
| TCI-State[2] | TCI.State.2 | TCI-StateId 2 | |
| TCI-State[3] | TCI.State.3 | TCI-StateId 3 | |
| } | | | |
| } | | | |

**Table 7.5.8.4.4.3-4: TCI-State for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | 4 entries | | |
| { | | | |
| tci-StateId | 0 | TCI.State.2 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| }, | | | |
| { | | | |
| tci-StateId | 1 | TCI.State.3 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| }, | | | |
| { | | | |

| | | | |
|---|---|---|---|
| tci-StateId | 3 | TCI.State.2 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| }, | | | |
| { | | | |
| tci-StateId | 1 | TCI.State.3 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| } | | | |
| } | | | |
| Note 1: Both TRS.2.1 TDD and TRS.2.2 TDD are configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, TRS.2.2 TDD = {4,5,6,7}, so resource #4 for each set corresponds to index 3 and 7, accordingly. | | | |

### 7.5.8.4.5 Test requirement

Tables 7.5.8.4.4.1-3, 7.5.8.4.5-1 and 7.5.8.4.5-2 define the primary level settings including test tolerances for NR SA PCell FR2 DCI based active TCI state switch with m-DCI for simultaneous reception.

**Table 7.5.8.4.5-1: NR Cell specific test parameters for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI. State.2 |
| TCI State 1 | | TCI.State.3 |
| TCI State 2 | | TCI. State.2 |

| | | |
|---|---|---|
| TCI State 3 | | TCI.State.3 |
| TRS Configuration | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [40]. | | |

**Table 7.5.8.4.5-2: OTA related test parameter for NR SA FR2 PCell DCI based active TCI state switch with m-DCI for simultaneous reception**

| Parameter | Unit | Cell 1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | | SSB2 | | SSB3 | |
| | | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 6 according to clause A.9.6 | | | | | | | |
| | | AoA1 | | AoA2 | | AoA3 | | AoA1 | |
| Assumption for UE beams Note 6 | | Rough | | | | | | | |
| $\hat{E}_s$ | dBm/SCS | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -85.60+TT | -85.60+TT |
| SS B_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -80.6+TT | -85.60+TT | -85.60+TT |
| $\hat{E}_s/I_{otBB}$ Note 7 | dB | 8.3+TT | 8.3+TT | 8.3+TT | 8.3+TT | 8.3+TT | 8.3+TT | ~~7.63~~8.3+TT | ~~7.63~~8.3+TT |
| Io Note2 | dBm/95.04 MHz Note4 | -55.41+TT | -55.41+TT | -55.41+TT | -55.41+TT | -55.41+TT | -55.41+TT | -60.41+TT | -60.41+TT |
| Time offset (t) | us | 0 | 0 | 0 | 0 | 0 | 0 | .35 | .35 |

NOTE 1: Void
NOTE 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.
NOTE 6: Information about types of UE beam is given in clause B.2.1.3 and does not limit UE implementation or test system implementation.
NOTE 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
NOTE 8: Three probes are used to test dual to dual TCI state switch. One probe shall be used to emulate two different SSBs i.e. SSB0 and SSB3. SSB3 is transmitted with same AoA as SSB0 with a time offset (x) and a different power from SSB0.

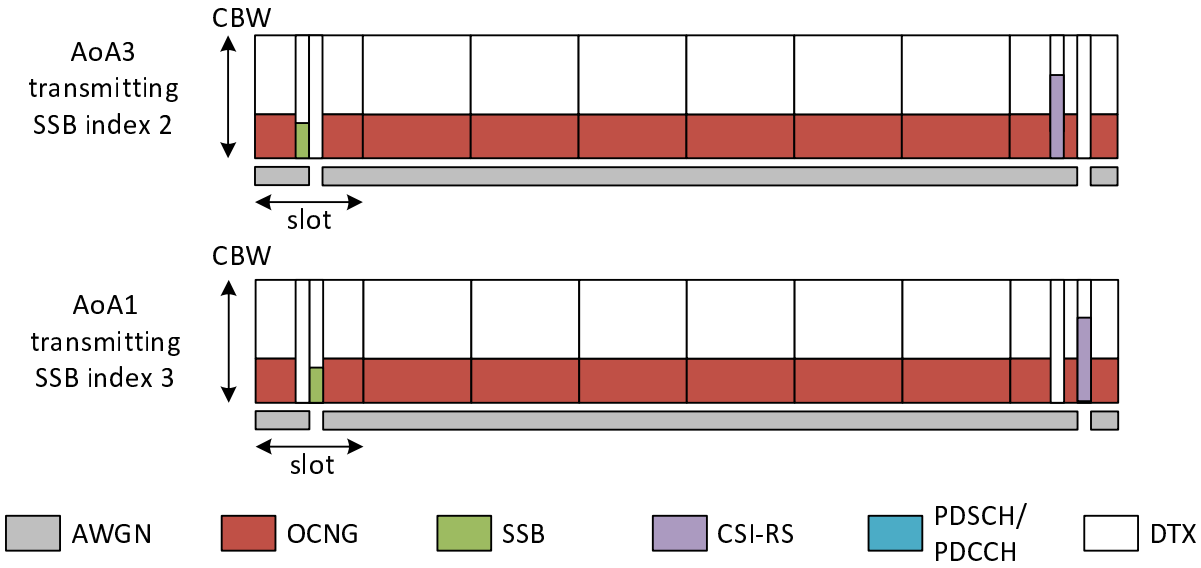



**Figure 7.5.8.4.5-1: Time multiplexed downlink transmissions during T1**

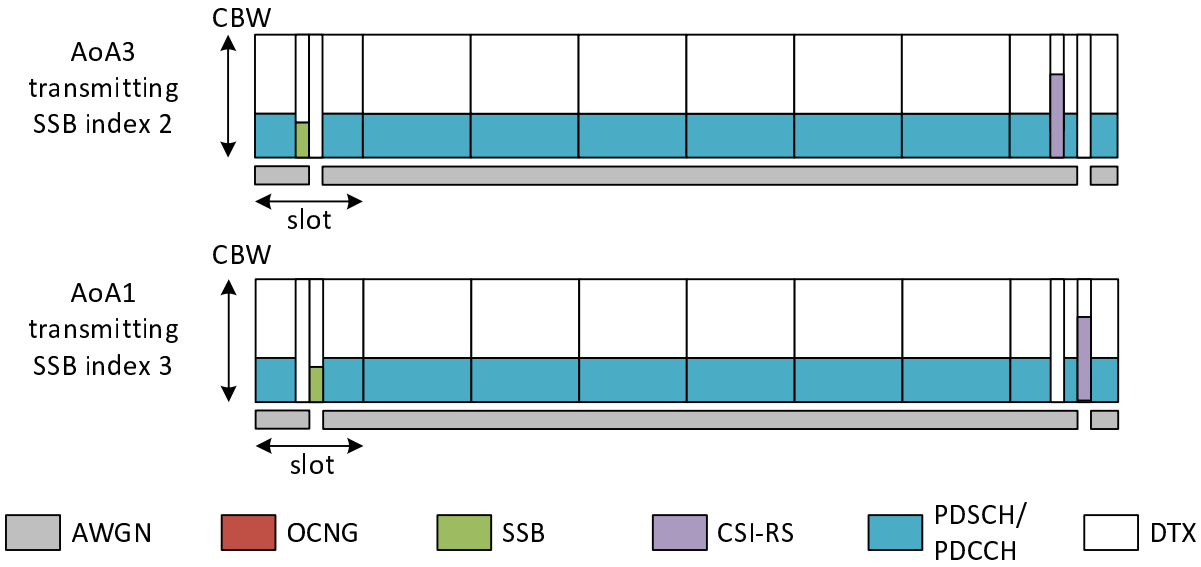



**Figure 7.5.8.4.5-2: Time multiplexed downlink transmissions during T2**

After receiving two DCIs in slot n and slot n+1 during T2, UE shall:

- be able to start receiving on TCI state 3 and TCI state 4 simultaneously after slot n + *timeDurationForQCL*

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.8.5 NR SA FR2 Single-DCI based active TCI state switch with known target TCI states for simultaneous reception

Editor's note: This test case is incomplete. The following aspect is either missing or TBD:

- UE positioning procedure is still FFS

- Test setup is incomplete

- Test tolerance analysis and measurement uncertainty are missing

#### 7.5.8.5.1 Test Purpose

The purpose of this test is to verify the DCI based active TCI state switch delay requirement specified in clause 7.5.8.0.6.

#### 7.5.8.5.2 Test Applicability

This test applies to all types of NR UE release 18 onwards supporting SA FR2, more than one TCI state configuration, more than one simultaneously trackable TRS resource set, group based L1-RSRP reporting enhancements, single DCI based spatial division multiplexing scheme and simultaneous reception with different QCL Type D reference signal.

#### 7.5.8.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.8.0.6.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.8.5.

#### 7.5.8.5.4 Test description

##### 7.5.8.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.8.5.4.1-1.

**Table 7.5.8.5.4.1-1: Supported test configurations for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Config | Description |
|---|---|
| 7.5.8.5-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.8.5.4.1-2.

**Table 7.5.8.5.4.1-2: Initial conditions for NR SA PCell FR2 Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.8.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.5.8.5.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.5.8.5.4.1-3.

**Table 7.5.8.5.4.1-3: General test parameters for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

#### 7.5.8.5.4.2 Test procedure

The test scenario comprises of one NR PCell (Cell 1) as given in Table 7.5.8.5.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.8.5.5-1. The OTA related test parameters for FR2 are shown in Table 7

5.8.5.5-2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with groupBasedBeamReporting-r17 for SSB index 0 and SSB index 1
- UE is configured with 3 different TCI states for PCell in Cell 1 before starting the test:
  - PDCCH TCI state 0 (QCL'd to SSB0),
  - PDSCH TCI state 0 (QCL'd to SSB0),
  - PDSCH TCI state 1 (QCL'd to SSB1)
- UE is indicated TCI state 0 as the active PDCCH and PDSCH TCI state at the beginning of the test.
  - TCI state 1, which is one of the target TCI states, is not in the active TCI state list.

The test consists of two time periods, T1 and T2.

During T1, only SSBs to which PDCCH TCI state 0 and PDSCH TCI state 0 are QCL'd is transmitted (SSB0). During T1, SSB0 is transmitted on AoA1.

At the beginning of T2, the SSB corresponding to PDSCH TCI state 1 starts transmitting on AoA2. The UE is configured with groupBasedBeamReporting-r17 to provide periodic group-based L1-RSRP reports for SSB0 and SSB1. In slot n, which is within 1280 ms of UE providing group-based L1-RSRP report with results for SSB0 and SSB1 as a beam pair, UE receives a MAC-CE command indicating activation of TCI state 0 and TCI state 1 in a single codepoint. Tci-PresentInDCI is configured as enabled in the PDSCH configura

ion.

After a time that equals to the active TCI state list update delay for sDCI, UE receives a DCI indicating TCI state 0 and TCI state 1 for PDSCH scheduling. The TE verifies that the UE can start receiving PDSCH with TCI state 0 (in AoA1) and TCI state 1 (in AoA2) simultaneously after timeDurationForQCL from receiving the DCI.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.8.5.5-1. Propagation conditions are set according to clause C.2.3.
3. The SS transmits an RRCReconfiguration message to configure 3 different TCI states for Cell 1, PDCCH TCI state 0 (QCL'd to SSB0), PDSCH TCI state 0 (QCL'd to SSB0), and PDSCH TCI state 1 (QCL'd to SSB1), as indicated in clause 7.5.8.5.4.3. This message also configures tci-PresentInDCI in the PDSCH configuration. In this message the UE is also configured with groupBasedBeamReporting-r17 for SSB index 0 and SSB index 1.
4. The UE transmits an RRCReconfigurationComplete message.
5. The SS shall send a MAC-CE to the UE indicating TCI state 0 as the active PDCCH TCI state. The SS shall continuously transmit PDCCHs to the UE indicating new transmissions on PCell to ensure that the UE is transmitting the corresponding ACK/NACK feedback.
6. T1 starts. During T1 only SSBs to which PDCCH TCI state 0 and PDSCH TCI state 0 are QCL'd is transmitted (SSB0). During T1, SSB0 is transmitted on AoA1.
7. The start of T2 is the instant when the last TTI containing the RRCReconfiguration message is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.5.8.5.5-2 and, SSB1 corresponding to PDSCH TCI state 1 starts transmitting, on AoA2. The SS transmits an RRCReconfiguration message to configure groupBasedBeamReporting-r17 to provide periodic group-based L1-RSRP reports for SSB0 and SSB1 in clause 7.5.8.5.4.3. T2 starts.

8. The SS sends, in slot n, DCI based PDSCH TCI state switch on CORESETPoolIndex 0 for indicating the TCI state switch of PDSCH to TCI state 3. Slot n is within 1280ms of UE providing group-based L1-RSRP report with results for SSB0 and SSB1 as a beam pair.

9. During T2, if the SS receives ACK/NACK on TCI-state 0 and TCI-state1 corresponding to the next scheduled DL simultaneously after timeDurationForQCL from UE receiving the DCI , the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

10. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI-state 0.

11. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK corresponding to PDSCH transmissions scheduled on TCI-state 0 continue to step 12. Otherwise switch the UE off and on and continue to step 1.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.8.5.4.3 Message contents

Message contents are according to TS 38

508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.8.5.4.3-1: Common Exception messages for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP and groupBasedBeamReporting enabled<br>Table H.3.6-3 with condition SSB |

**Table 7.5.8.5.4.3-2: ControlResourceSet for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF { | 2 entries | | |
| TCI-StateId[0] | 0 | TCI.State.2 | |
| TCI-StateId[1] | 1 | TCI.State.3 | |
| } | | | |
| tci-PresentInDCI | Present | | |
| } | | | |

**Table 7.5.8.5.4.3-3: PDSCH-Config for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-Config ::= SEQUENCE { | | | |
| tci-StatesToAddModList SEQUENCE(SIZE (1.. maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State[0] | TCI.State.2 | TCI-StateId 2 | |
| TCI-State[1] | TCI.State.3 | TCI-StateId 3 | |
| } | | | |
| } | | | |

**Table 7.5.8.5.4.3-4: TCI-State for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | 2 entries | | |
| { | | | |
| tci-StateId | 0 | TCI.State.2 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 3 | TRS.2.1 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| }, | | | |
| { | | | |
| tci-StateId | 1 | TCI.State.3 | |
| qcl-Type1 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| bwp-Id | 1 | | |
| referenceSignal CHOICE { | | | |
| csi-rs | 7 | TRS.2.2 TDD Resource #4 Note1 | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| } | | | |
| } | | | |
| Note 1: Both TRS.2.1 TDD and TRS.2.2 TDD are configured on the UE. The assumption to configure this field is that nzp-CSI-RS-ResourceId indices are configured in the following order: TRS.2.1 TDD = {0,1,2,3}, TRS.2.2 TDD = {4,5,6,7}, so resource #4 for each set corresponds to index 3 and 7, accordingly. | | | |

### 7.5.8.5.5 Test requirement

Tables 7.5.8.5.4.1-3, 7.5.8.5.5-1 and 7.5.8.5.5-2 define the primary level settings including test tolerances for NR SA PCell FR2 Single-DCI FR2 DCI

based active TCI state switch with known target TCI states for simultaneous reception

**Table 7.5.8.5.5-1: NR Cell specific test parameters for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |

| | | |
|---|---|---|
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI. State.2 |
| TCI State 1 | | TCI.State.3 |
| TRS Configuration | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.8.5.5-2: OTA related test parameter for NR SA FR2 PCell Single-DCI based active TCI state switch with known target TCI states for simultaneous reception**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup according to A.9.5 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| $\hat{E}_s/I_{otBB}$ Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.41 | -55.41 | - Infinity | -55.41 |

Note 1: Void
Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.
Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

## 7.5.9 Uplink spatial relation switch delay

### 7.5.9.0 Minimum conformance requirements

#### 7.5.9.0.1 Minimum conformance requirements for MAC-CE based uplink spatial relation switch delay

[TS38.133, Clause 8.12.3]

If the target spatial relation associated to DL RS is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation in the slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ 1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1 where $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213[8].

If the target spatial relation associated to DL RS is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation in the slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $T_{L1\text{-}RSRP}$+1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213[8],
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
  - $T_{L1\text{-}RSPR_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
    - with the assumption of M=1
    - with $T_{Report}$ = 0
  - $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of M=1 for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with $_{T}$Report = 0

The UE shall be able to transmit with the old UL spatial relation until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

When the UL spatial relation info switch for PUCCH changes both the associated DL RS and *pucch-PathlossReferenceRS* with the same MAC-CE activation, and if both the DL RS and *pucch-PathlossReferenceRS* are known as specified in clause 8.12.2 and 8.14.2 respectively, the UE shall be able to transmit PUCCH with the target UL spatial relation after the delay specified in clause 8.14.3. If either the associated DL RS or *pucch-PathlossReferenceRS* are unknown, a longer switching delay is allowed. The UE is not required to transmit PUCCH with the target UL spatial relation until the DL RS and pathloss reference RS switch are completed.

#### 7.5.9.0.2 Minimum conformance requirements for RRC based uplink spatial relation switch delay

[TS38.133, Clause 8.12.5]

If the target spatial relation associated to DL RS is known, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot n+ $T_{RRC_processing}$ */NR slot length* +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.

- $T_{RRC_processing}$ is the RRC processing delay defined in 36.331 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS38.331.

If the target spatial relation associated to DL RS is unknown, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured in the slot n+ $T_{RRC_processing}$ */NR slot length* + $T_{L1\text{-}RSRP}$ +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in 36.331 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS38.331.
- $T_{L1\text{-}RSRP}$ is defined in clause 8.12.3.

## 7.5.9.1 MAC-CE based uplink spatial relation switch

### 7.5.9.1.1 NR PCell FR2 spatial relation associated with known DL-RS

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

#### 7.5.9.1.1.1 Test purpose

The purpose of this test is to verify the uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 7.5.9.1.1.2 Test applicability

This test applies to all types of UE Rel-16 and forward supporting NR SA with PCell in FR2.

#### 7.5.9.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.9.1.

#### 7.5.9.1.1.4 Test description

There is only one cell configured in this test: NR PCell (Cell 1). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 7.5.9.1.1.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.9.1.1.4.1-1.

**Table 7.5.9.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.5.9.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.9.1.1.4.1-2.

**Table 7.5.9.1.1.4.1-2: Initial conditions for NR SA PCell FR2 uplink spatial relation switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.9.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.5.9.1.1.4.1-3.
2. Message contents are defined in clause 7.5.9.1.1.4.3.
3. There is only one NR cell specified in the test. NR Cell 1 power level is set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.9.1.1.4.1-3: General test parameters for spatial relation switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | [0.2] | |
| T2 | s | [2] | |

### 7.5.9.1.1.4.2 Test procedure

During the test PDCCH indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have continuous ACK/NACK sending by PUCCH.

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE is configured with a single TCI state, TCI State-0, which is QCL'd with SSB0. The UE shall be configured with 2 different spatial relations: PUCCH Spatial Relation Info-0 (QCL'd to SSB0) and Spatial Relation Info-1 (QCL'd to SSB1), before starting the test. The UE is indicated via MAC-CE activation of *PUCCH-SpatialRelationInfoId* corresponding to Spatial Relation Info-0.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.9.1.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 associated with PDCCH TCI state-0 and PUCCH Spatial Relation Info-0 is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.9.1.1.5-2. T2 starts. At the beginning of T2, the SSB1 associated with PUCCH Spatial Relation Info-1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to spatial relation to PUCCH Spatial Relation Info 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on Spatial Relation Info 0 until slot $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on Spatial Relation Info 1 on and after slot $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$ + 1.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to Spatial Relation Info 0.

9. Wait 1s for the UE to switch to Spatial Relation Info 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on Spatial Relation Info 0, continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.9.1.1.4.3 Message contents

TBD

#### 7.5.9.1.1.5 Test requirement

Table 7.5.9.1.1.5-1 and 7.5.9.1.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 7.5.9.1.1.5-1: NR Cell specific test parameters for spatial relation switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State-0 Configuration | | TCI.State.0 |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD |
| Spatial Relation Info-0 Configuration | | PUCCH.SRI.0 |
| Spatial Relation Info-1 Configuration | | PUCCH.SRI.1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.9.1.1.5-2: OTA related test parameters for uplink spatial relation switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |

| | | | | |
|---|---|---|---|---|
| Assumption for UE beams Note 6 | | Rough | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | -infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -infinity | -82.1 |
| Io Note2 | dBm/95.04 MHz Note4 | -50.6 | -54.1 | -50.6 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6] and does not limit UE implementation or test system implementation. | | | | |

During T2, the UE shall send L1-RSRP report with results for SSB0 and SSB1.

After receiving MAC-CE command in slot *n*, the UE shall:

- Continue transmitting using PUCCH spatial relation associated with SSB0 up to and including slot $n + T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$
- Start transmitting using PUCCH spatial relation associated with SSB1 from slot $n + T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu} + 1$ and onwards.

The rate of correct events observed during repeated tests shall be at least [90]%.

## 7.5.9.2 RRC based uplink spatial relation switch

### 7.5.9.2.1 NR PCell FR2 spatial relation switch associated with a known DL-RS

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

#### 7.5.9.2.1.1 Test purpose

The purpose of this test is to verify the RRC based uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12.5 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 7.5.9.2.1.2 Test applicability

This test applies to all types of UE Rel-16 and forward supporting NR SA with PCell in FR2.

#### 7.5.9.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.9.2.

#### 7.5.9.2.1.4 Test description

There is only one cell configured in this test: NR PCell (Cell 1). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 7.5.9.2.1.4.1 Initial conditions

This test shall be tested using the test configuration in Table 7.5.9.2.1.4.1-1.

**Table 7.5.9.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|

| | |
|---|---|
| 7.5.9.2.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.9.2.1.4.1-2.

**Table 7.5.9.2.1.4.1-2: Initial conditions for NR SA PCell FR2 uplink spatial relation switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.9.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.9.2.1.4.1-3.
2. Message contents are defined in clause 7.5.9.2.1.4.3.
3. There is only one NR cell specified in the test. NR Cell 1 power level is set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.9.2.1.4.1-3: General test parameters for spatial relation switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| timeRestrictionForChannelMeasurements | | configured | Time domain measurement restriction for the channel (signal) measurements (see TS 38.214 [19], clause 5.2.1.1) |
| T1 | s | 0.5 | |
| T2 | s | 1.5 | |

### 7.5.9.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE is configured with 1 SRS-SpatialRelation0 associated with SSB0. UE is indicated SRS-SpatialRelation0 associated with SSB0.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.9.2.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 associated with SRS-SpatialRelation0 is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.9.2.1.5-2. T2 starts. At the beginning of T2, the SSB1 associated with PUCCH Spatial Relation Info-1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a RRC to indicate switch to periodic SRS with target SRS-SpatialRelation1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:

a) Receives periodic SRS with target spatial relation (SRS-SpatialRelation0) on PCell until n + $T_{RRC_processing}$/NR slot length, and

b) Receives periodic SRS with target spatial relation (SRS-SpatialRelation1) on PCell on and after n + $T_{RRC_processing}$/NR slot length + 1.

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a RRC to indicate switch to SRS-SpatialRelation0.

9. Wait 1s for the UE to switch to SRS-SpatialRelation0. If the SS receives SRS with target spatial relation (SRS-SpatialRelation0), continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.9.2.1.4.3 Message contents

TBD

#### 7.5.9.2.1.5 Test requirement

Table 7.5.9.2.1.5-1 and 7.5.9.2.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 7.5.9.2.1.5-1: NR Cell specific test parameters for spatial relation switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| SRS-SpatialRelation0 | | SRS.SRI0 |
| SRS-SpatialRelation1 | | SRS.SRI1 |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 160 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.9.2.1.5-2: OTA related test parameters for uplink spatial relation switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | Rough | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

During T1 UE shall send L1-RSRP report with SSB0 to which SRS-SpatialRelation0 is associated. During T2, UE shall send L1-RSRP report with SSB1 to which SRS-SpatialRelation1 is associated.

After receiving RRC command in slot n, UE shall be able to transmit target periodic SRS with SRS-SpatialRelation1 on the PCell in the slot n + $T_{RRC_processing}$/*NR slot length* + 1.

The rate of correct events observed during repeated tests shall be at least 90%.

# 7.5.10 UE specific CBW change

## 7.5.10.0 Minimum conformance requirements

### 7.5.10.0.1 Minimum conformance requirements for NR FR2 UE specific CBW change of PCell with non-DRX in SA

[TS 38.133, Clause 8.13]

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in milliseconds as defined in clause 11.2 in TS 36.331 [29] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in milliseconds as defined in clause 12 in TS 38.331 [13], and

$T_{CBWchangeDelayRRC} = 6ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

## 7.5.10.1 NR FR2 UE specific CBW change of PCell with non-DRX in SA

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing
- TT analysis is missing

### 7.5.10.1.1 Test purpose

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13 in TS 38.133 [6].

### 7.5.10.1.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward. The requirements in this test apply for a UE which receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

### 7.5.10.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5.10.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.10.1.

### 7.5.10.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK transmission.

During T1 the SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The SS verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received.

#### 7.5.10.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.10.1.4.1-1.

**Table 7.5.10.1.4.1-1: UE specific CBW change supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.10.1.4.1-2.

**Table 7.5.10.1.4.1-2: Initial conditions for EN-DC PSCell FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.10.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.10.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.5.10.1.5-1.

2. Message contents are defined in clause 7.5.10.1.4.3.

3. There is one NR cell specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.5.10.1.4.1-3: General test parameters for UE specific CBW change in NR SA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| T1 | s | 0.2 | |

### 7.5.10.1.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE is connected to Cell 1 (PCell) on radio channel 1 (PCC). UE has been configured via RRC-configuration (*SCS-SpecificCarrier* in TS 38.331 [13]) with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP. Set the parameters according to Tables 7.5.10.1.4.1-3 and 7.5.10.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.

3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

4. T1 starts from the beginning of slot *i*, where slot *i* is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5. The UE shall reconfigure its CBW with the updated CBW of final condition (CBW-2).

6. The SS verifies the UE specific CBW change time in PCell by counting the time from the time when the RRC Reconfiguration message including updated CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

7. If the UE starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. If it is successful, continue to step 10. Otherwise continue to step 9.

9. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

10. Repeat steps 2-9 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.10.1.4.3 Message contents

TBD

### 7.5.10.1.5 Test requirement

Table 7.5.10.1.5-1 defines the NR cell specific test parameters. Table 7.5.10.1.5-2 defines OTA related test parameters, not including test tolerances yet.

Editor's note: will be updated after the TT analysis.

**7.5.10.1.5-1: NR Cell specific test parameters for UE specific CBW change in NR SA**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | | | TDD |
| TDD configuration | | | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active DL BWP ID | | | 0 |
| Initial DL BWP Configuration (BWP-1) | | | DLBWP.0.2 |
| Initial UL BWP Configuration (BWP-1) | | | ULBWP.0.2 |
| Initial Condition | Active DL CBW Configuration (CBW-1) | | DLCBW.1.1 |
| | Active UL CBW Configuration (CBW-1) | | ULCBW.1.1 |
| Final Condition | Active DL CBW Configuration (CBW-2) | | DLCBW.1.2 |
| | Active UL CBW Configuration (CBW-2) | | ULCBW.1.2 |
| 'PDSCH Reference measurement channel | | | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| TCI State | | | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table 7.5.10.1.5-2: OTA related test parameters for UE specific CBW change test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 according to table A.3.15 in TS 38.133 [6] |
| Assumption for UE beams Note 5 | | | Fine |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -112 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -103 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |

| | | | |
|---|---|---|---|
| | NR_TDD_FR2_Y | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note3 | -85 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $\hat{E}_s/I_{ot}$ | | dB | 18 + TT |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 + TT |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.

Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs after the beginning of slot i+$\frac{T_{\text{RRCprocessingDelay}}+T_{\text{CBWchangeDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot i+$\frac{T_{\text{RRCprocessingDelay}}+T_{\text{CBWchangeDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed PCell UE specific CBW change delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.11 UE UL carrier RRC reconfiguration delay

### 7.5.11.1 UE UL carrier RRC reconfiguration delay

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.5.11.1.1 Test purpose

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively. The test will also verify the interruption at UL carrier configuration requirements on PCell in TS 38.133 [6] clause 8.2.2.2.4.

#### 7.5.11.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting 5GS NR SA FR2.

#### 7.5.11.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.11.1.

##### 7.5.11.1.3.1 UE UL carrier configuration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_config}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

##### 7.5.11.1.3.2 UE carrier deconfiguration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_deconfig}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

#### 7.5.11.1.4 Test description

##### 7.5.11.1.4.1 Initial conditions

There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.* The test parameters for PCell and SCell are given in Table 7.5.11.4.1-1, Table 7.5.11.4.1-2 and Table 7.5.11.4.1-3. The test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 2 is not configured to UE. At the start of T2, a NR uplink of Cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the NR uplink of Cell 2. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

The test equipment also verifies that potential interruption of PCell due to UL carrier configuration on SCell is carried out within the correct time span and within the correct length by monitoring ACK/NACK sent in PCell.

**Table 7.5.11.1.4.1-1: Supported test configurations**

| Configuration | PCell (Cell 1) | SCell (Cell 2) |
|---|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | DL and UL: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 7.5.11.1.4.1-2: Initial conditions for SA UE uplink RRC reconfiguration delay for FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.11.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.3 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

**Table 7.5.11.1.4.1-3: General test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two NR RF channels |
| Active cell | | Config 1 | Cell 1: FR2 PCell<br>Cell 2: FR2 SCell | PCell on RF channel number 1<br>FR2 SCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern ID | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| Cell 2 timing offset to Cell 1 | μs | Config 1 | 3 | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 5 | |
| T3 | s | Config 1 | 5 | |

### 7.5.11.1.4.2 Test procedure

Test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.*

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameter for PCell and SCell according to the table 7.5.11.1.4.1-1, 7.5.11.1.4.1-2 and 7.5.11.1.4.1-3.

3. T1 starts. At this moment NR uplink of Cell 2 is not configured to UE.

4. When T1 expires the SS shall initiates the *RRCReconfiguration* procedure to UE to configure the NR UL of Cell2. T2 starts.

5. The UE:

a) Starts transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

and

b) Interruption of PCell due to UL carrier configuration shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

6. When T2 expires the SS initiates *RRCReconfiguration* procedure to UE to release the NR UL of Cell2.

7. The UE:

   a) Stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

and

   b) Interruption of PCell due to UL carrier de-configuration shall not happen outside the UL carrier de-configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

8. Repeat step 2-7 until a test verdict has been achieved.
   The UL carrier configuration delay along with length of PCell interruption and UL carrier de-configuration delay along with length of PCell interruption is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G

clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 7.5.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.

### 7.5.11.1.5 Test requirement

The UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

The UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

During T2 and T3, the start of interruption of PCell due to UL carrier configuration or de-configuration on SCell shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption shall not exceed the length specified in 38.133 [6] clause 8.2.2.2.4.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

**Table 7.5.11.1.5-1: NR Cell specific test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2**

| Parameter | | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | | Config 1 | Setup 1 as specified in clause A.9 | | | | | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | | Rough | | |
| Frequency Range | | | Config 1 | FR2 | | | FR2 | | |
| NR RF Channel Number | | | Config 1 | 1 | | | 2 | | |
| Duplex mode | | | Config 1 | TDD | | | TDD | | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | | Config 1 | 66 | | | 66 | | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | DLBWP.1.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | ULBWP.1.1 | | |
| OCNG Patterns | | | Config 1 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| SSB configuration | | | Config 1 | SSB.1 FR2 | | | SSB.1 FR2 | | |
| SMTC configuration | | | Config 1 | SMTC.1 | | | SMTC.1 | | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| TCI state | | | Config 1 | TCI.State.0 | | | TCI.State.0 | | |
| PUSCH parameters for NR UL carrier | | | Config 1 | N/A | | | N/A | G-FR2-A3-4 in [28] | N/A |
| PUCCH parameters for NR UL carriers | | | Config 1 | N/A | | | N/A | Table 11.3.2.3.1.2-2 in [28] | N/A |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | Config 1 | -104.7 | -104.7 |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -95.7 | -95.7 |
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1 | -88.7 | -88.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1 | 7 | 7 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1 | 7 | 7 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -58.92 | -58.92 |
| Propagation Condition | | Config 1 | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3 [6], and does not limit UE implementation or test system implementation

## 7.5.12 Conditional PSCell addition and release delay (FR2 SA)

### 7.5.12.1 NR SA FR2 Addition and Release Delay of PSCell

Editor's Note: This test case is incomplete in following aspects:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

#### 7.5.12.1.1 Test purpose

The purpose of this test is to verify that the conditional PSCell addition and release delays under SA are within the requirements.

#### 7.5.12.1.2 Test applicability

This test applies to all types of NR UE supporting NR-DC from Release 17 onwards and supporting Conditional PSCell addition.

#### 7.5.12.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.11.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.9A.2.

7.5.12.1.4 Test description

7.5.12.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.12.1.4.1-1.

**Table 7.5.12.1.4.1-1: Supported test configurations for FR2 PSCell**

| Config | Description |
|---|---|
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 2 | FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.12.1.4.1-2

**Table 7.5.12.1.4.1-2: Initial conditions for NR SA FR2 Addition and Release Delay of PSCell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.12.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.5.12.1.4.1-3: General Test Parameters for Conditional PSCell Addition and Release delay**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test |
| Active PCell | | | Cell 1 | PCell on RF channel number 1 in FR1 |
| Neighbour cell | | | Cell 2 | Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2 |
| A4 | Hysteresis | dB | 0 | Hysteresis for event A4 |
| | Threshold RSRP | dBm | -118 | Threshold for event A4 |
| | Time to Trigger | S | 0 | Time to trigger for event A4 |
| DRX | | | OFF | For both PCell and PSCell once activated |
| Measurement gap pattern ID | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration in Cell 2 | | | FR2 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | | ms | 2 | |
| T1 | | s | 5 | During this time the PCell is known and Cell 2 is unknown. |
| T2 | | s | ≤7 | During this time Cell 2 meets the addition condition and UE adds this PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for Cell 2. |
| T4 | | s | 1 | During this time the UE releases the Cell 2. |

1. The test parameters are given in Table 7.5.12.1.4.1-3.
2. Message contents are defined in clause 7.5.12.1.4.3.
3. There are two NR cells specified in the test. Cell 1 is the PCell on one NR FR1 carrier and Cell 2 is the PSCell on the other NR FR2 carrier. Cell 1 and Cell 2 shall be initially configured according to Annex C.

#### 7.5.12.1.4.2 Test procedure

The test consists of four successive time periods, with time durations of T1, T2, T3, T4, respectively.

At the start of time duration T1, the UE does not have any timing information of cell 2. NR shall configure a condition implying addition to cell 2 during T1, at a time earlier than $T_{RRC}$ before the beginning of T2.

At the start of T2, cell 2 becomes detectable and meets the addition condition. Reception by the test system of the PRACH preamble defines the start of T3.

During T3, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send an RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T4.

During T4, the UE shall release the PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 7.5.12.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message with condition CPA according to TS 38.508-1 [14] Table 4.6.1-13 including *RRCReconfiguration** message and associated execution condition. The *RRCReconfiguration** message contains PSCell configuration in *RRCReconfiguration***. And measurement gap pattern #0 is configured for the UE.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 expiring.

5. T2 starts. The execution condition of PSCell (Cell2) becomes satisfied, the UE applies *RRCReconfiguration** message corresponding to PSCell (Cell2), and sends an *RRCReconfigurationComplete** message with condition NR-DC and CPA, including NR *RRCReconfigurationComplete*** message for the selected candidate PSCell.

6. The UE shall send PRACH to PSCell no later than $T_{config_PSCell_Addition_Conditional}$ from the start of T2, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 13.

7. The SS shall transmit an *RRCReconfiguration* message to release measurement gap. T3 starts.

8. The UE shall transmit an *RRCReconfigurationComplete* message.

9 During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 13.

10. The SS shall transmit *RRCReconfiguration* message according to TS 38.508-1 [14] TBD to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2).

11. The UE shall transmit an *RRCReconfigurationComplete* message. T4 starts.

12. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T4, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

13. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.

14. If the UE is not switched off, the SS shall transmit an *RRCRelease* message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC_CONNECTED with generic parameter Connectivity *NR*. If paging succeeds, go to step 16, otherwise switches off the UE.

15. Switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

16. Repeat step 2-15 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.12.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 7.5.12.1.4.3-1: Common Exception messages for Conditional PSCell addition for NR SA FR2**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition GAPNEEDED for step 3<br>Table H.3.1-6 with condition gapUE and Pattern #0 |

**Table 7.5.12.1.4.3-2: MeasConfig-DEFAULT: Configuration of NR measurement (step 3)**

| Derivation path: Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-condEventA4 | Table 7.5.12.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.12.1.4.3-3: reportConfigNR-condEventA4 (Table 7.5.12.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| ReportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA4-r17 SEQUENCE { | | | |
| a4-Threshold-r17 CHOICE { | | | |
| rsrp | 39 | | |
| } | | | |
| hysteresis-r17 | 0 | | |
| timeToTrigger-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.5.12.1.5 Test requirement

Table 7.5.12.1.5-1 and Table 7.5.12.1.5-2 define the primary level settings including test tolerances.

**Table 7.5.12.1.5-1: Cell Specific Parameters for Conditional PSCell Addition and Release**

| Parameter | Unit | Config | Test | | | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 |
| E-UTRA Channel Number | | 1,2 | 1 | | | |
| NR Channel Number | | 1,2 | 2 | | | |
| Duplex Mode | | 1,2 | TDD | | | |
| TDD configuration | | 1,2 | TDDConf.3.1 | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | 1,2 | 48 | | | |

| | | | |
|---|---|---|---|
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | | 1 | TRS.2.1 TDD |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 |
| PDSCH Reference measurement channel | | 1,2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | | 1,2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.3.7 TDD |
| OCNG Patterns | | 1,2 | OP.3 |
| SSB configuration | | 1,2 | SSB.2 FR2 |
| SMTC configuration | | 1,2 | SMTC.2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 |
| TRS Configuration | | 1,2 | TRS.2.1 TDD |
| CSI-RS configuration for CSI reporting | | 1,2 | CSI-RS.3.1 TDD |
| reportConfigType | | 1,2 | periodic |
| reportQuantity | | 1,2 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2 | 40 |
| CSI reporting offset | slot | 1,2 | 4 |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Propagation condition | | 1,2 | No external noise (Note 1) |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | | |

**Table 7.5.12.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 2 | | | |
|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | Setup 2a according to clause A.3.15.2.1 | | | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}s$ Note2 | dBm/SCS | -∞ | -81 | | |
| SSB_RP Note2, Note 4 | dBm/SCS | -∞ | -81 | | |
| $\hat{E}_s / I_{ot}$ BB Note 2, Note 7 | dB | -∞ | 4.88 | | |
| Io Note 2, Note 4 | dBm/95.04 MHz | N/A | -56.41 | | |

| | |
|---|---|
| Note 1: | Void |
| Note 2: | Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | Void |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 5: | Void |
| Note 6: | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 7: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4. |

$T_{RRC_delay} + T_{Event_DU}$ occurs during T1 as the PSCell addition condition becomes satisfied at the start of T2. The test shall verify that there are no interruptions during T1.

The UE shall transmit the PRACH to PSCell (Cell 2) less than $T_{config_PSCell_Addition_Conditional}$ Note1 into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay during T2 can be expressed as follows:

$$T_{config_PSCell_Addition_Conditional} = T_{measure} + T_{UE_preparation} + T_{processing} + T_{\Delta} + T_{PSCell_DU} + 2\ ms$$

Where:

$T_{measure}$ = 6720ms for power class 1 or 4160 for power class 2/3/4

$T_{UE_preparation}$ = 10ms

$T_{processing}$ = 40ms

$T_{\Delta}$ = 20ms

$T_{PSCell_DU}$ = 1*10+10 = 20 ms

## 7.5.13 Unified TCI state switch delay

### 7.5.13.0 Minimum conformance requirements

#### 7.5.13.0.1 Minimum conformance requirements for MAC-CE based downlink TCI state switch delay for unified TCI

Same as clause 5.5.11.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 8.15.2 and 8.15.3.

#### 7.5.13.0.2 Minimum conformance requirements for MAC-CE based uplink TCI state switch delay for unified TCI

Same as clause 5.5.11.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 8.16.2 and 8.16.3.

#### 7.5.13.0.3 Minimum conformance requirements for MAC-CE based uplink TCI state switch delay for unified TCI for 2 known TCI states

The requirements in this clause shall apply for UL TCI state switch using separate UL TCI state or joint TCI state of unified TCI state switch framework and having two indicated TCI-States.

In case of joint TCI state based dual TCI state switch, UE is not expected to transmit on UL before UE completes the DL and UL TCI state switch of both TRPs.

For separate UL TCI state switch or joint TCI state switch for PUCCH or PUSCH, or semi-persistent/aperiodic/periodic SRS, when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1, upon receiving PDSCH carrying MAC-CE activation command in slot n on serving cell,

If both target TCI states are known,

- The UE shall be able to transmit uplink signal with the target TCI state(s) in the slot $n+T_{HARQ} + 3N_{slot}^{subframe,\mu} + \max\{NM1^* (T_{first_target\text{-}PL\text{-}RS1} + 4^*T_{target_PL\text{-}RS1} + 2ms), NM2^* (T_{first_target\text{-}PL\text{-}RS2} + 4^*T_{target_PL\text{-}RS\,2} + 2ms)\}$/ *NR slot length*.

If both target TCI states are unknown,

- The UE shall be able to transmit uplink signal with the target TCI state(s) in the slot $n+T_{HARQ} + 3N_{slot}^{subframe,\mu} + \max\{T_{L1\text{-}RSRP1} + T_{first_target\text{-}PL\text{-}RS1} + 4^*T_{target_PL\text{-}RS1} + 2ms, T_{L1\text{-}RSRP2} + T_{first_target\text{-}PL\text{-}RS2} + 4^*T_{target_PL\text{-}RS\,2} + 2ms\}$/ *NR slot length*.

If one of the target TCI states is unknown and the other TCI state is known,

- The UE shall be able to transmit uplink signal with the target TCI state(s) in the slot $n+T_{HARQ} + 3N_{slot}^{subframe,\mu} + \max\{T_{L1\text{-}RSRP1} + T_{first_target\text{-}PL\text{-}RS1} + 4^*T_{target_PL\text{-}RS1} + 2ms, NM2^* (T_{first_target\text{-}PL\text{-}RS2} + 4^*T_{target_PL\text{-}RS\,2} + 2ms)\}$/ *NR slot length*.

Where,

- $T_{HARQ}$ (in slot) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8].
- NM1 = 1, if the target PL-RS of the first TCI state is not maintained by the UE, 0 otherwise.
- NM2 = 1, if the target PL-RS of the second first TCI is not maintained by the UE, 0 otherwise.

  In FR2, in case the target PL-RS associated with or included in the target UL or joint TCI state is SSB, the requirements in this clause shall apply when this target PL-RS is maintained by the UE.

- PL-RS is maintained provided:
  - the target PL-RS is associated with or included in the UL or joint TCI states in the active TCI list for PUSCH/PUCCH/SRS transmissions
  - There are no more than 4 different RS activated as PL-RS per serving cell among all active UL TCI states (UL or joint TCI state) for PUSCH/PUCCH/SRS transmissions
  - The target pathloss reference signal remains detectable during TCI state switching period
    - SNR of the target pathloss reference signal≥-3dB
  - The associated SSBs with the target pathloss reference signal remain detectable during the TCI state switching period.
    - SNR of the associated SSB ≥-3dB
- $T_{first_target\text{-}PL\text{-}RS1}$ is time to first pathloss RS transmission of the first TCI state after L1-RSRP measurement when first target TCI state is unknown.
- $T_{first_target\text{-}PL\text{-}RS2}$ is time to first pathloss RS transmission of the second TCI state after L1-RSRP measurement when second target TCI state is unknown.

- $T_{first_target\text{-}PL\text{-}RS1}$ is time to first pathloss RS transmission of the first TCI state after MAC CE command is decoded by the UE when the first target TCI state is known.

- $T_{first_target\text{-}PL\text{-}RS2}$ is time to first pathloss RS transmission of the second TCI state after MAC CE command is decoded by the UE when the first seond TCI state is known.

- $T_{target_PL\text{-}RS1}$ is the periodicity of the target pathloss reference signal of the first TCI state which would SSB or NZP CSI-RS when PL-RS is associated with serving cell.

- $T_{target_PL\text{-}RS2}$ is the periodicity of the target pathloss reference signal of the second TCI state which would SSB or NZP CSI-RS when PL-RS is associated with serving cell.

- $T_{L1\text{-}RSRP1}$ and $T_{L1\text{-}RSRP2}$ are the time for Rx beam refinement in FR2 for the first and second TCI state, defined as

  - $T_{L1\text{-}RSPR_Measurement_Period_SSB}$ for SSB as specified in TS 38.133 [6] clause 9.5.4.1,

    - with the assumption of M=1

    - with $T_{Report} = 0$

  - $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in TS 38.133 [6] clause 9.5.4.2

    - CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell

    - configured with higher layer parameter *repetition* set to ON

    - with the assumption of M=1 for periodic CSI-RS

    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*

    - with $T_{Report} = 0$

The requirements specified in this clause are applicable if no more than 4 different RSs are activated as PL-RS per serving cell among all active UL (or joint) TCI states.

Note: In FR2, the requirements when the target PL-RS is not maintained in this clause apply only when PL-RS are not overlapped or adjacent to the PL-RS of the other TRP.

The normative reference for this requirement is TS 38.133 [6] clause 8.23.3.

#### 7.5.13.0.4 Minimum conformance requirements for active downlink TCI state switching delay for unified TCI for single-DCI mTRP

The requirements in this clause shall apply for DL TCI state switch using separate DL TCI state or joint TCI state of unified TCI state switch framework and having two indicated TCI states.

In case of joint TCI state based dual TCI state switch, if the target PL-RS is not maintained, UE is not expected to receive on DL based on the target TCI state before UE completes the DL and UL TCI state switch of both TRPs. In case of single TCI state switch requirements specified in TS 38.133 [6] clause 8.15.3 apply.

If both the target TCI states are known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ} + 3N_{slot}^{subframe,\mu} + \max\{TO_{k1}*(T_{first\text{-}SSB1} + AD_1*T_{SSB1} + T_{SSB\text{-}proc}), TO_{k2}*(T_{first\text{-}SSB2} + AD_2*T_{SSB2} + T_{SSB\text{-}proc})\}$ / NR slot length.

Among the dual target TCI states indicated for switch, if the one of the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot $T_{HARQ} + 3N_{slot}^{subframe,\mu} + T_{L1\text{-}RSRP1} + \max\{TO_{uk1}*(T_{first\text{-}SSB1} + AD_1*T_{SSB1} + T_{SSB\text{-}proc}), TO_{k2}*(T_{first\text{-}SSB2} + T_{SSB\text{-}proc})\}$ / *NR slot length*.

If the both of the dual target TCI state are unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive UE-dedicated PDCCH/PDSCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ $T_{HARQ}$ +3$N_{slot}^{subframe,\mu}$ + max{$T_{L1\text{-}RSRP1}$ +$TO_{uk1}$*($T_{first\text{-}SSB1}$+ $T_{SSB\text{-}proc}$), $T_{L1\text{-}RSRP2}$ +$TO_{k2}$*($T_{first\text{-}SSB2}$+ $T_{SSB\text{-}proc}$)} / *NR slot length*. The UE shall be able to receive UE-dedicated PDCCH/PDSCH with the old TCI state until slot n+ $T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$.

Where

- $T_{HARQ}$ (in slot) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3];
- $T_{first\text{-}SSB1}$ is time to first SSB transmission of first TCI states of the pair of TCI states after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state; $T_{first\text{-}SSB2}$ is time to first SSB transmission of second TCI states of the pair of TCI states after MAC CE command is decoded by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB\text{-}proc}$ = 2 ms;
- $TO_{k1}$ = 1 if first target TCI state is not in the active TCI state list for PDSCH/PDCCH, 0 otherwise.
- $TO_{k2}$ = 1 if second target TCI state is not in the active TCI state list for PDSCH/PDCCH, 0 otherwise.
- $AD_1$ = 1 if SSBs are adjacent in FR2 and $T_{SSB1}$ =$T_{SSB2}$ ; 0 otherwise
- $AD_2$ = 1 if SSBs are adjacent in FR2 and $T_{SSB2}$ = $T_{SSB1}$ ; 0 otherwise
- $T_{L1\text{-}RSRP1}$ = 0 for the first TCI state and $T_{L1\text{-}RSRP2}$ = 0 for the second TCI state in FR1 or when the TCI state switching not involving QCL-TypeD in FR2. Otherwise,
- $T_{L1\text{-}RSRP1}$ for the first TCI state and $T_{L1\text{-}RSRP2}$ for the second TCI state are the time for Rx beam refinement in FR2, defined as
- $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
  - with the assumption of M=1
  - with $T_{Report}$ = 0
- $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for CSI-RS as specified in clause 9.5.4.2
  - CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell
  - configured with higher layer parameter *repetition* set to ON
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with $T_{Report}$ = 0
  - $TO_{uk1}$ for the first TCI state and $TO_{uk2}$ for the second TCI state $TO_{uk1}$ = 1 and $TO_{uk2}$ = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD
  - $TO_{uk1}$ = 1 and $TO_{uk2}$ = 1when TCI state switching involves other QCL types only
  - $T_{first\text{-}SSB1}$ is time to first SSB transmission of first TCI states of the pair of TCI states after L1-RSRP measurement when TCI state switching involves QCL-TypeD; $T_{first\text{-}SSB2}$ is time to second SSB transmission of first TCI states of the pair of TCI states after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
  - $T_{first\text{-}SSB1}$ is time to first SSB transmission of first TCI states of the pair of TCI states after MAC CE command is decoded by the UE for other QCL types; $T_{first\text{-}SSB2}$ is time to second SSB transmission of first TCI states of the pair of TCI states after MAC CE command is decoded by the UE for other QCL types;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

For FR2 both of the dual target TCI state are unknown when SSB are adjacent, longer delay is expected.

The normative reference for this requirement is TS 38.133 [6] clause 8.21.3.

## 7.5.13.1 NR SA FR2 MAC-CE based active joint TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.13.1.1 Test purpose

The purpose of this test is to verify the MAC-CE based joint TCI state switch delay requirement defined in TS 38.133 [6] clause 8.15.3 and 8.16.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

### 7.5.13.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards and supporting unified TCI state operation.

### 7.5.13.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.1 and 7.5.13.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.1.

### 7.5.13.1.4 Test description

There is one NR PCell (Cell 1) configured in this test. This test consists of two successive time periods, with time duration of T1 and T2 respectively.

#### 7.5.13.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.1.4.1-1.

**Table 7.5.13.1.4.1-1: Supported test configurations for NR SA MAC-CE based active joint TCI state switch**

| Config | Description |
|---|---|
| 7.5.13.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.1.4.1-2.

**Table 7.5.13.1.4.1-2: Initial conditions for NR SA MAC-CE based active joint TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.13.1.4.1-3.

2. Message contents are defined in clause 7.5.13.1.4.3.

3. There is one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.13.1.4.1-3: General test parameters for NR SA MAC-CE based active joint TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel No. | | Channel 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| Number of RS for L1-RSRP reporting | | 2 | Two source RSs in TCI state 0 and 1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 7.5.13.1.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE shall be configured with 2 different DLorJoint states for PCell: Joint TCI state 0 (QCL'd to SSB0) and Joint TCI state 1 (QCL'd to SSB1), in Cell 1 before starting the test. Joint TCI state 0 is indicated as the active joint TCI-state and the TCI state 1 is not in the active TCI state list for PDSCH/PDCCH.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 7.5.13.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which Joint TCI state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.13.1.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to Joint TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to Joint TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 0 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 1 after slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to Joint TCI state 0.
9. Wait 1s for the UE to switch Joint TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on Joint TCI state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.5.13.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.1.4.3-1: Common Exception messages for NR SA MAC-CE based active joint TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.13.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | joint | | |
| uplink-PowerControlToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF Uplink-powerControl-r17 { | 1 entry | | |
| uplink-powerControl-r17[1] SEQUENCE { | | Entry 1 | |
| ul-powercontrolId-r17 | 1 | | |
| p0AlphaSetforPUSCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforPUCCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforSRS-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| } | | | |
| } | | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.13.1.4.3-3: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| pathlossReferenceRSToAddModList-r17 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | 1 entry | | |
| PathlossReferenceRS-r17 [1] SEQUENCE { | | Entry 1 | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| referenceSignal-r17 CHOICE { | | | |

| | | | |
|---|---|---|---|
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | Resource #4 in TRS.2.1 | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| } | | | |
| } | | | |
| pathlossReferenceRSToReleaseList-r17 | Not present | | |
| } | | | |

**Table 7.5.13.1.4.3-4: *PDSCH-Config***

| Derivation Path: TS 38.508-1 [14], table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-Field-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-RetxDCI-1-2-r17 | Not present | | |
| pucch-sSCellDynDCI-1-2-r17 | Not present | | |
| dl-OrJointTCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| dl-OrJointTCI-StateToAddModList-r17 SEQUENCE (SIZE (1..maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State [1] | TCI-state_1 | Entry 1 DLorJoint TCI.State.2 | |
| TCI-State [2] | TCI-state_2 | Entry 2 DLorJoint TCI.State.3 | |
| } | | | |
| dl-OrJointTCI-StateToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |
| beamAppTime-r17 | Not present | | |
| dummy | Not present | | |
| dmrs-FD-OCC-DisabledForRank1-PDSCH-r17 | Not present | | |
| minimumSchedulingOffsetK0-r17 | Not present | | |
| harq-ProcessNumberSizeDCI-1-2-v1700 | Not present | | |
| harq-ProcessNumberSizeDCI-1-1-r17 | Not present | | |
| mcs-Table-r17 | Not present | | |
| mcs-TableDCI-1-2-r17 | Not present | | |
| xOverheadMulticast-r17 | Not present | | |
| priorityIndicatorDCI-4-2-r17 | Not present | | |
| sizeDCI-4-2-r17 | Not present | | |
| } | | | |

**Table 7.5.13.1.4.3-5: *TCI-State_1* (Table 7.5.13.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 0 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |

| | | | |
|---|---|---|---|
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | 0 | TRS.2.1 TDD Resource #4 | |
| ul-powerControl-r17 | 1 | | |
| } | | | |

**Table 7.5.13.1.4.3-6: *TCI-State_2* (Table 7.5.13.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 1 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | 0 | TRS.2.1 TDD Resource #4 | |
| ul-powerControl-r17 | 1 | | |
| } | | | |

### 7.5.13.1.5 Test requirement

Tables 7.5.13.1.4.1-3, 7.5.13.1.5-1 and 7.5.13.1.5-2 define the primary level settings including test tolerances for NR SA MAC-CE based active TCI state switch.

**Table 7.5.13.1.5-1: NR Cell specific test parameters for NR SA MAC-CE based active joint TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| PL-RS Configuration (CSI-RS#1) | | Resource #4 in TRS.2.1 TDD for DLorJoint TCI.State.2 and DLorJoint TCI.State.3 |
| Joint TCI State 0 | | DLorJoint TCI.State.2 |
| Joint TCI State 1 | | DLorJoint TCI.State.3 |

| | | |
|---|---|---|
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.2<br>TRS 2.2 TDD for DLorJoint TCI.State.3 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | |

**Table 7.5.13.1.5-2: OTA related test parameter for NR SA MAC-CE based active joint TCI state switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | Source RS in TCI state 0 | | Source RS in TCI state 1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_S$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| $\hat{E}_s / I_{ot}$ BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | -Infinity | -56.0 |
| Note 1: Void<br>Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.<br>Note 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to receive and transmit with TCI state 0 until slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu}$
- be able to start receiving and transmitting with TCI state 1 after slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.13.2 NR SA FR2 MAC-CE based active uplink TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.5.13.2.1 Test purpose

The purpose of this test is to verify the MAC-CE based uplink TCI state switch delay requirement defined in TS 38.133 [6] clause 8.16.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 7.5.13.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards and supporting unified TCI state operation.

#### 7.5.13.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.2.

#### 7.5.13.2.4 Test description

There is one NR PCell (Cell 1) configured in this test. This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 7.5.13.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.2.4.1-1.

**Table 7.5.13.2.4.1-1: Supported test configurations for NR SA MAC-CE based active uplink TCI state switch**

| Config | Description |
|---|---|
| 7.5.13.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.2.4.1-2.

**Table 7.5.13.2.4.1-2: Initial conditions for NR SA MAC-CE based active uplink TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.13.2.4.1-3.
2. Message contents are defined in clause 7.5.13.2.4.3.
3. There is one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.13.2.4.1-3: General test parameters for NR SA MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

#### 7.5.13.2.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE shall be configured with 2 different uplink TCI states for PCell: Uplink TCI state 0 (associated with SSB0) and uplink TCI state 1 (associated with SSB1), in Cell 1 before starting the test. Uplink TCI state 0 is indicated as the active uplink TCI-state and the TCI state 1 is not in the active TCI state list for PDSCH/PDCCH. The UE shall be configured with a unified DL TCI state 0, and SSB0 is configured as QCL source for the TCI state. At the start of test UE is connected to DL TCI state 0.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 7.5.13.2.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which uplink TCI state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.13.2.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to uplink TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to uplink TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 0 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 1 after slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} + 2ms)$ / *NR slot length*

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to uplink TCI state 0.
9. Wait 1s for the UE to switch uplink TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.13.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.2.4.3-1: Common Exception messages for NR SA MAC-CE based active uplink TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.13.2.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | seperate | | |
| uplink-PowerControlToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF Uplink-powerControl-r17 { | 1 entry | | |
| uplink-powerControl-r17[1] SEQUENCE { | | Entry 1 | |
| ul-powercontrolId-r17 | 1 | | |
| p0AlphaSetforPUSCH-r17 | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforPUCCH-r17 | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforSRS-r17 | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| } | | | |
| } | | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.13.2.4.3-3: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| ul-TCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| ul-TCI-ToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF TCI-UL-State-r17 { | | | |
| TCI-UL-State-r17 [1] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 0 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal-r17 CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |

| | | | |
|---|---|---|---|
| }, | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| TCI-UL-State-r17 [2] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 1 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| } | | | |
| ul-TCI-ToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |
| ul-powerControl-r17 | Not present | | |
| pucch-ConfigurationListMulticast1-r17 | Not present | | |
| pucch-ConfigurationListMulticast2-r17 | Not present | | |
| pathlossReferenceRSToAddModList-r17 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | | | |
| PathlossReferenceRS-r17 [1] SEQUENCE { | | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| referenceSignal-r17 CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | Resource #4 in TRS.2.1 | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| } | | | |
| } | | | |
| pathlossReferenceRSToReleaseList-r17 | Not present | | |
| } | | | |

### 7.5.13.2.5 Test requirement

Tables 7.5.13.2.4.1-3, 7.5.13.2.5-1 and 7.5.13.2.5-2 define the primary level settings including test tolerances for NR SA MAC-CE based active TCI state switch.

**Table 7.5.13.2.5-1: NR Cell specific test parameters for NR SA MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI State | | DLorJoint TCI.State.0 |

| | | |
|---|---|---|
| PL-RS Configuration for CSI-RS#0 | | Resource #4 in TRS.2.1 TDD for UL TCI.State.2 |
| PL-RS Configuration for CSI-RS#1 | | Resource #4 in TRS.2.2 TDD for UL TCI.State.3 |
| UL TCI State-0 Configuration | | UL TCI.State.2 |
| UL TCI State-1 Configuration | | UL TCI.State.3 |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.13.2.5-2: OTA related test parameter for NR SA MAC-CE based active uplink TCI state switch**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -95.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -86.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 3.4 | | -infinity | 3.4 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.7 | | -infinity | -82.7 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.47 | | -61.5 | -56.47 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- Continue transmitting using UL TCI state 0 up to and including slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu}$

- Start transmitting using UL TCI state 1, from slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu} + (T_{first_target\text{-}PL\text{-}RS} + 4*T_{target_PL\text{-}RS} +$ 2ms) / *NR slot length* and onwards.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.13.3 NR SA FR2 MAC-CE based active downlink TCI state switch

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.5.13.3.1 Test purpose

The purpose of this test is to verify the MAC-CE based downlink TCI state switch delay requirement defined in TS 38.133 [6] clause 8.16.2 by a UE capable of beam correspondence without the need for UL beam sweeping.

### 7.5.13.3.2 Test applicability

This test applies to all types of NR UE release 17 onwards and supporting unified TCI state operation.

### 7.5.13.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.3.

### 7.5.13.3.4 Test description

There is one NR PCell (Cell 1) configured in this test. This test consists of two successive time periods, with time duration of T1 and T2 respectively.

#### 7.5.13.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.3.4.1-1.

**Table 7.5.13.3.4.1-1: Supported test configurations for NR SA MAC-CE based active downlink TCI state switch**

| Config | Description |
|---|---|
| 7.5.13.3-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.3.4.1-2.

**Table 7.5.13.3.4.1-2: Initial conditions for NR SA MAC-CE based active downlink TCI state switch**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.13.3.4.1-3.

2. Message contents are defined in clause 7.5.13.3.4.3.

3. There is two NR cells specified in the test: one NR PCell (Cell 1) and one NR cell as the cell with additional PCI (Cell 2). NR Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.13.3.4.1-3: General test parameters for NR SA MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two NR radio channels are used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Cell with additional PCI | | Cell 2 | NR Cell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | Two source RSs in TCI state 0 and 1. |
| Cell2 timing offset to cell1 | us | <CP | |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 7.5.13.3.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE shall be configured with 2 different downlink TCI states for PCell: Downlink TCI state 0 (QCL'd to TRS resource set 1, TCI state of which is QCLed to SSB0 of Cell1) and downlink TCI state 1 (QCL'd to TRS resource set 2, TCI state of which is QCLed to SSB1 of Cell2), in Cell 1 before starting the test. Downlink TCI state 0 is indicated as the active downlink TCI-state.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters according to T1 in Table 7.5.13.3.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 to which downlink TCI state 0 is QCL'd is transmitted.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.13.3.5-1. T2 starts. At the beginning of T2, the SSB1 corresponding to downlink TCI state 1 starts transmitting.

4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.

5. The UE transmits an *RRCReconfigurationComplete* message.

6. The SS sends a MAC-CE to indicate switch to downlink TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.

7. If the SS:

   a) Receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 0 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and

   b) Receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 1 after slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}+(T_{first\text{-}SSB}+T_{SSB\text{-}proc})$ / *NR slot length*

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a MAC-CE to indicate switch to downlink TCI state 0.

9. Wait 1s for the UE to switch downlink TCI state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on downlink TCI state 0 continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.13.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.3.4.3-1: Common Exception messages for NR SA MAC-CE based active downlink TCI state switch**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.13.3.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | separate | | |
| uplink-PowerControlToAddModList-r17 | Not present | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.13.3.4.3-3: *PDSCH-Config***

| Derivation Path: TS 38.508-1 [14], table 4.6.3-100 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| pdsch-HARQ-ACK-OneShotFeedbackDCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-EnhType3DCI-Field-1-2-r17 | Not present | | |
| pdsch-HARQ-ACK-RetxDCI-1-2-r17 | Not present | | |
| pucch-sSCellDynDCI-1-2-r17 | Not present | | |
| dl-OrJointTCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| dl-OrJointTCI-StateToAddModList-r17 SEQUENCE (SIZE (1..maxNrofTCI-States)) OF TCI-State { | 2 entries | | |
| TCI-State [1] SEQUENCE { | TCI-state_1 | Entry 1<br>DLorJoint<br>TCI.State.2 | |
| TCI-State [2] SEQUENCE { | TCI-state_2 | Entry 2<br>DLorJoint<br>TCI.State.3 | |
| } | | | |
| dl-OrJointTCI-StateToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |
| beamAppTime-r17 | Not present | | |
| dummy | Not present | | |
| dmrs-FD-OCC-DisabledForRank1-PDSCH-r17 | Not present | | |
| minimumSchedulingOffsetK0-r17 | Not present | | |
| harq-ProcessNumberSizeDCI-1-2-v1700 | Not present | | |

| | | | |
|---|---|---|---|
| harq-ProcessNumberSizeDCI-1-1-r17 | Not present | | |
| mcs-Table-r17 | Not present | | |
| mcs-TableDCI-1-2-r17 | Not present | | |
| xOverheadMulticast-r17 | Not present | | |
| priorityIndicatorDCI-4-2-r17 | Not present | | |
| sizeDCI-4-2-r17 | Not present | | |
| } | | | |

**Table 7.5.13.3.4.3-4: *TCI-State_1* (Table 7.5.13.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 0 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| ul-powerControl-r17 | Not present | | |
| } | | | |

**Table 7.5.13.3.4.3-5: *TCI-State_2* (Table 7.5.13.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-190 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TCI-State ::= SEQUENCE { | | | |
| tci-StateId | 1 | | |
| qcl-Type1 SEQUENCE { | | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeA | | |
| } | | | |
| qcl-Type2 SEQUENCE { | | | |
| cell | Not present | | |
| bwp-Id | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| qcl-Type | typeD | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| pathlossReferenceRS-Id-r17 | Not present | | |
| ul-powerControl-r17 | Not present | | |
| } | | | |

### 7.5.13.3.5 Test requirement

Tables 7.5.13.3.4.1-3, 7.5.13.3.5-1 and 7.5.13.3.5-2 define the primary level settings including test tolerances for NR SA MAC-CE based active TCI state switch.

**Table 7.5.13.3.5-1: NR Cell specific test parameters for NR SA MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 for SSB0 of Cell 1 and SSB1 of Cell 2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI State 0 | | DLorJoint TCI.State.0 |
| DL TCI State 1 | | DLorJoint TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.0<br>TRS.2.2 TDD for DLorJoint TCI.State.1 |
| Pathloss RS Configuration | | Resource #4 in TRS.2.1 TDD |
| reportQuantity for SSB | | ssb-Index-RSRP-Index-r17 |
| reportConfigType for SSB | | periodic |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | No external noise (Note 2) |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | |

**Table 7.5.13.3.5-2: OTA related test parameter for NR SA MAC-CE based active downlink TCI state switch**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.3.15.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| $\hat{E}_s / I_{ot}$ BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 |

| | |
|---|---|
| Note 1: | Void |
| Note 2: | SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | Void |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone. |
| Note 6: | Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 7: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. |

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on DL TCI state 0 till slot n+ $T_{HARQ}$ +3$N_{slot}^{subframe,\mu}$
- be able to start receiving on DL TCI state 1 after n+ $T_{HARQ}$ + (5ms + $T_{first\text{-}SSB}$) / *NR slot length*

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.13.4 sDCI MAC-CE based joint TCI state switching

### 7.5.13.4.1 NR SA FR2 PCell dual downlink and uplink TCI state switch in sDCI for known case

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- MU/TT analysis is missing.
- Message content is incomplete.

#### 7.5.13.4.1.1 Test purpose

To verify both active downlink and uplink TCI state switch delay requirement defined in defined in 38.133 [6] clause 8.21 and 8.23, respectively, by using joint TCI state of unified TCI state switch framework when *tci-JointTCI-UpdateSingleActiveTCI-PerCC-r18* is supported and when *tci-SeparateTCI-UpdateSingleActiveTCI-PerCC-r18* is not supported.

#### 7.5.13.4.1.2 Test applicability

This test applies to all types of NR UEs from Release 18 onwards supporting unified TCI with joint DL/UL TCI update for single-DCI based intra-cell multi-TRP.

#### 7.5.13.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.3 and 7.5.13.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.4.1.

#### 7.5.13.4.1.4 Test description

##### 7.5.13.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.4.1.4.1-1.

**Table 7.5.13.4.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.4.1.4.1-2 and Table 7.5.13.4.1.4.1-3.

**Table 7.5.13.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.5.13.4.1.4.1-3: General test parameters for TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 320 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0 and SSB2 of TRP0, SSB1 and SSB3 of TRP1 | L1-RSRP measurements of SSB0, SSB1 SSB2 and SSB3. |
| Number of RS for L1-RSRP reporting | | 4 | SSB0, SSB1, SSB2 and SSB3 in Joint TCI state 0, 1, 2, and 3. |
| Cell 2 timing offset to cell1 | us | <CP | |
| T1 | s | 0.2 | |
| T2 | s | 1 | UE is required to activate dual joint TCI states (TCI state 2 and TCI state 3). |

1. The general test parameter settings are set up according to Table 7.5.13.4.1.4.1-3.

2. Message contents are defined in clause 7.5.13.4.1.4.3.

2. Single Cell is used, which is NR FR2 PCell containing two TRPs (i.e., TRP 0 and TRP 1). The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

### 7.5.13.4.1.4.2 Test procedure

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.
- UE is provided with *dl-OrJoint-TCIStateList-r17* and UE's higher layer signalling *unifiedTCI-StateType-r17* in IE *MIMOParam-r17* is set to *joint*.
- applyIndicatedTCI-State-r18 is set as {first} for TRP0 (CORESET index p associated with Joint TCI state 0 and Joint TCI state 2) and as {second} for TRP1 (CORESET index q associated with Joint TCI state 1 and Joint TCI state 3).
- tci-SelectionPresentInDCI-r18 is configured in the BWP configuration, i.e. TCI state for the PDSCH is indicated by DCI format 1_1 and PDSCHs on two TRPs are scheduled in TDM manner.
- UE is configured with two joint TCI states (TCI state 0 and TCI state 2) for TRP0 and two joint TCI states (TCI state 1 and TCI state 3) for TRP1. QCL info to Joint TCI state 0,1,2 and 3 are provided by SSB0, SSB1, SSB2 and SSB3, respectively.

- UE is indicated in TCI state 0 and TCI state 1 as the active TCI state for TRP0 and TRP1.

The test consists of two time periods, T1 and T2. During T1, SSB0 in joint TCI state 0 and SSB1 in joint TCI state 1 are transmitted. At the beginning of T2, SSB2 in joint TCI state 2 and SSB3 in joint TCI state 3 start transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms after the slot in which UE provides L1-RSRP report with results for SSB2 and SSB3 in joint TCI state 2 and joint TCI state 3, UE receives a MAC-CE command indicating a switch to dual joint TCI state 2 and TCI state 3 for two TRPs.

The test equipment verifies that UE can be scheduled by two TRPs on joint TCI state 0 and joint TCI state 1 till slot n+ $T_{HARQ}$ +3$N_{slot}^{subframe,\mu}$. The test equipment also verifies the TCI state switch time for two TRPs by scheduling the UE on joint TCI state 2 and joint TCI state 3 after slot n+$T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$ + max{NM1* ($T_{first_target\text{-}PL\text{-}RS1}$ + 4*$T_{target_PL\text{-}RS1}$ + 2 ms), NM2* ($T_{first_target\text{-}PL\text{-}RS2}$ + 4*$T_{target_PL\text{-}RS\ 2}$+ 2 ms) }/ *NR slot length*.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 7.5.13.4.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 and SSB1 are transmitted.
3. When T1 expires the SS starts transmitting SSB2 and SSB3. T2 starts.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message
6. The SS sends a MAC-CE to indicate a switch to dual joint TCI state 2 and TCI state 3 for two TRPs in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB2 and SSB3.
7. If the SS:
   a) receives ACK/NACK on each UL transmission occasion scheduled on joint TCI state 2 and joint TCI state 3 until slot n+$T_{HARQ}$+3ms, and
   b) receives ACK/NACK on each UL transmission occasion scheduled on joint TCI state 2 and joint TCI state 3 after slot n+$T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$ + max{NM1* ($T_{first_target\text{-}PL\text{-}RS1}$ + 4*$T_{target_PL\text{-}RS1}$ + 2 ms), NM2* ($T_{first_target\text{-}PL\text{-}RS2}$ + 4*$T_{target_PL\text{-}RS\ 2}$+ 2 ms) }/ *NR slot length*, where NM1=1, NM2=1.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to joint TCI state 0 and TCI state 1.
9. Wait 1s for the UE to switch to joint TCI state 0 and TCI state 1. If the SS receives ACK/NACK on each UL transmission occasion scheduled on joint TCI state 0 and TCI state 1 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.13.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

7.5.13.4.1.5 Test requirement

Tables 7.5.13.4.1.5-1 and 7.5.13.4.1.5-2 defines the primary level settings including test tolerances.

**Table 7.5.13.4.1.5-1: NR Cell specific test parameters for dual TCI state switch**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{PRB,c}$ = 66 |
| Data PRBs allocated | | 66 |
| Initial BWP Configuration | | DLBWP.0.2<br>ULBWP.0.2 |
| Dedicated BWP Configuration | | DLBWP.1.1<br>ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters (CORESET index p) | | CCR.3.1 TDD |
| Dedicated CORESET parameters (CORESET index q) | | CCR.3.2 TDD |
| OCNG Patterns | | OP.5 defined in A.3.2.1 |
| SSB Configuration | | SSB.17 FR2 |
| SMTC Configuration | | SMTC.1 |
| Joint TCI State 0 | | DLorJoint TCI.State.2 |
| Joint TCI State 1 | | DLorJoint TCI.State.6 |
| Joint TCI State 2 | | DLorJoint TCI.State.7 |
| Joint TCI State 3 | | DLorJoint TCI.State.8 |
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.2<br>TRS.2.4 TDD for DLorJoint TCI.State.6<br>TRS.2.5 TDD for DLorJoint TCI.State.7<br>TRS.2.6 TDD for DLorJoint TCI.State.8 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.13.4.1.5-2: OTA related test parameters for dual TCI state switch**

| Parameter | Units | TRP0 | | | | TRP1 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSB0 | | SSB2 | | SSB1 | | SSB3 | |
| | | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup [TBD] according to clause A.3.XX | | | | | | | |
| | | AoA1 | | AoA2 | | AoA2 | | AoA3 | |
| Assumption for UE beams Note 6 | | Rough | | | | | | | |
| $\hat{E}_S$ | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SS B_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| $\hat{E}_s/I_{ot}$ BB Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |

| Parameter | Units | TRP0 | | | | TRP1 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSB0 | | SSB2 | | SSB1 | | SSB3 | |
| | | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| NOTE 1: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | |
| NOTE 2: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | | | | | | |
| NOTE 3: As observed with 0 dBi gain antenna at the center of the quiet zone. | | | | | | | | | |
| NOTE 4: Information about types of UE beam is given in clause B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | | | |
| NOTE 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | | |

During T2, the test verifies that UE can be scheduled by two TRPs on joint TCI state 2 and joint TCI state 3.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive and transmit with joint TCI state 0 and joint TCI state 1 till slot n+ $T_{HARQ}$ +$3N_{slot}^{subframe,\mu}$
- be able to start receiving and transmitting with joint TCI state 2 and joint TCI state 3 after slot n+$T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$ + max{NM1* ($T_{first_target\text{-}PL\text{-}RS1}$ + 4*$T_{target_PL\text{-}RS1}$ + 2 ms), NM2* ($T_{first_target\text{-}PL\text{-}RS2}$ + 4*$T_{target_PL\text{-}RS\ 2}$+ 2 ms) }/ *NR slot length*.
  - where NM1=1, NM2=1.

The rate of correct events observed during repeated tests shall be at least 90 %.

## 7.5.13.5 MAC-CE based dual downlink TCI state switching delay for unified TCI for single-DCI mTRP

### 7.5.13.5.1 NR SA FR2 PCell dual downlink TCI state switch in sDCI for known case

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

MU/TT analysis is missing.

Message content is imcomplete.

#### 7.5.13.5.1.1 Test purpose

To verify verify the MAC-CE based dual downlink TCI state switch delay requirement defined in TS 38.133 [6] clause 8.21.3 when *tci-SeparateTCI-UpdateSingleActiveTCI-PerCC-r18* is supported.

#### 7.5.13.5.1.2 Test applicability

This test applies to all types of NR UEs from Release 18 onwards supporting separate DL/UL TCI update for single-DCI based intra-cell multi-TRP.

#### 7.5.13.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.5.1.

#### 7.5.13.5.1.4 Test description

##### 7.5.13.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.5.1.4.1-1.

**Table 7.5.13.5.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.5.1.4.1-2 and Table 7.5.13.5.1.4.1-3.

**Table 7.5.13.5.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.5.13.5.1.4.1-3: General test parameters for TCI state switch**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0 and SSB2 of TRP0, SSB1 and SSB3 of TRP1 | L1-RSRP measurements of SSB0, SSB1 SSB2 and SSB3. |
| Number of RS for L1-RSRP reporting | | 4 | four source RSs in TCI state 0,1, 2,3. |
| Cell 2 timing offset to cell1 | us | <CP | |
| T1 | s | 0.2 | |
| T2 | s | 1 | |

1. The general test parameter settings are set up according to Table 7.5.13.5.1.4.1-3.

2. Message contents are defined in clause 7.5.13.5.1.4.3.

2. Single Cell is used, which is NR FR2 PCell containing two TRPs (i.e., TRP 0 and TRP 1). The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

### 7.5.13.5.1.4.2 Test procedure

Before the test starts,

- UE is connected to Cell 1 on radio channel 1 (PCC).
- UE is provided with *dl-OrJoint-TCIStateList-r17* and UE's higher layer signalling *unifiedTCI-StateType-r17* in IE *MIMOParam-r17* is set to *separate*.
- UE is configured with SSB-based L1-RSRP measurements on Cell 1
- UE is configured with two TCI states (TCI state 0 and TCI state 2) for TRP0 and two TCI states (TCI state 1 and TCI state 3) for TRP1. QCL info to DL TCI state 0, 1, 2 and 3 are provided by SSB0, SSB1, SSB2 and SSB3, respectively.
- UE is indicated in TCI state 0 and TCI state 1 as the active TCI state for TRP0 and TRP1

The test consists of two time periods, T1 and T2. During T1, source RS in TCI state 0 and TCI state 1 are transmitted. At the beginning of T2, source RS in TCI state 2 and source RS in TCI state 3 start transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms after the slot in which UE provides L1-RSRP report with results for source RSs in TCI state 2 and 3, UE receives a MAC-CE command indicating a switch to TCI state 2 and 3 for two TRPs. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled by two TRPs on TCI state 0 and TCI state 1 till slot n+ $T_{HARQ}$ +3$N_{slot}^{subframe,\mu}$. The test equipment also verifies the TCI state switch time for two TRPs by scheduling the UE on TCI state 2 and TCI state 3 after slot after slot n+ $T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$+ max{$TO_{k1}$*($T_{first\text{-}SSB1}$ + $AD_1$*$T_{SSB1}$ + $T_{SSB\text{-}proc}$), $TO_{k2}$*($T_{first\text{-}SSB2}$ + $AD_2$*$T_{SSB2}$ + $T_{SSB\text{-}proc}$)} / NR slot length.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 7.5.13.5.1.5-1. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0 and SSB1 are transmitted.
3. When T1 expires the SS starts transmitting SSB2 and SSB3. T2 starts.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5 The UE transmits an *RRCReconfigurationComplete* message
6. The SS sends a MAC-CE to indicate a switch to TCI state 2 and TCI state 3 for two TRPs in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB2 and SSB3.
7. If the SS:
   a) receives ACK/NACK on each UL transmission occasion scheduled on TCI state 0 and TCI state 1 until slot n+$T_{HARQ}$+3ms, and
   b) receives ACK/NACK on each UL transmission occasion scheduled on TCI state 2 and TCI state 3 after slot n+ $T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$+ max{$TO_{k1}$*($T_{first\text{-}SSB1}$ + $AD_1$*$T_{SSB1}$ + $T_{SSB\text{-}proc}$), $TO_{k2}$*($T_{first\text{-}SSB2}$ + $AD_2$*$T_{SSB2}$ + $T_{SSB\text{-}proc}$)} / NR slot length.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI state 0 and TCI state 1.
9. Wait 1s for the UE to switch to TCI state 0 and TCI state 1. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI state 0 and TCI state 1 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.13.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.5.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

#### 7.5.13.5.1.5 Test requirement

Tables 7.5.13.5.1.5-1 and 7.5.13.5.1.5-2 defines the primary level settings including test tolerances.

**Table 7.5.13.5.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |

| Parameter | Unit | Cell 1 |
|---|---|---|
| $BW_{channel}$ | | 100 MHz: $N_{PRB,c}$ = 66 |
| Data PRBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3. 2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP. 5 |
| SSB Configuration | | SSB.17 FR2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI State 0 | | DLorJoint TCI.State.0 |
| DL TCI State 1 | | DLorJoint TCI.State.1 |
| DL TCI State 2 | | DLorJoint TCI.State.6 |
| DL TCI State 3 | | DLorJoint TCI.State.7 |
| TRS Configuration | | TRS.2.1 TDD for DLorJoint TCI.State.0<br>TRS.2.2 TDD for DLorJoint TCI.State.1<br>TRS.2.4 TDD for DLorJoint TCI.State.6<br>TRS.2.5 TDD for DLorJoint TCI.State.7 |
| Pathloss RS Configuration | | Resource #4 in TRS.2.1 TDD |
| reportQuantity for SSB | | ssb-Index-RSRP-Index-r17 |
| reportConfigType for SSB | | periodic |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Propagation Condition | | AWGN |
| NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 7.5.13.5.1.5-2: OTA related test parameters for TCI state switch**

| Parameter | Units | TRP0 | | | | TRP1 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSB0 | | SSB2 | | SSB1 | | SSB3 | |
| | | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup [TBD] according to clause A.3.XX | | | | | | | |
| | | AoA1 | | AoA2 | | AoA2 | | AoA3 | |
| Assumption for UE beams Note 6 | | Rough | | | | | | | |
| $\hat{E}_s$ | dBm/SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| SS B_RP Note 2 | dBm/ SCS | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT | -80.6+TT | -80.6+TT | -Infinity | -80.6+TT |
| $\hat{E}_s/I_{ot\ BB}$ Note 7 | dB | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT | 8.3+TT | 8.3+TT | -Infinity | 8.3+TT |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT | -56.0+TT | -56.0+TT | - Infinity | -56.0+TT |

NOTE 1: Void
NOTE 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0 dBi gain antenna at the center of the quiet zone.
NOTE 6: Information about types of UE beam is given in clause B.2.1.3 and does not limit UE implementation or test system implementation.
NOTE 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

During T2, the test verifies that UE can be scheduled by two TRPs on TCI state 2 and TCI state 3.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on DL TCI state 0 and DL TCI state 1 till slot n+ $T_{HARQ}$ +3$N_{slot}^{subframe,\mu}$
- be able to start receiving on DL TCI state 2 and DL TCI state 3 after slot n+ $T_{HARQ}$ + 3$N_{slot}^{subframe,\mu}$+ max{$TO_{k1}$*($T_{first-SSB1}$ + $AD_1$*$T_{SSB1}$ + $T_{SSB-proc}$), $TO_{k2}$*($T_{first-SSB2}$ + $AD_2$*$T_{SSB2}$ + $T_{SSB-proc}$)} / NR slot length

The rate of correct events observed during repeated tests shall be at least 90 %.

## 7.5.13.6 MAC-CE based active uplink TCI state switch for single-DCI mTRP

### 7.5.13.6.1 NR SA FR2 MAC-CE based active uplink TCI state switch for 2 known TCI states

#### 7.5.13.6.1.1 Test purpose

The purpose of this test is to verify fulfilment of the uplink TCI switch delay requirement defined in TS 38.133 [6] clause 8.23.3 by a UE capable of beam correspondence without the need for UL beam sweeping. The test scenario comprises one PCell (Cell 1) with two TRPs.

#### 7.5.13.6.1.2 Test applicability

This test applies to all types of NR UE release 18 onwards and supporting unified TCI state operation for single-DCI based intra-cell multi-TRP with multiple activated TCI states.

#### 7.5.13.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.13.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.13.6.1.

#### 7.5.13.6.1.4 Test description

There is one NR PCell (Cell 1) configured in this test. This test consists of two successive time periods, with time duration of T1 and T2 respectively.

##### 7.5.13.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.13.6.1.4.1-1.

**Table 7.5.13.6.1.4.1-1: Supported test configurations for NR SA MAC-CE based active uplink TCI state switch for two known TCI states**

| Config | Description |
|---|---|
| 7.5.13.6.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.13.6.1.4.1-2.

**Table 7.5.13.6.1.4.1-2: Initial conditions for NR SA MAC-CE based active uplink TCI state switch for two known TCI states**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.13.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.13.6.1.4.1-3.
2. Message contents are defined in clause 7.5.13.6.1.4.3.
3. There is one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 7.5.13.6.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1, SSB2, SSB3 | L1-RSRP measurements of SSB0, SSB1, SSB2 and SSB3. |
| Number of reported RS | | 3 | L1-RSRP reporting of measurements on SSB0, SSB1, SSB2, and SSB3. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

### 7.5.13.6.1.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending. Prior to the start of the time duration T1, the UE shall be fully synchronized to NR PCell. The UE shall be configured with 4 different uplink TCI states for PCell: Uplink TCI state 0 (associated with SSB0), uplink TCI state 1 (associated with SSB1), Uplink TCI state 2 (associated with SSB2), and Uplink TCI state 3 (associated with SSB3) in Cell 1 before starting the test. Uplink TCI state 0 is indicated as the active uplink TCI-state and the TCI state 1, TCI state 2, TCI state 3 is not in the active TCI state list for PDSCH/PDCCH. The UE shall be configured with a unified DL TCI state 0, and SSB0 is configured as QCL source for the TCI state. At the start of test UE is connected to DL TCI state 0 and UL TCI state 0, and UL TCI state 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters according to T1 in Table 7.5.13.6.1.5-2. Propagation conditions are set according to clause C.2.2. T1 starts. During T1 only SSB0, SSB1 to which uplink TCI state 0, TCI state 1 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.13.6.1.5-2. T2 starts. At the beginning of T2, the SSB2 corresponding to uplink TCI state 2, and the SSB3 corresponding to uplink TCI state 3 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to uplink TCI-state 2 and to uplink TCI-state 3 in slot n which is within 1280ms of UE providing L1-RSRP report with results for SSB0, SSB1, SSB2, and SSB3.
7. If the SS:
   a) Receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 0 and uplink TCI state 1 until slot $n+T_{HARQ}+3N_{slot}^{subframe,\mu}$, and
   b) Receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 2 and uplink TCI state 3 after slot $n+ T_{HARQ} +3N_{slot}^{subframe,\mu} + \max\{NM1* (T_{first_target\text{-}PL\text{-}RS1} + 4*T_{target_PL\text{-}RS1} + 2ms), NM2* (T_{first_target\text{-}PL\text{-}RS2} + 4*T_{target_PL\text{-}RS2} + 2ms)\}$ / *NR slot length.* NM1 is equal to 1. NM2 is equal to 1.

   the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
8. When T2 expires the SS shall sends a MAC-CE to indicate switch to uplink TCI state 1 and uplink TCI state 2.

9. Wait 1s for the UE to switch to uplink TCI state 1 and uplink TCI state 2. If the SS receives ACK/NACK on each UL transmission occasion scheduled on uplink TCI state 0 continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.5.13.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.13.6.1.4.3-1: Common Exception messages for NR SA MAC-CE based active uplink TCI state switch for two known TCI states**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.5.13.6.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| mimoParam-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| additionalPCI-ToAddModList-r17 | Not present | | |
| additionalPCI-ToReleaseList-r17 | Not present | | |
| unifiedTCI-StateType-r17 | separate | | |
| uplink-PowerControlToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF Uplink-powerControl-r17 { | 1 entry | | |
| uplink-powerControl-r17[1] SEQUENCE { | | Entry 1 | |
| ul-powercontrolId-r17 | 1 | | |
| p0AlphaSetforPUSCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforPUCCH-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| p0AlphaSetforSRS-r17 SEQUENCE { | | | |
| p0-r17 | 0 | | |
| alpha-r17 | Alpha08 | | |
| closedLoopIndex-r17 | i0 | | |
| } | | | |
| } | | | |
| } | | | |
| uplink-PowerControlToReleaseList-r17 | Not present | | |
| sfnSchemePDCCH-r17 | Not present | | |
| sfnSchemePDSCH-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.5.13.6.1.4.3-3: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| ul-TCI-StateList-r17 CHOICE { | | | |
| explicitlist SEQUENCE { | | | |
| ul-TCI-ToAddModList-r17 SEQUENCE (SIZE (1..maxUL-TCI-r17)) OF TCI-UL-State-r17 { | | | |
| TCI-UL-State-r17 [1] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 0 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #0 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| TCI-UL-State-r17 [2] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 1 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #1 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| TCI-UL-State-r17 [3] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 2 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #2 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| TCI-UL-State-r17 [4] SEQUENCE { | | | |
| tci-UL-StateId-r17 | 3 | | |
| servingCellId-r17 | Not present | | |
| bwp-Id-r17 | Not present | | |
| referenceSignal CHOICE { | | | |
| ssb | SSB-Index of SSB #3 | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| ul-powerControl-r17 | 1 | | |
| pathlossReferenceRS-Id-r17 | 0 | | |
| } | | | |
| } | | | |
| ul-TCI-ToReleaseList-r17 | Not present | | |
| } | | | |
| } | | | |
| ul-powerControl-r17 | Not present | | |
| pucch-ConfigurationListMulticast1-r17 | Not present | | |
| pucch-ConfigurationListMulticast2-r17 | Not present | | |
| pathlossReferenceRSToAddModList-r17 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | | | |
| PathlossReferenceRS-r17 [1] SEQUENCE { | | | |
| pathlossReferenceRS-Id-r17 | 0 | | |

| | | | |
|---|---|---|---|
| referenceSignal-r17 CHOICE { | | | |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | Resource #4 in TRS.2.1 | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| } | | | |
| } | | | |
| pathlossReferenceRSToReleaseList-r17 | Not present | | |
| } | | | |

### 7.5.13.6.1.5 Test Requirement

Tables 7.5.13.6.1.4.1-3, 7.5.13.6.1.5-1 and 7.5.13.6.1.5-2 define the primary level settings including test tolerances for NR SA MAC-CE based active TCI state switch for two known TCI states.

**Table 7.5.13.6.1.5-1: OTA related test parameter for NR SA MAC-CE based active uplink TCI state switch two known TCI states**

| Parameter | Unit | Cell 1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | | SSB2 | | SSB3 | |
| | | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 7 according to clause A.9.7 | | | | | | | |
| | | AoA1 | | AoA2 | | AoA1 | | AoA3 | |
| Assumption for UE beams Note 6 | | Rough | | | | | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | | | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -86.1 | | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 3.4 | | -infinity | 3.4 | -infinity | 3.4 | -infinity | 3.4 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.7 | | -infinity | -82.7 | -infinity | -82.7 | -infinity | -82.7 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.47 | | -61.51 | -56.47 | -61.51 | -56.47 | -61.51 | -56.47 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

**Table 7.5.13.6.1.5-2: NR Cell specific test parameters for NR SA MAC-CE based active uplink TCI state switch for two known TCI states**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |

| | | |
|---|---|---|
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| DL TCI State | | DLorJoint TCI.State.0 |
| PL-RS Configuration for CSI-RS#0 | | Resource #4 in TRS.2.1 TDD for UL TCI.State.2 |
| PL-RS Configuration for CSI-RS#1 | | Resource #4 in TRS.2.2 TDD for UL TCI.State.3 |
| PL-RS Configuration for CSI-RS#2 | | Resource #4 in TRS.2.4 TDD for UL TCI.State.4 |
| PL-RS Configuration for CSI-RS#3 | | Resource #4 in TRS.2.5 TDD for UL TCI.State.5 |
| UL TCI State-0 Configuration | | UL TCI.State.2 |
| UL TCI State-1 Configuration | | UL TCI.State.3 |
| UL TCI State-2 Configuration | | UL TCI.State.4 |
| UL TCI State-3 Configuration | | UL TCI.State.5 |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

During T2, the UE shall send L1-RSRP report with results for SSB0 and SSB1. After receiving MAC-CE command in slot *n*, the UE shall:

- Continue transmitting using UL TCI state 0 and UL TCI state 1 up to and including slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu}$

- Start transmitting using UL TCI state 2 and UL TCI state 3, from slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu} + \max\{T_{first_target-PL-RS1} + 4*T_{target_PL-RS1} + 2ms, T_{first_target-PL-RS2} + 4*T_{target_PL-RS2} + 2ms\}$ / *NR slot length* and onwards.

The rate of correct events observed during repeated tests shall be at least 90%.

## 7.5.14 PSCell activation and deactivation delay

### 7.5.14.0 Minimum conformance requirements

#### 7.5.14.0.1 SCG Activation Delay Requirement

The requirements in this clause shall apply for the UE configured with one deactivated SCG in NR-DC and when PSCell in one SCG is being activated.

The delay within which the UE shall be able to activate the deactivated SCG depends upon the specified conditions.

Upon receiving SCG activation command in slot *n*, the UE shall be capable to transmit PRACH preamble or PUCCH or PUSCH towards PSCell no later than in slot $n + \frac{T_{activation_time}}{NR\ slot\ length}$,

where:

$T_{activation_time} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. When PSCell is activated from deactivated state, if any PSCell parameter is modified, $T_{processing}$ = 20ms. Otherwise, $T_{processing}$ = 5 ms.$T_{search}$ is the time for AGC settling and PSS/SSS detection.

$T_{search}$ is the time for AGC settling and PSS/SSS detection.

For RACH based PSCell activation, if the target cell is a known NR FR2 PSCell, $T_{search}$ = 0 ms. If the target cell is an unknown FR2 PSCell and Es/Iot $\geq$ -2 dB, then $T_{search}$ = 24* $T_{rs}$ ms.

For RACH-less based PSCell activation, if RLM and BFD are configured and TCI state is known, $T_{search}$ = 0 ms if the target cell is a known FR2 PSCell. There are no requirements if PSCell is unknown.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target PSCell. $T_{\Delta}$ = 1*Trs ms.

$T_{IU}$: When RACH based PSCell activation is configured, it is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. $T_{IU}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

When RACH-less based PSCell activation is configured, it is the uncertainty in acquiring the first PUSCH transmission occasion [or SR on PUCCH].

Trs is the SMTC periodicity of the PSCell if the UE has been provided with an SMTC configuration for the target cell in SCG activation command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5.

In FR2, the PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the SCG activation command:
  - the UE has sent a valid measurement report for the PSCell being activated and
  - One of the SSBs measured from the PSCell being activated remains detectable according to the cell identification conditions specified in clause 9.3.
  - One of the SSBs measured from PSCell being activated also remains detectable during the PSCell activation delay $T_{activation_time}$ according to the cell identification conditions specified in clause 9.3.

Otherwise, it is unknown.

If the UE is configured to perform BFD while the SCG is deactivated

- The TCI state is known if the following conditions are met:
  - During the period from the PSCell deactivation to the completion of PSCell activation, while PSCell was deactivated,
  - UE has not detected beam failure
- Otherwise, the TCI state is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.17.2.

### 7.5.14.0.2 SCG Deactivation Delay Requirement

The requirements in this clause shall apply for a UE which is configured with at least PCell and PSCell.

Upon receiving RRC-based SCG deactivation command in subframe *n*, the UE shall accomplish the deactivation actions specified in TS 38.331 [13] no later than in slot n + $\frac{T_{RRC_delay}}{NR\ slot\ length}$:

where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.17.3.

## 7.5.14.1 NR SA FR2 PSCell RACH-less based Activation and deactivation for FR1+FR2 inter-band with target PSCell in FR2

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- General test parameters are TBD since it's missing in TS 38.133

### 7.5.14.1.1 Test purpose

The purpose of this test case is to test the PSCell activation delay for a UE configured with one deactivated SCG in NR-DC and when PSCell in one SCG is being activated. The test also tests the deactivation delay. The test case tests the requirements within which the UE shall be able to activate the deactivated SCG in TS 38.133 [6] section 8.17.2 for RACH-less based conditions when PSCell and TCI state are known. The PCell is in NR FR1 and the PSCell is in NR FR2.

### 7.5.14.1.2 Test applicability

This test applies to all types of NR UE from Release 17 onwards and supporting NR-DC and supporting activation and deactivation on SCG.

### 7.5.14.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.14.0.

The normative reference for this requirement is TS.38.133 [6] clause 8.17.3.

### 7.5.14.1.4 Test description

#### 7.5.14.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.14.1.4.1-1.

**Table 7.5.14.1.4.1-1: Supported test configurations for FR2 PSCell activation case**

| Configuration | Description |
|---|---|
| 1 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode<br>Target PSCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode<br>Target PSCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode<br>Target PSCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.5.14.1.4.1-2.

**Table 7.5.14.1.4.1-2: Initial conditions for FR2 PSCell activation case**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.14.1.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.5.14.1.4.1-3.

2. Message contents are defined in clause 7.5.14.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is PSCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table 7.5.14.1.4.1-3: General test parameters for FR2 PSCell activation case**

TBD

### 7.5.14.1.4.2 Test procedure

At the beginning of T1 the UE is configured with a PSCell which is activated. At T1 the PSCell is deactivated. PSCell is configured with *bfd-and-RLM* with value *true*.

An RRC message for activation of PSCell is sent by the test equipment 1s after the RRC message deactivating the PSCell, in a slot # denoted m. The point in time at which the RRC message for activation of PSCell is received at the UE defines the start of time period T2.

During T2, the test equipment monitors for SR from the UE on the PSCell. The time when test equipment receives a scheduling request from the UE is denoted as slot T3.

Time period T4 starts when an RRC message for deactivation of the PSCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of the PSCell, respectively.

The test equipment verifies the activation time by when the SR from the UE is received in the activated PSCell.

The test equipment verifies the deactivation time by counting the slots from the time when the PSCell deactivation command is sent until UL transmission from the PSCell is discontinued.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR-DC*, DC bearer MCG and SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.5.14.1.5-1 and 7.5.14.1.5-2. T1 starts.

3. T1 starts. Immediately after, the SS shall transmit *RRCReconfiguration* message with condition DeactivatedSCG according to TS 38.508-1[14] Table 4.6.1-13 to deactivate NR cell (PSCell).

4. The UE shall transmit *RRCReconfigurationComplete* message. After 1s, the SS should transmit *RRCReconfiguration* message to activate PSCell.

5. The UE shall transmit an RRCConnectionReconfigurationComplete message. T2 starts.

6. The UE shall send SR on PUCCH for PSCell in the first available uplink SR resource no later than T3, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 11. T3 starts.

7. During T3 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 11.

8. The SS shall transmit *RRCReconfiguration* message with condition DeactivatedSCG according to TS 38.508-1[14] Table 4.6.1-13 to deactivated NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2) during T3.

9. The UE shall transmit an *RRCReconfigurationComplete* message. T4 starts.

10. The UE shall stop sending PUSCH for PSCell no later than in slot n + $\frac{T_{RRC_delay}}{NR\ slot\ length}$ into T4, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for the next iteration of the test procedure loop.

12. If the UE is not switched off, the SS shall transmit an *RRCRelease* message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC_CONNECTED with generic parameter Connectivity *NR-DC*. If paging succeeds, go to step 14, otherwise switches off the UE.

13. Switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR-DC* with Test Mode On according to TS 38.508-1 [14] clause 4.5.

14. Repeat step 2-13 until a test verdict has been achieved.

#### 7.5.14.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 7.5.14.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-19 in TS 38.508-1 [14] with condition RLM_BFD_PSCell<br>Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition SSB.3 FR2 and SMTC.1 |

**Table 7.5.14.1.4.3-2: *SchedulingRequestResourceConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-157 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequestResourceConfig ::= SEQUENCE { | | | |
| schedulingRequestResourceId | SchedulingRequestResourceId | | |
| schedulingRequestID | SchedulingRequestId | | |
| periodicityAndOffset CHOICE { | | | |
| sl80 | 9 | With SCS = kHz120 results in repetition every 10 ms | SCS120 |
| } | | | |
| } | | | |

#### 7.5.14.1.5 Test requirement

Table 7.5.14.1.5-1 and Table 7.5.14.1.5-2 define the primary level settings including test tolerances.

**Table 7.5.14.1.5-1: Cell specific test parameters for FR2 PSCell activation case**

| Parameter[Note 5] | | Unit | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| SSB ARFCN | | | Freq1 | | | | Freq2 | | | |
| Duplex mode | Config 1 | | FDD | | | | TDD | | | |
| | Config 2,3 | | TDD | | | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | TDDConf.3.1 | | | |
| | Config 2 | | TDDConf.1.1 | | | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Downlink initial BWP Configuration | Config 1,2,3 | | DLBWP.0.1 | | | | | | | | |
| Downlink dedicated BWP Configuration | Config 1,2,3 | | DLBWP.1.1 | | | | | | | | |
| Uplink initial BWP configuration | Config 1,2,3 | | ULBWP.0.1 | | | | | | | | |
| Uplink dedicated BWP configuration | Config 1,2,3 | | ULBWP.1.1 | | | | | | | | |
| TRS configuration | Config 1,2,3 | | N/A | | | | | TRS.2.1 TDD | | | |
| TCI state | Config 1,2,3 | | TCI.State.0 | | | | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | | | 100: $N_{RB,c}$ = 66 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | | | | |
| Data RBs allocated | Config 1,2 | | 52 | 66 | 66 | 52 | 66 | 52 | 52 | 66 | |
| | Config 3 | | 106 | | | 106 | | 106 | 106 | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | - | | | |
| | Config 2 | | SR.1.1 TDD | | | | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | | | | |
| RMSI CORESET Parameters | Config 1 | | CR.1.1 FDD | | | | | - | | | |
| | Config 2 | | CR.1.1 TDD | | | | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | | | | |
| Dedicated CORESET Parameters | Config 1 | | CCR.1.1 FDD | | | | | - | | | |
| | Config 2 | | CCR.1.1 TDD | | | | | | | | |
| | Config 3 | | CCR.2.1 TDD | | | | | | | | |
| OCNG Patterns | | | OP.1 | | | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | SSB.3 FR2 | | | |
| | Config 3 | | SSB.2 FR1 | | | | | | | | |
| CSI-RS configuration for CSI reporting | Config 1~3 | | N/A | | | | | CSI-RS.3.1 TDD | | | |
| reportConfigType for CSI reporting | | | periodic | | | | | N/A | | | |
| reportConfigType for L1-RSRP | | | periodic | | | | | N/A | | | |
| reportQuantity for CSI reporting | | | cri-RI-PMI-CQI | | | | | N/A | | | |
| reportQuantity for L1-RSRP | | | ssb-Index-RSRP | | | | | N/A | | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | | | | N/A | | | |
| | Config 3 | | 10 | | | | | | | | |
| L1-RSRP reporting periodicity Note 7 | Config 1,2 | slot | 5 | | | | | N/A | | | |
| | Config 3 | | 10 | | | | | | | | |
| CSI reporting offset | Config 1,2 | slot | 2 | | | | | N/A | | | |
| | Config 3 | | 4 | | | | | | | | |
| L1-RSRP reporting offset | Config 1,2 | slot | 2 | | | | | N/A | | | |
| | Config 3 | | 4 | | | | | | | | |
| SMTC configuration | | | SMTC.1 | | | | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | | | | |
| Propagation conditions | | | N/A<br>Link only, see clause A.3.7A | | | | | AWGN | | | |
| Scheduling request resource periodicity | | ms | N/A | | | | | 20 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: All parameters apply for configuration 1, 2 and 3
Note 6: Void.
Note 7: L1-RSRP measurement and reporting are configured to the UE prior to the start of time period T1.

**Table 7.5.14.1.5-2: OTA related test parameters for FR1 PCell with FR2 PSCell activation case**

| Parameter | | Unit | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| Angle of arrival configuration | | | N/A | | | | According to clause A.3.15.1 | | | |
| Assumption for UE beams Note 7 | | | N/A | | | | Rough | | | |
| $N_{oc}$ Note 1 | Config 1,2,3 | dBm/15kHz | Link only, see clause A.3.7A | | | | -103.8 | | | |
| $N_{oc}$ Note 1 | Config 1,2,3 | dBm/SCS | | | | | -94.8 | | | |
| $\hat{E}_s/N_{oc}$ | Config 1,2,3 | dB | | | | | 7 | | | |
| Ê . /I . | Config 1,2,3 | dB | | | | | 7 | | | |
| SSB_RP Note 2, Note 4 | Config 1,2,3 | dBm/SCS | | | | | -87.8 | | | |
| Io Note 2, Note 4 | Config 1,2,3 | dBm/95.04 MHz | | | | | -58 | | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Void
Note 7: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

During T2 the UE shall send the first SR on PSCell in the first available uplink SR resource no later than T3 which is:

$T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU} + 2$ ms

where

$T_{processing}$ = 5ms (no RRC parameter has been modified),

$T_{search}$ = 0ms (RACH-less based PSCell activation, with RLM and BFD are configured, PSCell and TCI state are known), and

$T_{\Delta}$ = 20ms.

This allows T3 of $[T_{RRC_delay} + T_{IU} + 27]$ms.

During T4 the UE shall stop all transmissions on the PSCell no later than in slot n + $\frac{T_{RRC_delay}}{NR\ slot\ length}$ as defined in clause 8.17.3.

During T2 the interruption of PCell during PSCell activation shall not happen outside the slot $m + T_{RRC_delay}$.

During T4 the interruption of PCell during PSCell deactivation shall not happen outside the slot $n + T_{RRC_delay}$.

The interruption duration on PCell due to activation and deactivation of PSCell shall not be more than the values specified for in Clause 8.17.2 and 8.17.3 in TS 38.133 [6].

## 7.5.15

## 7.5.16 NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation

Editor's Note: This test case is incomplete, and the following aspects need to be updated:

- MU and TT are missing
- Message contents may need to be updated
- Test procedure needs to be updated
- Applicability needs to be updated
- Annex E and F need to be updated
- UE positioning procedure is still FFS

### 7.5.16.1 Test purpose

To verify that that the NR UE correctly follows the L1-RSRP scheduling restrictions requirements defined in clause 7.5.16.3.

### 7.5.16.2 Test applicability

This test applies to all types of NR UE release 18 onwards supporting [*groupBasedBeamReporting-r17* and *timeRestrictionForChannelMeasurements* in multi-Rx operation].

### 7.5.16.3 Minimum conformance requirements

#### 7.5.16.3.1 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to L1-RSRP measurement.

- For the case where RS for L1-RSRP measurement is CSI-RS which is QCLed with active TCI state for PDCCH/PDSCH and not in a CSI-RS resource set with repetition ON, and N=1 applies as specified in clause TS 38.133 [6] 9.5.4.2
  - There are no scheduling restrictions due to L1-RSRP measurement performed based on the CSI-RS.
- For FR2-1 and the case where UE supporting *schedulingMeasurementRelaxation-r1*8 according to the conditions described in TS 38.133 [6] clause 3.6.19 is configured to receive two PDSCH transmission occasions from two different QCL sources, there are no scheduling restrictions for the PDSCHs due to L1-RSRP measurement performed based on the CSI-RS, when following conditions are met:
  - The CSI-RS configured for L1-RSRP is not in a CSI-RS resource set with repetition ON, and
  - The CSI-RS configured for L1-RSRP has same QCL source as the active TCI state of one of PDSCHs and has different QCL-TypeD from the other PDSCH, and
  - The CSI-RS configured for L1-RSRP and both PDSCHs are on the same OFDM symbol(s), or the CSI-RS and one of the PDSCHs with different QCL-typeD are on the same OFDM symbol(s) when partially overlapping PDSCHs are scheduled, and
  - Resources of the active TCI states for the two PDSCHs have been reported as a resource group in Rel-17 group-based RSRP report.

The normative reference for this requirement is TS 38.133 [6] clause 9.5.6.3.

#### 7.5.16.3.2 Measurement restriction for CSI-RS based L1-RSRP

The SSB mentioned in this clause can be associated with either the serving cell PCI or a PCI different from serving cell PCI or intra-frequency neighbor cell(s) configured with L1-RSRP measurement.

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for L1-RSRP measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.5.5.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.16.

#### 7.5.16.4 Test description

There is no measurement gap and no DRX configured in the test. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured. The test is for sDCI based sceneriao and consists of two time periods, T1 and T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with *groupBasedBeamReporting-r17* for SSB index 0 and SSB index 1.
- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL-ed to SSB0) and TCI state 1 (QCL-ed to SSB1).
- *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.During T1, the time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival (AoA1 and AoA2) is shown in Figure 7.5.16.4-1. UE transmits periodic L1-RSRP group-based beam reports for SSB index 0 and SSB index 1. After UE transmits first valid L1-RSRP group-based beam report, TCI state 0 and TCI state 1 are activated for CORESET index p and CORSET index q which indicates for 2 PDSCH reception.

During T2, the time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival is shown in Figure 7.5.16.4-2. At the beginning of T2, the CSI-RS resource index 0 and CSI-RS resource index 1 are configured for measurement resources for L1-RSRP. CSI-RS resource 0 is QCL-ed to SSB index 0, and CSI-RS resource 1 is QCL-ed to SSB index 1. During T2, CSI-RS resource 0 is transmitted on AoA1 and CSI-RS resource 1 is transmitted on AoA2. During T2, after the CSI-RS configuration, PDSCH is always scheduled on the symbols overlapping with CSI-RS resource symbols.

For scheduling restriction relaxation, the UE is required to receive both PDSCHs on the symbols overlapped with CSI-RS configured for L1-RSRP and sends ACK correctly.

For measurement restriction relaxation, the UE is required to measure both CSI-RS resource index 0 and CSI-RS resource index 1 at the same time from the beginning of T2.

The test parameters are given in table 7.5.16.4.1-1, table 7.5.16.5.1-2, table A.7.5.16.5-1 and table 7.5.16.5-2 below.

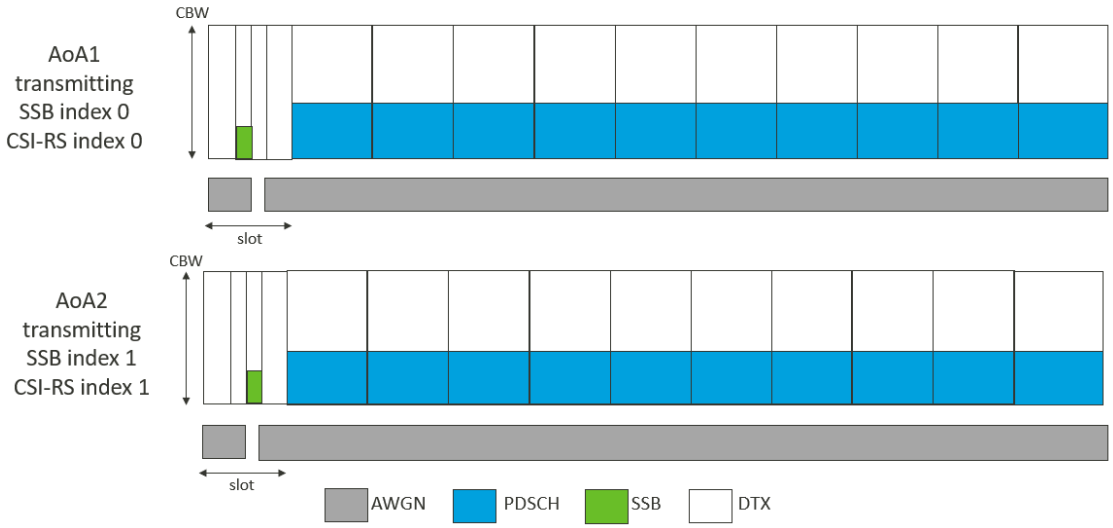



**Figure 7.5.16.4-1: Time multiplexed downlink transmissions during T1**

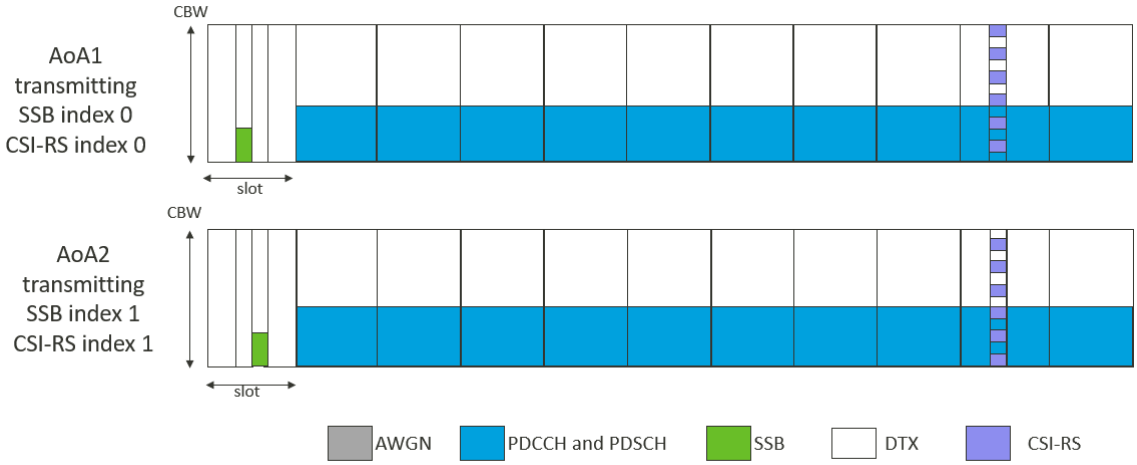



**Figure 7.5.16.4-2: Time multiplexed downlink transmissions during T2**

### 7.5.16.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.16.4.1-1.

**Table 7.5.16.4.1-1: Supported test configurations for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Configuration | Description |
|---|---|
| 7.5.16-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.5.16.4.1-2

**Table 7.5.16.4.1-2: Test Environment parameters for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.5.16.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.5.16.4.1-3.
2. Message contents are defined in clause 7.5.16.4.3.
3. There is one NR cell specified in the test. Cell 1 is the active PCell cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.5.16.4.1-3: General test parameters for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| RF Channel Number | | 1 | | |
| SSB configuration | | SSB.1 FR2 | | |
| SMTC configuration | | SMTC pattern 1 | | |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.4A TDD | CSI-RS.3.5A TDD | 2 CSI-RS resources configured |
| CSI-RS resource index | | 0 | 1 | |
| reportConfigType | | periodic | periodic | |
| reportQuantity | | cri-RSRP | cri-RSRP | |
| CSI reporting periodicity | slot | 80 | 80 | |
| DRX cycle length | s | OFF | | |
| T1 | s | [0.8] | | |
| T2 | s | [0.5] | | |

### 7.5.16.4.2 Test procedure

The test is for sDCI based sceneriao and consists of two time periods, T1 and T2. Before the test starts, UE is configured to transmit periodic L1-RSRP group-based beam reports for SSB index 0 and SSB index 1. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5
2. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 configuring UE with *groupBasedBeamReporting-r17* for SSB index 0 and SSB index 1 and higher layer parameter *timeRestrictionForChannelMeasurements*. IE *tci-PresentInDCI* is not configured in the PDSCH configuration.
3. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
4. Set the parameters according to Table 7.5.16.5-1 and T1 in Table 7.5.16.5-2. T1 starts.
5. The UE needs to transmit periodic L1-RSRP group-based beam reports for SSB index 0 and SSB index 1 with vlaid values for SSB indexes 0 and 1. If valid reports are not received by SS, go to Step 8.
6. Set the parameters according to Table 7.5.16.5-1 and T2 in Table 7.5.16.5-2. T2 starts.
7. The SS shall check following requirements:

- R1: the UE receives both PDSCHs on the symbols overlapped with CSI-RS configured for L1-RSRP and sends ACK correctly. If the UE is receiving both the PDSCHs and sending the ACK correctly, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: No later than [10ms + 80 slots] from the beginning of time period T2, UE shall send L1-RSRP report including the valid results for both CSI-RS resource 0 and CSI-RS resource 1. If the UE reports valid L1-RSRP values for both CSI-RS resources, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one

- R3: the L1-RSRP values of CSI-RS#0 and CSI-RS#1 reported by the UE is compared to the expected L1-RSRP values for CSI-RS#0 and CSI-RS #1. If the resulting values are outside the limits in Table 7.5.16.5-3 or the UE fails to report the measurement value for either CSI-RS#0 or CSI-RS #1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF RSRP value of CSI-RS #0 and CSI-RS #1 reported by the UE is compared to the expected DIFF RSRP values. If the resulting values are outside the limits in Table 7.5.16.5-4 or the UE fails to report the measurement value for CSI-RS #0 or CSI-RS #1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.3 is achieved.

### 7.5.16.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.5.16.4.3-1: Common Exception messages for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table H.3.6-10 |

### 7.5.16.5 Test requirement

Table 7.5.16.5-1 defines the primary level settings including test tolerances for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation.

**Table 7.5.16.5-1: Cell specific test parameters for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{PRB,c}$ = 66 |

| Parameter | Unit | Cell 1 |
|---|---|---|
| Data PRBs allocated | | 24 |
| PDSCH/PDCCH subcarrier spacing | KHz | 120 |
| PDSCH Reference measurement channel QCL-ed to SSB index 0 | | SR.3.2 TDD |
| PDSCH Reference measurement channel QCL-ed to SSB index 1 | | SR.3.2 TDD |
| RMSI CORESET RMC configuration | | CR.3.1 TDD |
| Dedicated CORESET (CORESET index p) RMC configuration QCL-ed to SSB index 0 | | CCR.3.1 TDD |
| Dedicated CORESET (CORESET index q) RMC configuration QCL-ed to SSB index 1 | | CCR.3.1 TDD |
| PDSCH TCI state QCL-ed to SSB index 0 | | TCI.State.0 |
| PDSCH TCI state QCL-ed to SSB index 1 | | TCI.State.1 |
| OCNG Pattern | | OP.4 defined in A.2.1 |
| Initial BWP configuration | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated UL BWP configuration | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration QCL-ed to SSB index 0 | | TRS.2.1 TDD |
| TRS Configuration QCL-ed to SSB index 1 | | TBD |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation condition | | AWGN |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols | | |

**Table 7.5.16.5-2: NR OTA test parameters for NR SA FR2 UE L1-RSRP measurement reporting with Scheduling and Measurement Restrictions in multi-Rx operation**

| Parameter | Unit | SSB index 0 | | SSB index 1 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 5 according to A.9.5 | | | |
| | | AoA1 | | AoA2 | |
| Beam Assumption Note 2 | | Rough | | Rough | |
| SSB $\hat{E}_s/I_{ot}$ Note1, 3 | dB | -2.1+TT | | -2.1+TT | |
| SSB_RP Note1 | dBm/ SCS | -91+TT | | -91+TT | |
| CSI_RS_RP | dBm/ SCS | N/A | -85+TT | N/A | -85+TT |
| Io Note 4 | dBm/95.04 MHz | -66.41+TT | | -66.41+TT | |
| Time multiplexing of the downlink transmissions from each AoA | | Defined in Figure 7.5.16.4-1 for T1 and Figure 7.5.16.4-2 for T2 | | | |
| NOTE 1: SSB Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation<br>NOTE 3: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4.<br>NOTE 4: Calculation of Io does not consider the different power level between CSI-RS and SSB | | | | | |

The UE behaviour follows the requirements defined in clause 7.5.16.3.1 and 7.5.16.3.2.

During T2,

- UE is required to receive both PDSCHs and send ACK correctly.
- No later than Y + 80 slot from the beginning of time period T2, UE shall send L1-RSRP report including the valid results for both CSI-RS resource 0 and CSI-RS resource 1 while meeting the accuracy requirements defined in clause 10.1.X.

- Y is the RRC processing delay, which is 10 ms

**Table 7.5.16.5-3: L1-RSRP absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#0) | FFS |
| Highest reported value (CSI-RS#0) | FFS |
| Lowest reported value (CSI-RS#1) | FFS |
| Highest reported value (CSI-RS#1) | FFS |

**Table 7.5.16.5-4: L1-RSRP relative accuracy requirements for the reported values R3**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | FFS |
| Highest DIFF RSRP reported (CSI-RS#0) | FFS |
| Lowest DIFF RSRP reported (CSI-RS#1) | FFS |
| Highest DIFF RSRP reported (CSI-RS#1) | FFS |

# 7.6 Measurement procedures

## 7.6.1 Intra-frequency measurements

### 7.6.1.0 Minimum conformance requirements

#### 7.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.5.1 and 9.2.5.2]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intr}$: it is the time period used in PSS/SSS detection given in table 7.6.1.0.1-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.1-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

$M_{pss/sss_sync_w/o_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync_w/o_gaps}$ = 40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ = 24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ = 24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24

$M_{meas_period_w/o_gaps}$ : For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ = 40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ = 24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ = 24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ = 24.

When intra-frequency SMTC is fully non-overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1.

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

For FR2 when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, $K_{layer1_measurement}$= 1.5, otherwise $K_{layer1_measurement}$=1.

**Table 7.6.1.0.1-1: Time period for PSS/SSS detection (Frequency range 2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 7.6.1.0.1-2: Measurement period for intra-frequency measurements without gaps (Frequency FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, ceil($M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil($M_{meas_period_w/o_gaps}$ x$K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.2.1, 10.1.7.1 and 10.1.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$.This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{Measurement_Period,\ Intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 9.2.2, 9.2.4.3, 9.2.5.1 and 9.2.5.2.

#### 7.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 7.6.1.0.2-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

**Table 7.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range 2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range 2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

## 7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC1, PC3

This test case is incomplete for UE power classes other than PC1 and PC3

This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.1.1.1 Test purpose

The purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements defined in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

### 7.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

### 7.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.1.

### 7.6.1.1.4 Test description

#### 7.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.1.4.1-1.

**Table 7.6.1.1.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Test Case ID | Description |
|---|---|
| 7.6.1.1-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.1-2 | 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 7.6.1.1.4.1-2.

**Table 7.6.1.1.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 below.
2. Message contents are defined in clause 7.6.1.1.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.6.1.1.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| A3-Offset | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 7.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 and Table 7.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.1.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 2402 ms for UE supporting power class 1,

   - 1442 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.1.1.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM |

**Table 7.6.1.1.4.3-2: MeasObjectNR (Step 3, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 | | 7.6.1.1-1, |
| | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2 | | 7.6.1.1-2, |

| | | | |
|---|---|---|---|
| smtc1 | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 2 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.1.1.5 Test requirement

Table 7.6.1.1.4.1-3, Table 7.6.1.1.5-1 and Table 7.6.1.1.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting without gap in non-DRX.

**Table 7.6.1.1.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | N/A | |
| | | 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | N/A | |
| | | 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.state.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns | | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1~2 | N/A | | 16 | |
| SSB | | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition | | 1, 2 | No external noise (Note 1) | | | |

Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

**Table 7.6.1.1.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.9.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption Note 4 | | 1,2 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1 | -89 | | -89 | |
| | | 2 | -86 | | -86 | |
| $\hat{E}_s / I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| $Io$ | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 2 | -64.41 | -64.41 | -Infinity | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure 7.6.1.1.5-1 | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

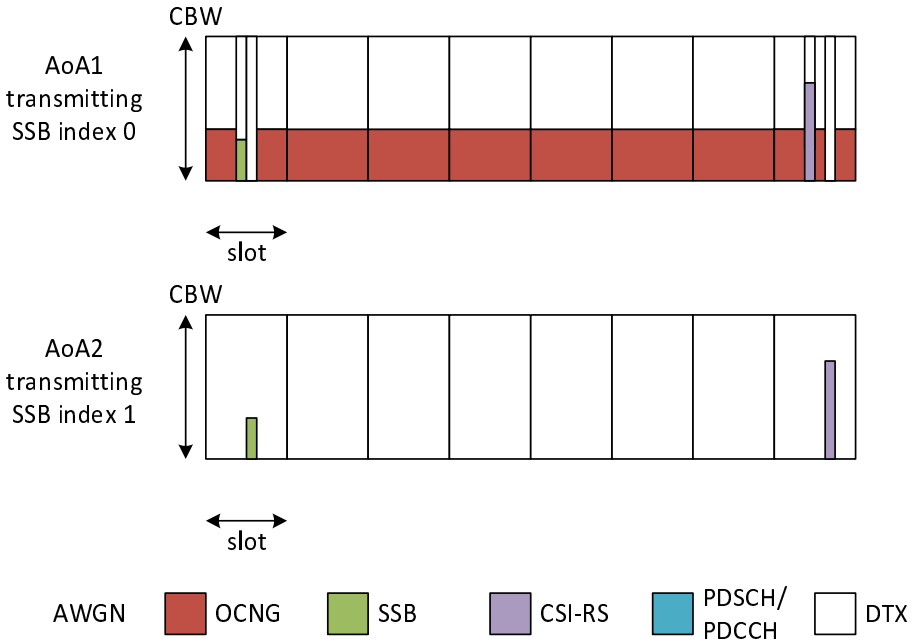



**Figure 7.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1 example)**

## 7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC1, PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC1 and PC3.

### 7.6.1.2.1 Test purpose

Ther purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

### 7.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

### 7.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.2.

### 7.6.1.2.4 Test description

#### 7.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.2.4.1-1.

**Table 7.6.1.2.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in DRX**

| Test Case ID | Description |
|---|---|
| 7.6.1.2-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 7.6.1.2-2 | 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.2.4.1-2.

**Table 7.6.1.2.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3 below.
2. Message contents are defined in clause 7.6.1.2.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.6.1.2.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in DRX**

| Parameter | Unit | Config | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2 | PCell (Cell 1) | | |
| Neighbour cell | | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1, 2 | SMTC.1 | | |
| A3-Offset | dB | 1, 2 | -7[Note 1] | | |
| CP length | | 1, 2 | Normal | | |
| Hysteresis | dB | 1, 2 | 0 | | |
| Time To Trigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.1 | DRX. 7 | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 µs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 10 | 52 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | | |

### 7.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for sub-test 1 or less than Y ms for sub-test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 7202 for UE supporting power class 1,

   - 4322 for UE supporting power class 2, 3 or 4.

   and Y is

   - 51202 for UE supporting power class 1,

   - 30722 for UE supporting power class 2, 3 or 4.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.1.2.4.1-1 as appropriate.

#### 7.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.1.2.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR<br><br>Table H.3.1-4 with A3-offset = -7dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM<br><br>Table H.3.7-1 with Condition DRX.1 for sub-test 1<br>Table H.3.7-1 with Condition DRX.7 for sub-test 2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 7.6.1.2-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 7.6.1.2-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

### 7.6.1.2.5 Test requirement

Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

**Table 7.6.1.2.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3. 2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| | | 2 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.state.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SSB | | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

**Table 7.6.1.2.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 1 defined in A.9 | | | |
| Beam assumption Note 4 | | 1,2 | Rough | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | 3.51 | -1.60 | -Infinity | -1.60 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -101.5 Note 6 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -92.5 | | | |
| | | 2 | -89.5 | | | |
| SSB_RPSS-RSRP | dBm/SCS | 1 | -88.47 | -88.47 | -Infinity | -88.47 |
| | | 2 | -85.47 | -85.47 | -Infinity | -85.47 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| *Io* | dBm/95.04MHz | 1 | -58.03 | -55.68 | -58.03 | -55.68 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms (sub-test 1) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS_sync_intra}$ = 3600 ms, $T_{SSB_measurement_period_intra}$= 3600 ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS_sync_intra}$ = 2160 ms, $T_{SSB_measurement_period_intra}$= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms (sub-test 2) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS_sync_intra}$ = 25600 ms, $T_{SSB_measurement_period_intra}$= 25600 ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS_sync_intra}$ = 15360 ms, $T_{SSB_measurement_period_intra}$= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC1, PC3

This test case is incomplete for UE power classes other than PC1 and PC3

This test case is incomplete for test frequencies > 40.8 GHz

#### 7.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

#### 7.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards and supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

#### 7.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.3.

#### 7.6.1.3.4 Test description

##### 7.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.3.4.1-1.

**Table 7.6.1.3.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Test Case ID | Description |
|---|---|
| 7.6.1.3-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.3-2 | 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.3.4.1-2.

**Table 7.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.1.3.4.1-3.

2. Message contents are defined in clause 7.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Gap type | | 1, 2 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | |
| Measurement gap length | ms | 1, 2 | 6 | |
| Measurement gap offset | ms | 1, 2 | 39 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.3.2 TDD **resource #0** | |
| A3-Offset | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 7.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.3.4.1-3, Table 7.6.1.3.5-1 and 7.6.1.3.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - X = 3202 for UE supporting power class 1,

   - X = 1922 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.1.3.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-6 with Condition gapUE and Pattern #0<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 7.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbSubcarrierSpacing | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2 | | 7.6.1.3-1, |
| | SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2 | | 7.6.1.3-2, |
| smtc1 | SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| physCellId | PhysCellId of Cell 2 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.1.3.4.3-3: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

### 7.6.1.3.5 Test requirement

Table 7.6.1.3.4.1-3 and Table 7.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting with gap in non-DRX test.

**Table 7.6.1.3.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| | | 1 | CR.3.1 TDD | | N/A | |

| | | | | |
|---|---|---|---|---|
| RMSI CORESET RMC configuration | | 2 | CR.3.2 TDD | N/A |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | N/A |
| | | 2 | CCR.3.7 TDD | N/A |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | N/A |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | 120 |
| OCNG Patterns | | 1, 2 | OP.5 | N/A |
| cellIndividualOffset | dB | 1,2 | N/A | 16 |
| SSB | | 1 | SSB.3 FR2 | SSB.7 FR2 |
| | | 2 | SSB.4 FR2 | SSB.8 FR2 |
| Propagation Condition | | 1, 2 | No external noise (Note 1) | |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | |

**Table 7.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.9 | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption Note 4 | | 1,2 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1 | -89 | | -89 | |
| | | 2 | -86 | | -86 | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | 86 |
| $Io$ | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1,2 | Defined in Figure 7.6.1.3.5-1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |
| Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

For UE supporting power class 1, $T_{PSS/SSS_sync_intr}$ = 1600 ms, $T_{SSB_measurement_period_intra}$= 1600 ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS_sync_intr}$ = 960 ms, $T_{SSB_measurement_period_intra}$= 960 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of X ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty), where

X = 3202 for UE supporting power class 1,

X = 1922 for UE supporting power class 2, 3 or 4,

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

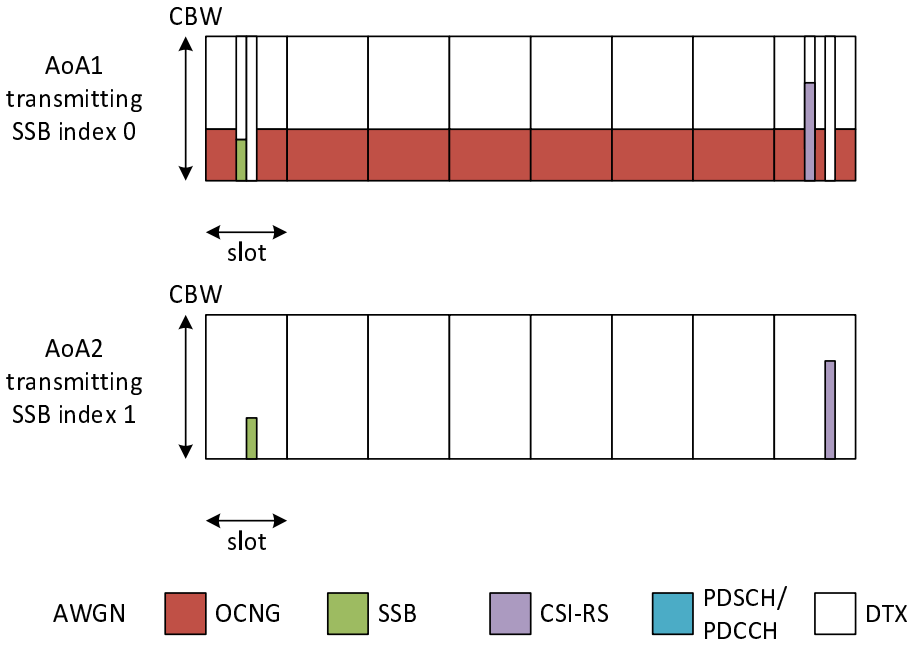



**Figure 7.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)**

## 7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC1, PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC1 and PC3.

#### 7.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

#### ，7.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

#### 7.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.4.

#### 7.6.1.4.4 Test description

##### 7.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.4.4.1-1.

**Table 7.6.1.4.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in DRX**

| Test Case ID | Description |
|---|---|
| 7.6.1.4-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.1.4-2 | 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.4.4.1-2.

**Table 7.6.1.4.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.1.4.4.1-3.
2. Message contents are defined in clause 7.6.1.4.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 7.6.1.4.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in DRX**

| Parameter | Unit | Config | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2 | PCell (Cell 1) | | |
| Neighbour cell | | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| Gap type | | 1, 2 | Per-UE gaps | | |

| | | | | | |
|---|---|---|---|---|---|
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | | |
| Measurement gap length | ms | 1, 2 | 6 | | |
| Measurement gap offset | ms | 1, 2 | 39 | | |
| SMTC configuration | | 1, 2 | SMTC.1 | | |
| CSI-RS parameters | | 1, 2 | CSI-RS.3.2 TDD | | |
| A3-Offset | dB | 1, 2 | -7[Note1] | | |
| CP length | | 1, 2 | Normal | | |
| Hysteresis | dB | 1, 2 | 0 | | |
| Time To Trigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.1 | DRX. 7 | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 10 | 52 | |
| Note 1: Including test tolerance given in Annex F.1.3.2 | | | | | |

#### 7.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.4.4.1-3 and Table 7.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

   - X = 7202, Y = 51202 for UE supporting power class 1,

   - X = 4322, Y = 30722 for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.1.4.4.1-3 as appropriate.

#### 7.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.1.4.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting with gap in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR<br>Table H.3.1-4 with A3-offset = -7dB<br>Table H.3.1-6 with Condition gapUE and Pattern #0<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.7-1 with Condition DRX.1 and Gap for test 1<br>Table H.3.7-1 with Condition DRX. 7 and Gap for test 2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 7.6.1.4-1 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2 |
| Specific message contents exceptions for Test Configuration 7.6.1.4-2 | Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2 |

**Table 7.6.1.4.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

7.6.1.4.5 Test requirement

Table 7.6.1.4.4.1-3 , Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting with gap in DRX test.

**Table 7.6.1.4.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1, 2 | 66 | | 66 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| | | 2 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 2 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | 1, 2 | TCI.State.2 | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SSB | | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

**Table 7.6.1.4.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | | |
| Beam Assumption Note 4 | | 1,2 | Rough | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | 3.51 | -1.60 | -Infinity | -1.60 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -101.5 Note 6 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -92.5 | | | |
| | | 2 | -89.5 | | | |
| SSB_RPSS-RSRP | dBm/SCS | 1 | -88.47 | -88.47 | -Infinity | -88.47 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | -85.47 | -85.47 | -Infinity | -85.47 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| *Io* | dBm/95.04MHz | 1 | -58.03 | -55.68 | -58.03 | -55.68 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS_sync_intra}$ = 7200ms, $T_{SSB_measurement_period_intra}$= 7200 ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS_sync_intra}$ = 2160 ms, $T_{SSB_measurement_period_intra}$= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,
- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS_sync_intra}$ = 25600 ms, $T_{SSB_measurement_period_intra}$= 25600 ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS_sync_intra}$ = 15360 ms, $T_{SSB_measurement_period_intra}$= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,
- X = 30722 for UE supporting power class 2, 3 or 4,

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

### 7.6.1.5 NR SA FR2 event triggered reporting test without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17*

Editor's note: This test case is incomplete. The following aspects are missing:

- Test tolerance and measurement uncertainty analysis are missing

#### 7.6.1.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements for FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17* in TS 38.133[6] clauses 9.2.5.1 and 9.2.5.2.

#### 7.6.1.5.2 Test applicability

This test applies to all types of NR UE power class 6 release 17 onwards that support *highSpeedMeasFlagFR2-r17*.

#### 7.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.5.

#### 7.6.1.5.4 Test description

##### 7.6.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.5.1-1.

**Table 7.6.1.5.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17***

| Configuration | Description |
|---|---|
| 7.6.1.5.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.1.5.4-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 7.6.1.5.4.1-2.

**Table 7.6.1.5.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17***

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.1.5.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.5.4.1-3 below.

2. Message contents are defined in clause 7.6.1.5.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

**Table 7.6.1.5.4.1-3: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| *highSpeedMeasFlagFR2-r17* | | 1,2 | Set2 | *highSpeedMeasFlagFR2-r17* = set2 is configured |
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| A3-Offset | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | [1] | |
| T2 | s | 1, 2 | [2] | |

### 7.6.1.5.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.5.4.1-3 and Table 7.6.1.5.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.5.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.5.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1140 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.1.5.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17***

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table 4.6.3-169 in 38.508-1 [14] with condition R17 HST FR2 |
| Specific message contents exceptions for Test Configuration 7.6.1.5-1 | |

### 7.6.1.5.5 Test requirement

Table 7.6.1.5.4.1-3, Table 7.6.1.5.5-1 and Table 7.6.1.5.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with highSpeedMeasFlagFR2-r17.

**Table 7.6.1.5.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17***

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | N/A | |
| | | 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | N/A | |
| | | 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | N/A |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | 120 |
| OCNG Patterns | | 1, 2 | OP.5 | N/A |
| cellIndividualOffset | dB | 1~2 | N/A | 16 |
| SSB | | 1 | SSB.1 FR2 | SSB.7 FR2 |
| | | 2 | SSB.2 FR2 | SSB.8 FR2 |
| Propagation Condition | | 1, 2 | No external noise (Note 2) | No external noise (Note 2) 19444Hz Note 1 |
| Note 1: The AWGN 19444 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 19444 Hz.<br>Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. | | | | |

**Table 7.6.1.5.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17***

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.9.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption Note 4 | | 1,2 | Rough | | Rough | |
| $E_S$ | dBm/SCS | 1 | -89+TT | -89+TT | -Infinity | -89+TT |
| | | 2 | -86+TT | -86+TT | -Infinity | -86+TT |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12+TT | -0.12+TT | -Infinity | -0.12+TT |
| SSB_RP | dBm/SCS | 1 | -89+TT | -89+TT | -Infinity | -89+TT |
| | | 2 | -86+TT | -86+TT | -Infinity | -86+TT |
| *Io* | dBm/95.04MHz | 1 | -64.41+TT | -64.41+TT | -Infinity | -64.41+TT |
| | | 2 | -61.41+TT | -61.41+TT | -Infinity | -61.41+TT |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure 7.6.1.1.5-1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Void<br>Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 1140ms for a UE supporting power class 6

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.2 Inter-frequency measurements

### 7.6.2.0 Minimum conformance requirements for Inter-frequency measurements

#### 7.6.2.0.1 Minimum conformance requirements for Inter-frequency measurement with measurement gaps

Same as clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

#### 7.6.2.0.2 Minimum conformance requirements for Inter-frequency measurement without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$. It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following condition is met:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})$ ms

$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})$ ms

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 7.6.2.0.2-1.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 7.6.2.0.2-2.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 7.6.2.0.2-3.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when interfrequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when interfrequency SMTC is fully overlapping with measurement gaps.

$M_{pss/sss_sync_inter}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{pss/sss_sync_inter}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_inter}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =40 samples. For a vehicle mounted UE supporting FR2 power class 2, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 24 samples.

When interfrequency SMTC is fully non overlapping with measurement gaps or interfrequency SMTC is fully overlapping with MGs, Kp=1.

When interfrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by inter-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by inter-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

**Table 7.6.2.0.2-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 7.6.2.0.2-2: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 7.6.2.0.2-3, if UE supports inter-frequency measurement without measurement gaps:

**Table 7.6.2.0.2-3: Measurement period for inter-frequency measurements without gaps ((FR1)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by SSB-ToMeasure [2], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [8] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in TS 38.133 [6] clause 9.3.9.3.1~9.3.9.3.3 are valid under the following conditions:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned, and

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 inter-frequency cell

> The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 inter-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

If following conditions are met:

- The UE has been notified about system information update through paging,
- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

#### 7.6.2.0.3 Minimum conformance requirements for event triggered reporting using MUSIM gap

Same as clause 6.6.1.0.6.

### 7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 7.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 7.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.1.

7.6.2.1.4 Test description

7.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.1.4.1-1.

**Table 7.6.2.1.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.2.1-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

**Table 7.6.2.1.4.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 5.2 for PC1; 3.5 for other PC | |

**Table 7.6.2.1.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

#### 7.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
      or:

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.1.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #13<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.1.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

7.6.2.1.5 Test requirement

Table 7.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.9 | | | |
| | | | | AoA1 | | AoA2 | |
| Assumption for UE beams[Note 7] | | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB-RP Note 3 | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1 | No external noise (Note 9) | | No external noise (Note 9) | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

### 7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 7.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

#### 7.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.2.

#### 7.6.2.2.4 Test description

##### 7.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.2.4.1-1.

**Table 7.6.2.2.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.2.2-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

**Table 7.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -12 | | Value modified by TT |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.2 | As specified in clause A.3.3 |

| | | | | | |
|---|---|---|---|---|---|
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | |

**Table 7.6.2.2.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 7.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.2.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.2.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.2.4.1-2 as appropriate.

#### 7.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.2.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with A3-offset = -12dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #13<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2 |

#### 7.6.2.2.5 Test requirement

Table 7.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 1 as specified in clause A.9 | | | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| OCNG Patterns | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

### 7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 7.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.3.

#### 7.6.2.3.4 Test description

##### 7.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.3.4.1-1.

**Table 7.6.2.3.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.2.3-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

**Table 7.6.2.3.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |

| | | | | |
|---|---|---|---|---|
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 7 for PC1; 4.5 for other PC | |

**Table 7.6.2.3.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

### 7.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.10. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.3.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with Condition SSB Index and A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #13<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.3.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

### 7.6.2.3.5 Test requirement

Table 7.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.9 | | | |
| | | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $\hat{E}_s$ | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB-RP [Note 3] | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB[Note 8] | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io[Note3] | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | | Config 1 | No external noise (Note 9) | | No external noise (Note 9) | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Void |
| Note 3: | SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Void |
| Note 5: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 6: | As observed with 0dBi gain antenna at the centre of the quiet zone |
| Note 7: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 8: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4. |
| Note 9: | The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

The UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

## 7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 7.6.2.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

### 7.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.4.

7.6.2.4.4 Test description

7.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.4.4.1-1.

**Table 7.6.2.4.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.2.4-1 | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Void | |

**Table 7.6.2.4.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -12 | | Value modified by TT |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.2 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | |

**Table 7.6.2.4.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 7.6.2.4.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.4.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.4.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.4.4.1-2 as appropriate.

#### 7.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.4.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4 with Condition SSB Index and A3-offset = -12dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #13<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2 |

7.6.2.4.5 Test requirement

Table 7.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.4.5-1: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 1 as specified in clause A.9 | | | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

### 7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

#### 7.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

#### 7.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306), otherwise Test 1 is applicable.

#### 7.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.5.

#### 7.6.2.5.4 Test description

##### 7.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.5.4.1-1.

**Table 7.6.2.5.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 7.6.2.5-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.5-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 7.6.2.5-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

**Table 7.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | One NR FR1 and one NR FR2 carrier frequency is used. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1 in FR1 |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2 in FR2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | Gap not configured | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 39 | N/A | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1 | SSB.1 FR1 | | As specified in clause A.3.1 |
| | | Config 2 | SSB.1 FR1 | | As specified in clause A.3.1 |
| | | Config 3 | SSB.2 FR1 | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |

| | | | | | |
|---|---|---|---|---|---|
| *A4-Threshold* | dBm | Config 1,2,3 | -105 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 5.2 for PC1; 3.5 for other PC | 3 for PC1; 2 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 7.6.2.5.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 7.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.5.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and 2562 ms for UE supporting power class 1, or 1602 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.5.4.1-2 as appropriate.

### 7.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.5.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1<br>Table H.3.1-2 with Condition INTER-FREQ for Test 2<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with A4-threshold= -105dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.5.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB6 | | |
| } | | | |

### 7.6.2.5.5 Test requirement

Table 7.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1,2,3 | N/A | | Setup 1 as specified in clause A.9 | |
| Beam Assumption[Note 7] | | | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.3.1 | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | | | Config 1 | SMTC.2 | | SMTC.2 | |
| | | | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| | | | Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_S$ | dBm/SCS | Config 1,2,3 | NA<br>Link only, see clause A.6A | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2 | | -Infinity | -87 |
| | | Config 3 | | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1,2,3 | | -Infinity | 14.69 |
| | dBm/95.04 MHz Note5 | Config 1,2,3 | | -Infinity | -58.01 |
| Propagation Condition | | Config 1,2,3 | | No external noise (Note 9) | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/$Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

In test 1 with per-UE gap the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 2, without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

2560 for UE supporting power class 1, or

1600 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms for power class 1 UE and 3202 ms for other power classes in test 1 and 2562 for power class 1 UE and 1602 ms for other power classes in test 2.

### 7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

### 7.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 7.6.2.6.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle. Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306), otherwise Tests 1 and 2 are applicable.

### 7.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.6.

### 7.6.2.6.4 Test description

#### 7.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.6.4.1-1.

**Table 7.6.2.6.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 7.6.2.6-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.6-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 7.6.2.6-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

**Table 7.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | | | Two NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | | Gap not configured | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 39 | | N/A | | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
| | | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
| | | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | | |
| CP length | | Config 1,2,3 | Normal | | | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | | |
| Filter coefficient | | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX .1 | DRX .2 | DRX .1 | DRX .2 | DRX is used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | | | |
| T2 | s | Config 1,2,3 | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 7.6.2.6.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.7.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.6.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.6.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.6.4.1-2 as appropriate.

### 7.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.6.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2<br>Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with A4-threshold= -105dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4 |

**Table 7.6.2.6.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB6 | | |
| } | | | |

7.6.2.6.5 Test requirement

Table 7.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.3.1 | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | - | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | | Config 1 | CCR.1.1 FDD | | CCR.3.1 TDD | |
| | | | Config 2 | CCR.1.1 TDD | | CCR.3.1 TDD | |
| | | | Config 3 | CCR.2.1 TDD | | CCR.3.1 TDD | |
| SMTC configuration | | | Config 1 | SMTC.2 | | SMTC.2 | |
| | | | Config 2,3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | 120 | |
| | | | Config 3 | 30 | | 120 | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | NA Link only, see clause A.6A | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | | -95.7 | |
| | | Config 3 | | -95.7 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2 | | -Infinity | -86.7 |
| | | Config 3 | | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | | -Infinity | 9 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | | - | - |
| | dBm/38.16MHz | Config 3 | | - | - |
| | dBm/95.04 MHz Note5 | Config 1,2,3 | | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2,3 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

## 7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

### 7.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 7.6.2.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306), otherwise Test 1 is applicable.

### 7.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.7.

### 7.6.2.7.4 Test description

#### 7.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.7.4.1-1.

**Table 7.6.2.7.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 7.6.2.7-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.7-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 7.6.2.7-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

**Table 7.6.2.7.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two NR carrier frequencies is used |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | Gap not configured | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 39 | N/A | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1 | SSB.1 FR1 | | As specified in clause A.3.1 |
| | | Config 2 | SSB.1 FR1 | | As specified in clause A.3.1 |
| | | Config 3 | SSB.2 FR1 | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3 | SSB.3 FR2 | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3μs | | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 7 for PC1; 4.5 for other PC | 3.5 for PC1; 2.5 for other PC | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 7.6.2.7.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.7.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 7.6.2.7.4.2 Test procedure

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.7.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.7.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and 3362 ms for UE supporting power class 1, or 2082 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.7.4.1-2 as appropriate.

#### 7.6.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.7.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1<br>Table H.3.1-2 with Condition INTER-FREQ for Test 2<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.7.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB6 | | |
| } | | | |

7.6.2.7.5 Test requirement

Table 7.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| Beam Assumption[Note 7] | | | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.3.1 | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.3.1 | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |

| | | | | | |
|---|---|---|---|---|---|
| OCNG Patterns | | Config 1,2,3 | OP.1 | OP.1 | |
| PDSCH Reference measurement channel | | Config 1 | SR.1.1 FDD | - | |
| | | Config 2 | SR.1.1 TDD | | |
| | | Config 3 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | Config 1 | CR.1.1 FDD | - | |
| | | Config 2 | CR.1.1 TDD | | |
| | | Config 3 | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | Config 1 | CCR.1.1 FDD | CCR.3.1 TDD | |
| | | Config 2 | CCR.1.1 TDD | CCR.3.1 TDD | |
| | | Config 3 | CCR.2.1 TDD | CCR.3.1 TDD | |
| SMTC configuration | | Config 1 | SMTC.2 | SMTC.2 | |
| | | Config 2,3 | SMTC.1 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | 120 | |
| | | Config 3 | 30 | 120 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2, 3 | NA Link only, see clause A.6A | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2 | | -Infinity | -87 |
| | | Config 3 | | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1,2,3 | | -Infinity | 14.69 |
| | dBm/95.04 MHz Note5 | Config 1,2,3 | | Infinity | -58.01 |
| Propagation Condition | | Config 1,2,3 | | No external noise (Note 9) | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

In test 1 with per-UE gap , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 2 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

3360 for UE supporting power class 1, or

2080 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms for power class 1 UE and 4162 ms for other power classes in test 1 and 3362 for power class 1 UE and 2082 ms for other power classes in test 2

## 7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

### 7.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

### 7.6.2.8.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle. Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306), otherwise Tests 1 and 2 are applicable.

### 7.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.8.

### 7.6.2.8.4 Test description

#### 7.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.8.4.1-1.

**Table 7.6.2.8.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations**

| Test Case ID | Description of serving cell | Description of target cell |
|---|---|---|
| 7.6.2.8-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.6.2.8-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 7.6.2.8-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | | |

**Table 7.6.2.8.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | | | Two NR carrier frequencies is used. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2,3 | 0 | | Gap not configured | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 39 | | N/A | | |
| SMTC-SSB parameters on NR RF Channel 1 | | Config 1 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
| | | Config 2 | SSB.1 FR1 | | | | As specified in clause A.3.1 |
| | | Config 3 | SSB.2 FR1 | | | | As specified in clause A.3.1 |
| SMTC-SSB parameters on NR RF Channel 2 | | Config 1,2,3 | SSB.3 FR2 | | | | As specified in clause A.3.2 |
| *offsetMO* | dB | Config 1,2,3 | 6 | | | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | | | |
| *a4-Threshold* | dBm | Config 1,2,3 | -105 | | | | |
| CP length | | Config 1,2,3 | Normal | | | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | | | |
| Filter coefficient | | Config 1,2,3 | 0 | | | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX .1 | DRX .2 | DRX .1 | DRX .2 | DRX is used |
| Time offset between serving and neighbour cells | | Config 1 | 3ms | | | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 2,3 | 3µs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | | | |
| T2 | s | Config 1,2,3 | 11 for PC1; 6.5 for other PCT BD | 108 for PC1; 67 for other PCT BD | 11 for PC1; 6.5 for other PCT BD | 108 for PC1; 67 for other PCT BD | PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0 |

**Table 7.6.2.8.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.8.4.3.
2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.
3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 7.6.2.8.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.2.8.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.8.4.1-2.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]
9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.8.4.1-2 as appropriate.

### 7.6.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.2.8.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2<br>Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4 |

**Table 7.6.2.8.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB6 | | |
| } | | | |

### 7.6.2.8.5 Test requirement

Table 7.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1,2,3 | NA | | Setup 1 as specified in clause A.9 | |
| Beam Assumption[Note 7] | | Config 1,2,3 | N/A | | Rough | |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | TDD | |
| | | Config 2,3 | TDD | | TDD | |

| | | | | | |
|---|---|---|---|---|---|
| TDD configuration | | | Config 1 | Not Applicable | TDDConf.3.1 |
| | | | Config 2 | TDDConf.1.1 | TDDConf.3.1 |
| | | | Config 3 | TDDConf.2.1 | TDDConf.3.1 |
| $BW_{channel}$ | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 66 |
| BWP BW | | MHz | Config 1 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | | Config 2 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 66 |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | N/A |
| | Initial UL BWP | | | ULBWP.0.1 | N/A |
| | Dedicated DL BWP | | | DLBWP.1.1 | N/A |
| | Dedicated UL BWP | | | ULBWP.1.1 | N/A |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | - |
| | | | Config 2 | SR.1.1 TDD | |
| | | | Config 3 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | - |
| | | | Config 2 | CR.1.1 TDD | |
| | | | Config 3 | CR2.1 TDD | |
| Dedicated CORESET RMC configuration | | | Config 1 | CCR.1.1 FDD | CCR.3.1 TDD |
| | | | Config 2 | CCR.1.1 TDD | CCR.3.1 TDD |
| | | | Config 3 | CCR.2.1 TDD | CCR.3.1 TDD |
| SMTC configuration | | | Config 1 | SMTC.2 | SMTC.2 |
| | | | Config 2,3 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | 120 |
| | | | Config 3 | 30 | 120 |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | | | -104.7 |
| $N_{oc}$ Note2 | | dBm/SCS Note4 | Config 1,2 | | -95.7 |
| | | | Config 3 | | -95.7 |
| SSB_RP Note 3 | | dBm/SCS Note5 | Config 1,2 | | -Infinity -86.7 |
| | | | Config 3 | | -Infinity -86.7 |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | NA<br>Link only, see clause | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | A.6A | -Infinity | 9 |
| Io[Note3] | dBm/9.36MHz | Config 1,2 | | - | - |
| | dBm/38.16MHz | Config 3 | | - | - |
| | dBm/95.04 MHz Note5 | Config 1,2,3 | | -66.7 | -57.2 |
| Propagation Condition | | Config 1,2,3 | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6240 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

### 7.6.2.9 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2) (rel16 additional mandatory gap pattern 17)

Editor's Note: This test case is incomplete in following aspects:

- Test procedure is missing
- Message contents are missing

- TT analysis is missing

#### 7.6.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4 in TS 38.133 [6].

#### 7.6.2.9.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting gap pattern17.

#### 7.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in TS 38.133 [6] clause 9.3.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.9.

#### 7.6.2.9.4 Test description

In this test, there are two cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

##### 7.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.9.4.1-1.

**Table 7.6.2.9.4.1-1: SA event triggered reporting tests without SSB index reading for FR2-FR2**

| Config | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.2.9.4.1-2.

**Table 7.6.2.9.4.1-2: Initial conditions for FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.2.9.4.1-3. Cell-specific parameters of NR PCell are specified in Table 7.6.2.9.5-1.
2. Message contents are defined in clause 7.6.2.9.4.3.
3. There are two NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.2.9.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection (GP17)**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies are used |
| Active cell | | Config 1 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | Config 1 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2 |
| Gap Pattern Id | | Config 1 | 17 | As specified in clause 9.1.2-1 in TS 38.133 [6] |
| Measurement gap offset | | Config 1 | 39 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 in TS 38.133 [6] |
| A3-Offset | dB | Config 1 | -30 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells\ |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 6 (PC1)<br>4 (other PC) | |

### 7.6.2.9.4.2 Test procedure

TBD

### 7.6.2.9.4.3 Message contents

TBD

### 7.6.2.9.5 Test requirement

Table 7.6.2.9.5-1 defines the NR cell specific test parameters, not including test tolerances yet [will update after TT analysis].

**7.6.2.9.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection (GP17)**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1 | Setup 3 as specified in clause A.3.15 in TS 38.133 [6] | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption[Note 7] | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | Config 1 | 1 | | 2 | |
| Duplex mode | | Config 1 | TDD | | TDD | |
| TDD configuration | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | Config 1 | 100: $N_{RB,c} = 66$ | | 100: $N_{RB,c} = 66$ | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| TCI configuration | | | Config 1 | CSI-RS.Config.0 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | | N/A | | N/A | |
| $N_{oc}$ Note2 | | dBm/SCS Note4 | Config 1 | N/A | | N/A | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 + TT | -87 + TT | -Infinity | -87 + TT |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1 | N/A | N/A | -Infinity | N/A |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1 | N/A | N/A | -Infinity | N/A |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 + TT | -58.01 + TT | -Infinity | -58.01 + TT |
| Propagation Condition | | | Config 1 | AWGN | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone. |
| Note 7: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 5120 ms (PC1) or 3200 ms (other than PC1) from the beginning of time period T2.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.2.10 SA event triggered reporting test without gap under non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.6.2.10.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event without gap. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.9 in TS 38.133 [6].

### 7.6.2.10.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

### 7.6.2.10.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.10.

### 7.6.2.10.4 Test description

In this test, there are two cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

#### 7.6.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.10.4.1-1.

**Table 7.6.2.10.4.1-1: SA FR2-FR2 event triggered reporting tests without gap under non-DRX**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.2.10.4.1-2.

**Table 7.6.2.10.4.1-2: Initial conditions**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | PCell (Cell 1) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | 1 | Cell 2 | NR cell 2 is on NR RF channel number 2. |
| RF Channel Number | | 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| SMTC configuration | | 1 | SMTC.1 | |
| A3-Offset | dB | 1 | -10 | Value modified by TT |
| CP length | | 1 | Normal | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 μs | Synchronous cells |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 5 | |

**Table 7.6.2.10.4.1-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.10.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 7.6.2.10.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.10-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.10-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for UE supporting power class 1, or 1442 ms for UE supporting power class 2, 3 and 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
  or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.6.2.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.2.10.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -10dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |

### 7.6.2.10.5 Test requirement

Table 7.6.2.10.5-1 defines the NR cell specific test parameters, not including test tolerances yet [will update after TT analysis].

**Table 7.6.2.10.5-1: Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Initial BWP configuration | | 1 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |

| | | | | |
|---|---|---|---|---|
| Active DL BWP configuration | | 1 | DLBWP.1.1 | DLBWP.1.1 |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | ULBWP.1.1 |
| RLM-RS | | 1 | SSB | SSB |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | CCR.3.1 TDD |
| TRS configuration | | 1 | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI states | | 1 | TCI.State.2 | N/A |
| OCNG Patterns | | 1 | OP.1 | OP.1 |
| SSB | | 1 | SSB.3 FR2 | SSB.3 FR2 |
| Propagation Condition | | 1 | AWGN | |

**7.6.2.10.5-2: NR OTA Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.3.15.1 | | | |
| Beam assumption[Note 4] | | 1 | Rough | | Rough | |
| $\hat{E}_s/I_{ot\ BB}$[Note 5] | dB | 1 | 3.36 | 3.36 | -Infinity | 7.36 |
| $N_{oc}$[Note 2] | dBm/15 kHz | 1 | -102.7 | | | |
| $N_{oc}$[Note 2] | dBm/SCS | 1 | -93.7 | | | |
| SSB-RP | dBm/SCS | 1 | -89.7 | -89.7 | -Infinity | -85.7 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 8 |
| $Io$ | dBm/95.04MHz | 1 | -58.23 | -58.23 | -64.68 | -56.04 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB-RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%,

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.2.11 SA event triggered reporting test without gap under DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 7.6.2.11.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event without gap. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.9 in TS 38.133 [6].

### 7.6.2.11.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

### 7.6.2.11.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.11.

### 7.6.2.11.4 Test description

In this test, there are two cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

#### 7.6.2.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.11.4.1-1.

**Table 7.6.2.11.4.1-1: SA FR2-FR2 event triggered reporting tests without gap under DRX**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.2.11.4.1-2.

**Table 7.6.2.11.4.1-2: Initial conditions**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | 1, 2 | 1, 2 | 2 TDD carrier frequency are used for the NR cells. |
| Active cell | | 1, 2 | PCell (Cell 1) | Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. Cell 2 is on NR RF channel number 2. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| A3-Offset | dB | 1, 2 | -14 | Value modified by TT |
| CP length | | 1, 2 | Normal | |

| | | | | |
|---|---|---|---|---|
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | DRX.7 | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 52 | |

**Table 7.6.2.11.4.1-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.11.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

### 7.6.2.11.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.11-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.11-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 51202 ms for UE supporting power class 1, or 30722 ms for UE supporting power class 2, 3 and 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.2.11.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.2.11.4.3-1: Common Exception messages SA inter-frequency event triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -14dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.7 |

### 7.6.2.11.5 Test requirement

Table 7.6.2.11.5-1 defines the NR cell specific test parameters, not including test tolerances yet [will update after TT analysis].

**Table 7.6.2.11.5-1: Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 1 | | 2 | |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | N/A | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | N/A | |
| RLM-RS | | 1, 2 | SSB | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | N/A | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | N/A |
| OCNG Patterns | | 1, 2 | OP.1 | OP.1 |
| SSB | | 1 | SSB.3 FR2 | SSB.3 FR2 |
| | | 2 | SSB.4 FR2 | SSB.4 FR2 |
| Propagation Condition | | 1, 2 | AWGN | |

**7.6.2.11.5-2: NR OTA Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 1 defined in A.3.15.1 | | | |
| Beam assumption Note 4 | | 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | 3.70 | 3.70 | -Infinity | 3.70 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -99.2 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -90.2 | | | |
| | | 2 | -87.2 | | | |
| SSB-RP | dBm/SCS | 1 | -86.2 | -86.2 | -Infinity | -86.2 |
| | | 2 | -83.2 | -83.2 | -Infinity | -83.2 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| $Io$ | dBm/95.04MHz | 1 | -55.73 | -55.73 | -61.18 | -55.73 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB-RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%,

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.2.12 to 7.6.2.19

## 7.6.2.20 NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 7.6.2.20.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event on an inter-frequency layer based on measurement performed within a measurement gap when the UE is configured with two periodic MUSIM gaps. This test will partly verify the SA inter-frequency NR cell search requirements in clause TS 38.133 [6] 9.3.4.

#### 7.6.2.20.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting providing MUSIM assistance information with MUSIM gap preference and related MUSIM gap configuration.

#### 7.6.2.20.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6.2.0.1 and 7.6.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.20.

#### 7.6.2.20.4 Test description

##### 7.6.2.20.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.20.4.1-1.

**Table7.6.2.20.4.1-1: Supported test configurations for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with higher priority**

| Configuration | Description |
|---|---|
| 7.6.2.20-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.2.20.4.1-2.

**Table 7.6.2.20.4.1-2: Initial conditions for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with higher prority**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.20.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.20.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.2.20.4.1-3: General test parameters for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with higher priority**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | ms | Config 1 | 17 | |
| Measurement gap priority | | Config 1 | 3 | Lowest priority level |
| 1st MUSIM gap Pattern Id | | Config 1 | 0 | As specified in Table 9.1.10-1 |
| 1st MUSIM gap offset | ms | Config 1 | 10 | |
| 1st MUSIM gap priority | | Config 1 | 2 | Second priority level |
| 2nd MUSIM gap Pattern Id | | Config 1 | 1 | As specified in Table 9.1.10-1 |
| 2nd MUSIM gap offset | ms | Config 1 | 3 | |
| 2nd MUSIM gap priority | | Config 1 | 1 | Highest priority level |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 10.4 for PC1; 6.5 for other PC | |

#### 7.6.2.20.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) in channel 1 and a FR2 neighbour cell (NR Cell 2) in channel 2. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

The three gaps, including a measurement gap and two periodic MUSIM gaps, are configured with different priority levels. In this test, the measurement gap has the lowest priority level, and the 2nd MUSIM gap has the highest priority level (i.e., priority of 2nd MUSIM gap > 1st MUSIM gap > measurement gap) as defined in Table 7.6.2.20.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.20.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message with *measConfig* and *musim-GapConfig-r17*.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.20.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10242 ms for UE supporting power class 1, or 6402 ms for UE supporting other power class, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

- switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:
- if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5).

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.2.20.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.2.20.4.3-1: Common Exception messages SA inter-frequency event triggered reporting using MUSIM gap with higher priority**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-4 with Condition A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.20.4.3-2: RRCReconfiguration: NR measurement Configuration (Step 3, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT specified in Table H. 3.1-2 with Condition INTER-FREQ and GAP NEEDED | Measurement configuration | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| musim-GapConfig-r17 | | | |
| setup | MUSIM-GapConfig | MUSIM gap configuration Table 7.6.2.20.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.2.20.4.3-3: MeasObjectNR-DEFAULT (Table 7.6.2.20.4.3-2)**

| Derivation Path: Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR :: = SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

**Table 7.6.2.20.4.3-4: MeasGapConfig (Table 7.6.2.20.4.3-2)**

| Derivation Path: Table H.3.1-6 with Condition MGe and Pattern #13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig :: = SEQUENCE { | | | |
| gapFR2 | not present | | |
| gapFR1 | not present | | |
| gapUE | not present | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| gapOffset-r17 | 17 | | |
| gapPriority-r17 | 3 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.2.20.4.3-5: MUSIM-GapConfig (Table 7.6.2.20.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-82BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MUSIM-GapConfig-r17 ::= SEQUENCE { | | | |
| musim-GapToReleaseList-r17 | not present | | |
| musim-GapToAddModList-r17 SEQUENCE (SIZE (1..3)) OF MUSIM-Gap-r17 { | 2 entries | | |
| MUSIM-Gap-r17[1] SEQUENCE { | | Entry 1 | |
| musim-GapId-r17 | 0 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #0 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | | |
| ms40 | 10 | Pattern #0 | |
| } | | | |
| } | | | |
| } | | | |
| MUSIM-Gap-r17[2] SEQUENCE { | | Entry 2 | |
| musim-GapId-r17 | 1 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #1 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | | |
| ms80 | 3 | Pattern #1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| musim-AperiodicGap-r17 | not present | | |
| musim-GapToAddModListExt-v1820 SEQUENCE (SIZE (1..3)) OF MUSIM-GapExt-v1820 { | 2 entries | | |
| MUSIM-GapExt-v1820[1] SEQUENCE { | | Entry 1 | |
| gapPriority-r18 | 2 | Priority for 1st MUSIM gap | |
| } | | | |
| MUSIM-GapExt-v1820[2] SEQUENCE { | | Entry 2 | |

| | | | |
|---|---|---|---|
| gapPriority-r18 | 1 | Priority for 2nd MUSIM gap | |
| } | | | |
| } | | | |
| musim-GapKeep-r18 | not present | | |
| } | | | |

7.6.2.20.5 Test requirement

Table 7.6.2.20.4.1-3 and Table 7.6.2.20.5-1 define the primary level settings including test tolerances for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with higher priority.

**Table 7.6.2.20.5-1: NR Cell specific test parameters for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with higher priority**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.9 | | | |
| | | | | AoA1 | | AoA2 | |
| Beam AssumptionNote 7 | | | 1,2 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}s$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ BB Note 8 | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| IoNote3 | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1 | No external noise (Note 9) | | No external noise (Note 9) | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1, or

6400 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; $2xTTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 10242 ms in this test for power class UE and 6402 ms for other power classes.

## 7.6.2.21 NR SA FR2-FR2 event triggered reporting using MUSIM gap with shorter MGRP

Editor's Note: This test case is incomplete in following aspects:

TT analysis is still missing.

### 7.6.2.21.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event on an inter-frequency layer based on measurement performed within measurement gaps, when UE is also configured with MUSIM gaps. This test will partly verify the SA inter-frequency NR cell search requirements in clause TS 38.133 [6] 9.3.4.

#### 7.6.2.21.2 Test applicability

This test applies to all types of NR UE release 18 and forward, supporting providing MUSIM assistance information with MUSIM gap preference and related MUSIM gap configuration.

#### 7.6.2.21.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6.2.0.1 and 7.6.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.21.

#### 7.6.2.21.4 Test description

##### 7.6.2.21.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.21.4.1-1.

**Table7.6.2.21.4.1-1: Supported test configurations for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with shorter MGRP**

| Configuration | Description |
|---|---|
| 7.6.2.21-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.2.21.4.1-2.

**Table 7.6.2.21.4.1-2: Initial conditions for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with shorter MGRP**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.2.21.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.2.21.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.2.21.4.1-3: General test parameters for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with shorter MGRP**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 1 for per-UE gap,<br>14 for per-FR gap | As specified TS 38.133 [6] in table 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | |
| MUSIM gap Pattern Id | | Config 1 | 0 | As specified in TS 38.133 [6] table 9.1.10-1. |

| | | | | |
|---|---|---|---|---|
| MUSIM gap offset | ms | Config 1 | 2 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in TS 38.133 [6] clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 10.4 for PC1; 6.5 for other PC | |

#### 7.6.2.21.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) in channel 1 and a FR2 neighbour cell (NR Cell 2) in channel 2. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

Measurement gap and MUSIM gap pattern configurations defined in Table 7.6.2.21.4.1-3 are provided to the UE. When UE does not support per-FR gap, measurement gap pattern configuration is provided for a per-UE gap. When UE supports per-FR gap, measurement gap pattern configuration is provided for a per-FR2 gap. MUSIM gap is configured with shorter MGRP than the configured measurement gap. In test 1 measurement gap pattern configuration # 1 as defined in Table 7.6.2.21.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #14 as defined in Table 7.6.2.21.4.1-2 is provided for UE that support per-FR gap.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.21.5-1.

3. SS shall transmit an *RRCReconfiguration* message with *measConfig* and *musim-GapConfig-r17*.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.21.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10242 ms for UE supporting power class 1, or 6402 ms for UE supporting power class 2 ,3 and 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5).

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.2.21.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.2.21.4.3-1: Common Exception messages SA inter-frequency event triggered reporting using MUSIM gap with shorter MGRP**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-4 with Condition SSB Index and A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.2.21.4.3-2: RRCReconfiguration: NR measurement Configuration (Step 3, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT specified in Table H. 3.1-2 with Condition INTER-FREQ and GAP NEEDED | Measurement configuration | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| musim-GapConfig-r17 CHOICE { | | | |
| | MUSIM-GapConfig | MUSIM gap configuration Table 7.6.2.21.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.2.21.4.3-3: MeasObjectNR-DEFAULT (Table 7.6.2.21.4.3-2)**

| Derivation Path: Table H.3.1-3 with condition INTER-FREQ MO and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

**Table 7.6.2.21.4.3-4: MeasGapConfig: measurement gap configuration (Table 7.6.2.21.4.3-2)**

| Derivation Path: Table H.3.1-6 with MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR2 | not present | | |
| gapFR2 CHOICE { | | | pc_independentGapConfig |
| setup SEQUENCE { | | | |
| gapOffset | 39 | Pattern #14 | |
| mgl | ms5dot5 | Pattern #14 | |
| mgrp | ms80 | Pattern #14 | |
| } | | | |
| } | | | |
| gapFR1 | not present | | |
| gapUE | not present | | pc_independentGapConfig |
| gapUE CHOICE { | 1 entry | | |
| setup SEQUENCE { | | Entry 1 | |
| gapOffset-r17 | 39 | Pattern #1 | |
| gapPriority-r17 | not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.2.21.4.3-5: MUSIM-GapConfig (Table 7.6.2.21.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-82BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MUSIM-GapConfig-r17 ::= SEQUENCE { | | | |
| musim-GapToReleaseList-r17 | not present | | |
| musim-GapToAddModList-r17 SEQUENCE (SIZE (1..3)) OF MUSIM-Gap-r17 { | 1 entry | | |
| MUSIM-Gap-r17[1] SEQUENCE { | | Entry 1 | |
| musim-GapId-r17 | 0 | | |
| musim-GapInfo-r17 SEQUENCE { | | | |
| musim-Starting-SFN-AndSubframe-r17 | not present | | |
| musim-GapLength-r17 | ms6 | Pattern #0 | |
| musim-GapRepetitionAndOffset-r17 CHOICE { | | | |
| ms40 | 2 | Pattern #0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| musim-AperiodicGap-r17 | not present | | |
| } | | | |

7.6.2.21.5 Test requirement

Table 7.6.2.21.4.1-3 and Table 7.6.2.21.5-1 define the primary level settings including test tolerances for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with shorter MGRP.

**Table 7.6.2.21.5-1: NR Cell specific test parameters for NR SA FR2-FR2 event-triggered reporting using MUSIM gap with shorter MGRP**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| AoA setup | | Config 1 | Setup 3 as specified in clause A.9 | | | |
| | | | AoA1 | | AoA2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Beam AssumptionNote 7 | | | 1,2 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| Ês | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | | Config 1 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | VoidNote 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Void |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone |
| Note 7: | Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 8: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1, or

6400 for UE supporting power class 2, 3, 4.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = $TTI_{DCCH}$ = 1 ms; $2xTTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 10242 ms in this test for power class UE and 6402 ms for other power classes.

## 7.6.3 L1-RSRP measurement for beam reporting

### 7.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

#### 7.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

#### 7.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

#### 7.6.3.0.3 Minimum conformance requirements for Inter-cell SSB based L1-RSRP Reporting

If a cell with PCI different from serving cell is known according to TS 38.133 [6] clause 9.13.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$. The requirements specified in this clause are only applicable when

- *highSpeedMeasFlag-r16* is not configured, and
- *highSpeedMeasFlagFR2-r17* is not configured, and
- highSpeedMeasCA-Scell-r17 is not configured, and

- SSBs of CDP outside SMTCs for L1-RSRP measurement are not overlapped with concurrent gaps.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ is defined in Table 7.6.3.6.3-1 for FR2 when *highSpeedMeasFlagFR2-r17* is not configured, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- N= 8.

For FR2,

- P is $P_{L1_sharing}$*$P_{sharing\ factor,\ CDP}$, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ($T_{SSB_CDP} = T_{SMTCperiod}$), and $T_{SSB_SC} = T_{SMTCperiod}$.
- P is $P_{L1_sharing} * \frac{P_{\text{sharing factor}}}{1-\frac{T_{SSB}}{xRP}}$, when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with GAP ($T_{SMTCperiod} < xRP$), and $T_{SSB_SC} = T_{SMTCperiod}$.
- $P_2=\frac{1}{1-\frac{T_{SSB_CDP}}{T_{SMTCperiod}}}$, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB_CDP} < T_{SMTCperiod}$).
- $P_2= \frac{1}{1-\frac{T_{SSB_CDP}}{MGRP}-\frac{T_{SSB_CDP}}{T_{SMTCperiod}}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB_CDP} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB_CDP} < 0.5*T_{SMTCperiod}$
- $P_2= \frac{1}{1-\frac{T_{SSB_CDP}}{min(T_{SMTCperiod},MGRP)}}$,when SSB is partially overlapped with measurement gap ($T_{SSB_CDP}$ <MGRP) and SSB is partially overlapped with SMTC occasion ($T_{SSB_CDP} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- If SSB resource from serving cell is configured for L1-RSRP measurements, and $P_1$ is valid according to TS 38.133 [6] clause 9.5.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain)
  - $P = \frac{P_2}{1-\frac{P_2*T_{SSB_CDP}}{P_1*T_{SSB_SC}}}$, if $P_2*T_{SSB_CDP} < P_1*T_{SSB_SC}$.
  - $P = P_2$, if $P_2*T_{SSB_CDP} > P_1*T_{SSB_SC}$.
  - $P = 2*P_2$, if $P_1*T_{SSB_SC} = P_2*T_{SSB_CDP}$.
  - Otherwise, $P = P_2$
- $T_{SSB_CDP}$ = SSB periodicity of the cell with PCI different from serving cell
- $T_{SMTCperiod}$ = the configured SMTC period
- $T_{SSB_SC}$ = ssb-periodicityServingCell of the serving cell
- $P_{sharing\ factor}$ = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,

- $P_{sharing\ factor} = 3$, otherwise.

- $P_{L1_sharing} = 2$, if SSB resource from serving cell is configured for L1-RSRP measurements, and $P_{sharing_factor}$ is used in 9.5.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain). $P_{L1_sharing} = 1$, otherwise.

If the higher layer in TS 38.331 [6] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For FR2 cell with PCI different from serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For FR2 cell with PCI different from serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 7.6.3.6.3-1: Inter-cell L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ for known cells with different PCIs in FR2**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_CDP}$ (ms) |
|---|---|
| non-DRX | $max(T_{Report}, ceil(M*P*N)*T_{SSB_CDP})$ |
| DRX cycle ≤ 320ms | $max(T_{Report}, ceil(1.5*M*P*N)*max(T_{DRX},T_{SSB_CDP}))$ |
| DRX cycle > 320ms | $ceil(1.5*M*P*N)*T_{DRX}$ |
| Note: $T_{SSB_CDP}$ is the periodicity of the SSB-Index configured for inter-cell L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.13.4.1

## 7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

### 7.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 7.6.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.1.

7.6.3.1.4 Test description

7.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.1.4.1-1.

**Table 7.6.3.1.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.3.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.3.1.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| | | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | Off |
| reportConfigType | 1~2 | | periodic |
| reportQuantity | 1~2 | | ssb-Index-RSRP |
| Number of reported RS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.3.1.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 7.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.3.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 1720ms for UE supporting power class 1 in configuration 1, no later than 1700 ms for UE supporting power class 1 in configuration 2, no later than 1240 ms for UE supporting power class other than 1 in configuration 1 and no later than 1220 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 the number of

failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.3.1.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB |

**Table 7.6.3.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.6.3.1.5 Test requirement

Table 7.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.1.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | | | |
| Assumption for UE beamsNote 4 | 1~2 | | Rough | | | |
| $N_{oc}$ Note2 | 1~2 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -96 | | | |
| | 2 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 2 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 2 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations.

**Table 7.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

**Table 7.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

**Table 7.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 7.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

### 7.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

### 7.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.2.

### 7.6.3.2.4 Test description

#### 7.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.2.4.1-1.

**Table 7.6.3.2.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.3.2-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.3.2.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |

| | | | |
|---|---|---|---|
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| | 2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | DRX.3 |
| reportConfigType | 1~2 | | periodic |
| reportQuantity | 1~2 | | ssb-Index-RSRP |
| Number of reported RS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 3 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.3.2.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 7.6.3.2.4.2 Test procedure

Same as in 7.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 2920ms for UE supporting power class 1 in configuration 1, no later than 2900ms for UE supporting power class 1 in configuration 2, no later than 1960ms for UE supporting power class other than 1 in configuration 1 and no later than 1940 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 7.6.3.2.4.3 Message contents

Same message content as in subclause 7.6.3.1.4.3 with the following exception:

**Table 7.6.3.2.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.7-1 with condition DRX.3 |

### 7.6.3.2.5 Test requirement

Table 7.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.2.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | | | |
| Assumption for UE beamsNote 4 | 1~2 | | Rough | | | |
| $N_{oc}$ Note2 | 1~2 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -96 | | | |
| | 2 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 2 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 2 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations.

**Table 7.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

**Table 7.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

**Table 7.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

### 7.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

### 7.6.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.3.

### 7.6.3.3.4 Test description

#### 7.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.3.4.1-1.

**Table 7.6.3.3.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.3.4-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 7.6.3.3.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| Data $_{RBs}$ allocated | 1 | | 66 |

| | | | |
|---|---|---|---|
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS configuration | 1 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | Off |
| reportConfigType | 1 | | aperiodic |
| reportQuantity | 1 | | cri-RSRP |
| Number of reported RS | 1 | | 2 |
| qcl-Info | 1 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1 | | 8 |
| Propagation condition | 1 | | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.3.3.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 7.6.3.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.3.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.3.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 7.6.3.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.3.3.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions APERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and APERIODIC |

**Table 7.6.3.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

7.6.3.3.5 Test requirement

Table 7.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.3.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1 | | Setup 1 according to A.9 | |
| $N_{oc}$ Note1 | 1 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 9 |
| Note 1: Void<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.3.5-2 the corresponding relative accuracy requirements in Table 7.6.3.3.5-3.

**Table 7.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

**Table 7.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values R3**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

### 7.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

### 7.6.3.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

### 7.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.4.

### 7.6.3.4.4 Test description

#### 7.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.4.4.1-1.

**Table 7.6.3.4.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.3.4-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 7.6.3.4.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| Data $_{RBs}$ allocated | 1 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |

| | | | |
|---|---|---|---|
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS configuration | 1 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | DRX.3 |
| reportConfigType | 1 | | aperiodic |
| reportQuantity | 1 | | cri-RSRP |
| Number of reported RS | 1 | | 2 |
| qcl-Info | 1 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1 | | 8 |
| Propagation condition | 1 | | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.3.4.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.3.4.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 7.6.3.4.4.2 Test procedure

Same test procedure as in subclause 7.6.3.3.4.2 with tables 7.6.3.3.4.1-2 and 7.6.3.3.5-1 replaced by tables 7.6.3.4.4.1-2 and 7.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

#### 7.6.3.4.4.3 Message contents

Same message content as in subclause 7.6.3.3.4.3 with the following exception:

**Table 7.6.3.4.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.7-1 with condition DRX.3 |

#### 7.6.3.4.5 Test requirement

Table 7.6.3.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.4.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1 | | Setup 1 according to A.9 | |
| Assumption for UE beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 9 |

Note 1: Void
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.4.5-2 the corresponding relative accuracy requirements in Table 7.6.3.4.5-3.

**Table 7.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values**

| Normal Conditions | T1 |
|---|---|

| | |
|---|---|
| Lowest reported value (CSI-RS#1) | 40 |
| Highest reported value (CSI-RS#1) | 99 |

**Table 7.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 1 |
| Highest DIFF RSRP reported (CSI-RS#0) | 7 |

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.3.5 NR SA FR2 SSB based L1-RSRP measurement test when DRX is used for power class 6 UE configured with *highSpeedMeasFlagFR2-r17*

Editor's note: This test case is incomplete. The following aspects are missing:

- Test tolerance and measurement uncertainty analysis are missing

### 7.6.3.5.1 Test purpose

The purpose of this test is to verify that the power class 6 UE makes correct reporting of L1-RSRP measurement when *highSpeedMeasFlagFR2-r17* is configured within L1-RSRP measurement requirements for power class 6 UE configured with *highSpeedMeasFlagFR2*-r17 in TS 38.133[6] clause 9.5.4.1.

### 7.6.3.5.2 Test applicability

This test applies to all types of NR UE power class 6 release 17 onwards that support *highSpeedMeasFlagFR2-r17.*

### 7.6.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.5.

### 7.6.3.5.4 Test description

#### 7.6.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.6.3.5.4.1-2. The test parameters are given in Tables 7.6.3.5.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test.

**Table 7.6.3.5.4.1-1: NR SA FR2 SSB based L1-RSRP for power class 6 UE configured with *highSpeedMeasFlag-r17* test configurations**

| Configuration | Description |
|---|---|
| 7.6.3.5-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.3.5-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 7.6.3.5.4.1-2: Initial conditions for NR SA FR2 cell re-selection for PC6**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.1.1.7.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 7.6.3.5.4.1-2: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| highSpeedMeasFlagFR2-r17 | 1~2 | | Set 1 |
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD |
| | 2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | DRX.3 |
| reportConfigType | 1~2 | | periodic |
| reportQuantity | 1~2 | | ssb-Index-RSRP |
| Number of reported RS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 3 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~2 | | AWGN 19444Hz |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

1. Message contents are defined in clause 7.6.3.5.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

#### 7.6.3.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.5.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 7.6.3.5.4.1-2.

2. Set the parameters according to T1 in Table 7.6.3.5.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.5.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

- R1: the UE shall start to transmit valid L1-RSRP reports no later than 720 ms plus 320 slots in configurations 1 and 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.5.3.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.5.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

- R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.5.3.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.5.3.5-3 for test configuration 2 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

- R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.5.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
  or:
  - switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.3.5.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.7-1 with condition DRX.3 |

**Table 7.6.3.5.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.3.5.4.3-3: HighSpeedConfigFR2**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-62C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| HighSpeedConfigFR2-r17 ::= SEQUENCE { | | | |
| highSpeedMeasFlagFR2-r17 | set1 | | |
| highSpeedDeploymentTypeFR2-r17 | bidirectional | | |
| highSpeedLargeOneStepUL-TimingFR2-r17 | true | | |
| } | | | |

### 7.6.3.5.5 Test requirement

Table 7.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.5.5-1: SSB specific test parameters for power class 6 UE configured with highSpeedMeasFlag-r17**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | | | |
| Beam Assumption Note 4 | 1-2 | | Rough | | | |
| $N_{oc}$ Note2 | 1~2 | dBm/15kHz | -105+TT | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -96+TT | | | |
| | 2 | | -93+TT | | | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1 | dBm/SSB SCS | -96+TT | -96+TT | -Infinity | -87+TT |
| | 2 | | -93+TT | -93+TT | -Infinity | -84+TT |

| | | | | | | |
|---|---|---|---|---|---|---|
| Io Note3 | 1 | dBm/95.04MHz | -63.97+TT | -63.97+TT | -66.98 | -57.47+TT |
| | 2 | | -63.97+TT | -63.97+TT | -66.98 | -57.47+TT |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 0 | -Infinity | 9+TT |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than 720 ms plus 320 ms from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.5.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.5.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.5.5-4 for all test configurations.

**Table 7.6.3.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 40 |
| Highest reported value (SSB#1) | - | 99 |

**Table 7.6.3.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 43 |
| Highest reported value (SSB#1) | - | 102 |

**Table 7.6.3.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

### 7.6.3.6 NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used

Editor's note: This test case is incomplete. The following aspects are missing:

- NR FR1 - FR2 OTA testability is still FFS.

#### 7.6.3.6.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.13.4.1.

#### 7.6.3.6.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting inter-band CA between FR1 (PCell) and FR2 (SCell).

#### 7.6.3.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.6.

#### 7.6.3.6.4 Test description

##### 7.6.3.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.6.4.1-1.

**Table 7.6.3.6.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | NR PCell 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR PCell 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | NR PCell 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | NR PCell 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR SCell 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5 | NR PCell 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR SCell 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 6 | NR PCell 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR SCell 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.3.6.4.1-2: Cell specific test parameters for FR1 PCell**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | freq1 |
| Duplex mode | 1,4 | | FDD |
| | 2,5 | | TDD |
| | 3,6 | | TDD |
| TDD Configuration | 1,4 | | N/A |
| | 2,5 | | TDDConf.1.1 |
| | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,4 | | SR.1.1 FDD |
| | 2,5 | | SR.1.1 TDD |
| | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 | | CR.1.1 FDD |
| | 2,5 | | CR.1.1 TDD |
| | 3,6 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 | | CCR.1.1 FDD |
| | 2,5 | | CCR.1.1 TDD |
| | 3,6 | | CCR.2.1 TDD |
| SSB configuration | 1,4 | | SSB.3 FR1 |
| | 2,5 | | SSB.3 FR1 |

| | | | |
|---|---|---|---|
| | 3,6 | | SSB.4 FR1 |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| CSI-RS for tracking | 1,4 | | TRS.1.1 FDD |
| | 2,5 | | TRS.1.1 TDD |
| | 3,6 | | TRS.1.2 TDD |
| DRX configuration | 1~6 | | Off |
| SSB index assigned as RLM RS | 1~6 | | 0,1 |
| SSB Index assigned as BFD RS ($q_0$) | 1~6 | | 0 |
| SSB Index assigned as CBD RS ($q_1$) | 1~6 | | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | 1~6 | dBm/15 kHz | -104 |
| $\hat{E}_s / I_{ot}$ | 1~6 | dB | 17 |
| $\hat{E}_s / N_{oc}$ | 1~6 | dB | 17 |
| SS-RSRP Note3 | 1~6 | dBm/15 kHz | -87 |
| Io Note3 | 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | 3,6 | dBm/ 38.16MHz | -52.86 |
| Propagation condition | 1~6 | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 7.6.3.6.4.1-3: Cell specific test parameters for FR2 SCell**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~6 | | Freq2 |
| Duplex mode | 1~6 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~6 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~6 | | 66 |
| PDSCH Reference measurement channel | 1,2,3 | | SR.3.2 TDD |
| | 4,5,6 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2,3 | | CR.3.1 TDD |
| | 4,5,6 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2,3 | | CCR.3.1 TDD |
| | 4,5,6 | | CCR.3.7 TDD |
| SSB configuration | 1,2,3 | | SSB.1 FR2 |
| | 4,5,6 | | SSB.2 FR2 |
| OCNG Patterns | 1~6 | | OP.1 |

| | | | |
|---|---|---|---|
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~6 | | SMTC.1 |
| TRS Configuration | 1~6 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~6 | | TCI.State.2 |
| DRX configuration | 1~6 | | Off |
| reportConfigType | 1~6 | | periodic |
| reportQuantity | 1~6 | | ssb-Index-RSRP |
| Number of reported RS | 1~6 | | 2 |
| SSB index associated to serving PCI | 1~6 | | 0 |
| SSB index associated to a PCI different from serving cell | 1~6 | | 1 |
| Timing offset between two SSBs associated to different PCI | 1~6 | | <CP |
| L1-RSRP reporting period | 1~6 | slot | 320 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 2 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~6 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Configure the test equipment and the DUT according to the parameters in Table 7.6.3.6.4.1-4.

**Table 7.6.3.6.4.1-4: Initial conditions for NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.3.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Cell specific test parameter settings are set up according to Table 7.6.3.6.4.1-2 and 7.6.3.6.4.1-3

2. Message contents are defined in clause 7.6.3.6.4.3.

#### 7.6.3.6.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2 respectively. Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.6.4.1-2 and 7.6.3.6.4.1-3. Before the test, UE is configured to perform RLM and BFD on Cell 1 in FR1 and perform L1-RSRP measurements on the SSB#0 in FR2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.3.6.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.6.5-1. T2 starts. SSB#1 starts transmission, and the UE is configured for L1-RSRP measurement on SSB#1.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 2200ms for UE supporting power class 1 in configuration 1,2 and 3, no later than 2180 ms for UE supporting power class 1 in configuration 4, 5 and 6, no later than 1720 ms for UE supporting power class 2, 3 and 4 in configuration 1 and no later than 1700 ms for UE supporting power class 2, 3 and 4 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.3.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.3.6.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10 |

**Table 7.6.3.6.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.6.3.6.5 Test requirements

Table 7.6.3.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.3.6.5-1: SSB specific test parameters for FR2 SCell**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | 1~6 | | Setup 3 according to A.9.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 4] | 1~6 | | Rough | | Rough | |
| $N_{oc}$ [Note2] | 1~6 | dBm/15kHz | -105 | | -105 | |
| $N_{oc}$ [Note2] | 1~3 | dBm/SSB SCS | -96 | | -96 | |
| | 4~6 | | -93 | | -93 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP [Note3] | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 2 | | -93 | -93 | -Infinity | -84 |
| Io [Note3] | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 2 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for [illegible] to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2160 for UE supporting power class 1
- 1680 for UE supporting power class 2, 3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.6.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.6.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.6.5-4 for all test configurations.

**Table 7.6.3.6.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#0 and SSB#1) | - | 40 |
| Highest reported value (SSB#0 and SSB#1) | - | 99 |

**Table 7.6.3.6.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#0 and SSB#1) | - | 43 |
| Highest reported value (SSB#0 and SSB#1) | - | 102 |

**Table 7.6.3.6.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 1 |
| Highest DIFF RSRP reported (SSB#0) | - | 7 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.6.4 CLI measurements

### 7.6.4.0 Minimum conformance requirements

#### 7.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

**Table 7.6.4.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$**

| Configuration | $T_{SRS_measurement_period}$ (ms) |
|---|---|
| No DRX | Max(60, 3 X $T_{SRS}$) |
| DRX cycle ≤ 320ms | Max(60, Ceil(1.5 X 3) X max($T_{SRS}$, $T_{DRX}$)) |
| DRX cycle > 320ms | 3 X $T_{DRX}$ |
| Note: $T_{SRS}$ is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and $T_{DRX}$ is the DRX cycle length. | |

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

### 7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS
- The test procedure is incomplete
- The message content is FFS
- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.
- MU/TT analysis for UE power class other than PC3 is incomplete.
- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

#### 7.6.4.1.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

#### 7.6.4.1.2 Test applicability

FFS

#### 7.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.1.

#### 7.6.4.1.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

##### 7.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.1.4.1-1.

**Table 7.6.4.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.4.1 - 1 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.1.4.1-2.

**Table 7.6.4.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 7.6.4.1.4.1-3 below.
2. Message contents are defined in clause 7.6.4.1.4.3.
3. One cell is deployed in the test, which is FR2 PCell (Cell 1). The test parameters for PSCell are given in Table 7.6.4.1.4.1-3
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

**Table 7.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | Cell 1 | |
| RF Channel Number | | 1 | 1: Cell 1 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table 7.6.4.1.5-3 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -112 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | OFF | Non-DRX |

| | | | | |
|---|---|---|---|---|
| Time offset between DL from serving cell and SRS from test system | µs | 1 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

#### 7.6.4.1.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.1.5-2. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.6.4.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 with event I1 configured.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.

<rest of the steps are FFS >

#### 7.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 7.6.4.1.5 Test requirement

Table 7.6.4.1.5-1 defines the cell specific settings for all tests. Table 7.6.4.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 7.6.4.1.5-1: NR Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell in FR2**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |

**Table 7.6.4.1.5-2: NR OTA Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell and neighbour cell UE in FR2**

| Parameter | Unit | Test configuration | Cell 1 | | Neighbour cell UE | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.9.1 | | | |
| Beam assumption Note 4 | | 1 | Fine | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -100.5 | | -100.5 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -91.5 | | -91.5 | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | - | - | -infinity | 7 |
| $\hat{E}_s / N_{oc}$ | dB | 1 | - | - | -infinity | 7 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | - | - | -infinity | -84.5 |
| Io | dBm/95.04 MHz | 1 | -63.86 | -56.07 | -63.86 | -56.07 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5: Cell 2 doesn't transmit during the SRS and the 2 previous symbols. Es/NoC is not applied to those symbols.

**Table7.6.4.1.5-3: SRS configuration for measurement reporting**

| | Field | SRSConf.1 | Comments |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | |
| | srs-ResourceIdList | 0 | |
| | resourceType | Periodic | |
| | Usage | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | |
| | nrofSRS-Ports | Port1 | |
| | transmissionComb | n2 | |
| | combOffset-n2 | 0 | |
| | cyclicShift-n2 | 0 | |
| | resourceMapping startPosition | 0 | |
| | resourceMapping nrofSymbols | n1 | |
| | resourceMapping repetitionFactor | n1 | |
| | freqDomainPosition | 0 | |
| | freqDomainShift | 0 | |
| | freqHopping c-SRS | 12 | |
| | freqHopping b-SRS | 0 | |
| | freqHopping b-hop | 0 | |
| | groupOrSequenceHopping | Neither | |
| | resourceType | Periodic | |
| | periodicityAndOffset | sl40, 25 | |
| | sequenceId | 0 | Any 10 bit number |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.4.2 NR SA FR2 CLI-RSSI measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

### 7.6.4.2.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5

### 7.6.4.2.2 Test applicability

TBD

### 7.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.2.

### 7.6.4.2.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

#### 7.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.2.4.1-1.

**Table 7.6.4.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI test**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.2.4.1-2.

**Table 7.6.4.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Table 7.6.4.2.4.1-3 below.

2. Message contents are defined in clause 7.6.4.2.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1). The test parameters for PSCell are given in Table 7.6.4.2.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

**Table 7.6.4.2.4.1-3: General test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | NR Cell 1 | |
| RF Channel Number | | 1 | 1: Cell 1 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| CLI-RSSI configuration | | 1 | CLI-RSSIConf.1 | Table7.6.4.2.5-3 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -94.5 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | OFF | Non-DRX |
| Time offset between DL from serving cell and OCNG from test system | μs | 1 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

### 7.6.4.2.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.2.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.2.5-2. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.6.4.2.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 with event I1 configured.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. The UE shall transmit periodically *MeasurementReport* messages.

<rest of the steps are FFS >

### 7.6.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

7.6.4.2.5 Test requirement

Table 7.6.4.2.5-1 defines the cell specific settings for all tests. Table 7.6.4.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 7.6.4.2.5-1: : NR Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| PUSCH parameters | | 1 | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns Note 1 | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table 7.6.4.2.5-2: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.9.1 | |
| Beam assumption Note 3 | | 1 | Fine | Fine |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -119+TT | -108+TT |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -110 | -99 |
| Io on CLI-RSSI measurement resource | dBm/95.04 MHz | 1 | -81.01 | -70.01 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -100.46 | -89.46 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

**Table7.6.4.2.5-3: CLI-RSSI measurement resource configuration for measurement reporting**

| | Field | CLI-RSSIConf.1 |
|---|---|---|
| RSSI-Resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120 |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl40, 25 |

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 5ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.5 NR measurements with autonomous gaps

### 7.6.5.0 Minimum conformance requirements

#### 7.6.5.0.1 Minimum conformance requirements for SA inter-frequency CGI reporting in autonomous gaps test (PCell in FR2)

##### 7.6.5.0.1.1 Minimum conformance requirements for interruptions when identifying CGI of an NR cell with autonomous gaps

[TS38.133, Clause 8.2.1.2.16]

When a UE is identifying CGI of an NR cell with autonomous gaps, the UE is allowed interruptions on PSCell or any activated SCell:

- with up to K1 interruptions with interrupted slots up to interruption length X1 specified in Table 7.6.5.0.1.1-1 for each interruption during MIB decoding time period $T_{MIB}$ (ms) specified in clause 7.6.5.0.1.2.
- with up to L1 interruptions with interrupted slots up to interruption length Y1 specified in Table 7.6.5.0.1.1-1 for each interruption during SIB1 decoding time period $T_{SIB1}$ (ms) specified in clause 7.6.5.0.1.2 for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to L2 interruptions with interrupted slots up to interruption length Y2 specified in Table 7.6.5.0.1.1-1 for each interruption during SIB1 decoding time period $T_{SIB1}$ (ms) specified in clause 7.6.5.0.1.2 for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- K1 = 6 for the target cell carrier frequency on FR1 and K1 = 25 for the target cell carrier frequency on FR2, and
- L1 = $T_{SIB1}/20$, and
- L2 = $T_{SIB1}/T_{SMTC}$, where $T_{SMTC}$ is the periodicity of the SMTC occasion configured for the target cell carrier.

**Table 7.6.5.0.1.1-1: Interruption length X1, Y1 and Y2 during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) | Interruption length Y2 (slots) |
|---|---|---|---|---|
| 0 | 1 | 6 | 7 | 6 |
| 1 | 0.5 | 12 | 13 | 10 |
| 2 | 0.25 | 24 | 25 | 19 |
| 3 | 0.125 | 48 | 49 | 37 |

##### 7.6.5.0.1.2 Minimum conformance requirements for NR measurements with autonomous gaps

[TS 38.133, Clause 9.11]

###### 7.6.5.0.1.2.1 Introduction

The requirements in this clause are applicable for CGI identification of an intra-frequency and inter-frequency NR target cell.

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE:

- in RRC_CONNECTED state, and
- configured with SA or NR-DC or NE-DC operation mode, or with EN-DC operation mode for CGI identification requested by NR PSCell.

The overall CGI reporting delay is defined in clause 7.6.5.0.1.2.3.

The measurement reporting delay can be longer for the measurement reporting requirements in this clause when IDC autonomous denial is configured.

#### 7.6.5.0.1.2.2 CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of reportCGI. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may make autonomous gaps in both downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3 in TS 38.331 [13]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of reportCGI, regardless of whether DRX is used or not, or whether SCell(s) are configured or not, the UE shall be able to identify a new CGI of NR cell within:

$$T_{identify_CGI} = (T_{MIB} + T_{SIB1})\ ms$$

Where:

$T_{MIB}$ is the time period used to acquire MIB message. $T_{MIB} = 6 * T_{SMTC}$ ms for target cell carrier frequency on FR1 and $T_{MIB} = 25 * T_{SMTC}$ ms for target cell carrier frequency on FR2.

$T_{SIB1}$ is the time period used to acquire SIB1 message. $T_{SIB1} = 6 * T_{RMSI\text{-}scheduling}$ ms.

Where $T_{SMTC}$ is the SMTC periodicity configured for the target cell measurement, and $T_{RMSI\text{-}scheduling}$ is

- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and 20ms when SSB and RMSI CORESET multiplexing pattern is 1
- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and $T_{SMTC}$ when SSB and RMSI CORESET multiplexing pattern is 2 or 3.

The requirement for identifying the CGI of an NR cell within $T_{identify_CGI}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

Within the time $T_{identify_CGI}$, over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in,

- Clause 8.2.1.2.16 in TS 38.133 [6] for NR serving cells and Clause 7.32.2.15 in TS 36.133 [23] for E-UTRA serving cells if the UE is configured with EN-DC operation mode,
- Clause 8.2.2.2.14 in TS 38.133 [6] if the UE is configured with SA operation mode,
- Clause 8.2.3.2.14 in TS 38.133 [6] for NR serving cells and Clause 7.36.2.14 in TS 36.133 [23] for E-UTRA serving cells if the UE is configured with NE-DC operation mode,
- Clause 8.2.4.2.11 in TS 38.133 [6] if the UE is configured with NR-DC operation mode.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and
- During MIB decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the cell identification conditions specified in clauses 9.2 or 9.3 in TS 38.133 [6], and

- During MIB decoding, the SSB for MIB decoding remains detectable with SNR ⩾-3dB
- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with SNR ⩾-3dB

#### 7.6.5.0.1.2.3 CGI reporting delay

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI}$ defined in clause 7.6.5.0.1.2.2 plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and additional 20ms margin if target cell is on FR2.

### 7.6.5.1 SA inter-frequency CGI reporting in autonomous gaps test (PCell in FR2)

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing
- TT analysis is missing

#### 7.6.5.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an CGI. This test will partly verify the SA inter-frequency NR cell search requirements in clause 8.2.1.2.16 and 9.11 in TS 38.133 [6].

#### 7.6.5.1.2 Test applicability

This test applies to all types of NR SA UE Rel-16 and forward supporting with PCell in FR2 and supporting acquisition of CGI from neighbour NR cell using autonomous gap, which is controlled by CGI reporting pc_nr_CGI_Reporting.

#### 7.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.5.1.

#### 7.6.5.1.4 Test description

In this test, there are two cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

Measurement gap patterns are configured. During T1 the UE shall report event A3 for cell 2. Within 3 seconds of the event report, the test equipment shall add a measurement reporting configuration using *ReportConfigNR* which contains a *ReportCGI* IE with *cellForWhichToReportCGI* set to the physical Cell ID of cell 2 and including the optional IE *useAutonomousGaps-r16*.

In the measurement control information, it is indicated to the UE to decode the CGI of the neighbour cell using autonomous gaps. The test consists of two time phases, T1 and T2. Time period T2 begins 10ms after the test equipment has transmitted the RRC reconfiguration message containing the *ReportCGI* IE.

##### 7.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.5.1.4.1-1.

**Table 7.6.5.1.4.1-1: SA inter-frequency CGI reporting test in autonomous gaps**

| Config | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.6.5.1.4.1-2.

**Table 7.6.5.1.4.1-2: Initial conditions for EN-DC PSCell FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 7.2.3 for E-UTRA and 7.2.3 for NR. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | Figure A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | Figure A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameters for NR cells are given in Table 7.6.5.1.4.1-3 below. Cell-specific parameters of NR cells are specified in Table 7.6.5.1.5-1.

2. Message contents are defined in clause 7.6.5.1.4.3.

3. There are two NR cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

**Table 7.6.5.1.4.1-3: General test parameters for SA inter-frequency CGI reporting in autonomous gaps**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies are used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause 9.1.2-1 in TS 38.133 [6]. |
| Measurement gap offset | | Config 1 | 39 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 in TS 38.133 [6] |
| SI-RNTI scheduling rate | ms | | 40 ms | S-RNTI scheduled on four occasions per 160ms transmission period |
| A3-Offset | dB | Config 1 | -30 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells |

| | | | | |
|---|---|---|---|---|
| T1 | s | Config 1 | <10 | UE expected to report event A3 for cell 2 within 5.2s (PC1) or 3.5s (other PC) of the start of T1. Test equipment shall configure CGI reporting within 3s after receiving the event A3 report. T2 begins 10ms after test equipment has transmitted the RRC reconfiguration to configure CGI reporting. |
| T2 | s | Config 1 | 1 | |

#### 7.6.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4. UE is connected to Cell 1 (PCell) on NR RF channel 1. NR Cell 2 is also on NR RF channel 1. Set the parameters according to Tables 7.6.5.1.4.1-3 and 7.6.5.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.
3. T1 starts. At this moment, the UE does not have any timing information of Cell 2.
4. During T1, UE reports event A3 for Cell 2. Within 3 seconds of the event report, the test equipment shall add a measurement reporting configuration using *ReportConfigNR* which contains a *ReportCGI* IE with *cellForWhichToReportCGI* set to the physical Cell ID of cell 2 and including the optional IE *useAutonomousGaps-r16*.
5. T2 starts 10 ms after the test equipment has transmitted the RRC reconfiguration message containing the *ReportCGI* IE.
6. If the UE transmits a measurement report containing the cell global identifier of Cell 2 within 765 ms from the start of T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. If it is successful, continue to step 9. Otherwise continue to step 8.
8. Switch the UE OFF and then ON. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR SA*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.5.1.4.3 Message contents

TBD

### 7.6.5.1.5 Test requirement

Table 7.6.5.1.5-1 defines the cell specific test parameters, not including test tolerances yet.

Editor's note: will be updated after TT analysis.

**Table 7.6.5.1.5-1: Cell specific test parameters SA inter-frequency CGI reporting in autonomous gaps**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1 | Setup 3 as specified in clause A.3.15 in TS 38.133 [6] | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 7] | | 1,2 | Rough | | | |
| NR RF Channel Number | | Config 1 | 1 | | 2 | |
| Duplex mode | | Config 1 | TDD | | TDD | |

| | | | | | |
|---|---|---|---|---|---|
| TDD configuration | | | Config 1 | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | N/A |
| | Initial UL BWP | | | ULBWP.0.1 | N/A |
| | Dedicated DL BWP | | | DLBWP.1.1 | N/A |
| | Dedicated UL BWP | | | ULBWP.1.1 | N/A |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | Not sent |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | - |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | - |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | 120 |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | N/A |
| TCI configuration | | | Config 1 | CSI-RS.Config.0 | N/A |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | | -99.03 + TT | -99.03 + TT |
| $N_{oc}$ Note2 | | dBm/SCS Note4 | Config 1 | -90 + TT | -90 + TT |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 + TT | -93 + TT |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1 | 3 + TT | -3 + TT |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1 | 3 + TT | -3 + TT |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -56.25 + TT | -59.25 + TT |
| Propagation Condition | | | Config 1 | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone |
| Note 7: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation |

The UE shall report the CGI of cell 2 within 25*Tsmtc + 6*Tsi-rnti+20ms +2ms= 762ms from the start of T2, allow 765ms. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 775 ms the number of interrupted slots shall not exceed the allowed number as defined in clause 8.2.2.2.14 in TS 38.133 [6].

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.6 L1-SINR measurement for beam reporting

### 7.6.6.0 Minimum conformance requirements

#### 7.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 5.6.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

#### 7.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 5.6.5.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.3, 9.8.4.2 and 9.8.5.

#### 7.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 5.6.5.0.3

The normative reference for this requirement is TS 38.133 [6] clauses 99.8.3, 9.8.4.3 and 9.8.5.

### 7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

#### 7.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

#### 7.6.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting L1-SINR measurement.

#### 7.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.1.

#### 7.6.6.1.4 Test description

##### 7.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.1.4.1-1.

**Table 7.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Config | Description |
|---|---|
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS configuration | 1 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | Off |
| reportConfigType | 1 | | aperiodic |
| reportQuantity | 1 | | cri-SINR |
| reportQuantity-r16 | 1 | | cri-SINR-r16 |
| Number of reported RS | 1 | | 2 |
| qcl-Info | 1 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1 | | 26 |
| Propagation condition | 1 | | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 7.6.6.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.6.1.5-1. T1 starts.

3. After 160ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.1.5-2 or the UE fails to report the

measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

-R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.1.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.6.1.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC |

**Table 7.6.6.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

#### 7.6.6.1.5 Test requirement

Table 7.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.6.1.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based L1-SINR measurement in non-DRX**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Angle of arrival configuration | 1 | | Setup 1 according to A.9.1 | |
| Beam assumption Note 3 | 1 | | Rough | |
| $N_{oc}$ Note1 | 1 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note3 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 160ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.1.5-2 the corresponding relative accuracy requirements in Table 7.6.6.1.5-3.

**Table 7.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 51 |
| Highest reported value (CSI-RS#1) | 74 |

**Table 7.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values R3**

| | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS#0) | 4 |
| Highest DIFF SINR reported (CSI-RS#0) | 13 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

#### 7.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

#### 7.6.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, supporting long DRX cycle and L1-SINR measurement.

#### 7.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.2.

#### 7.6.6.2.4 Test description

##### 7.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.2.4.1-1.

**Table 7.6.6.2.4.1-1: Applicable NR configurations for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.6.2.4.1-2: General test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| CSI-IM configuration | 1~2 | | CSI-IM.3.1 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| DRX configuration | 1~2 | | DRX.3 |
| reportConfigType | 1~2 | | periodic |
| reportQuantity-r16 | 1~2 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| L1-SINR reporting period | 1~2 | slot | 640 |
| T1 | 1~2 | s | 5 |

| | | | |
|---|---|---|---|
| T2 | 1~2 | s | 2 |
| Propagation condition | 1~2 | | AWGN |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.6.2.4-3: Test Environment parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 7.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.6.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirements for SSB#1 Table 7.6.6.2.5-2 for all test configurations. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit L1-SINR reports every 640 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

-R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF-SINR value of SSB#0 reported by the UE is compared to the expected DIFF-SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.6.2.4.3-1: Common Exception messages for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-4 with condition PERIODIC<br>Table H.3.7-1 with condition DRX.3<br>Table H.3.4-1 |

**Table 7.6.6.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |

| | | | |
|---|---|---|---|
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

7.6.6.2.5 Test requirement

Table 7.6.6.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.6.2.5-1: SSB specific test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | | | |
| Beam assumption Note 4 | 1~2 | | Rough | | | |
| $N_{oc}$ Note2 | 1~2 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -96 | | | |
| | 2 | | -93 | | | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 2 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -64 | -64 | -67 | -57.5 |
| | 2 | | -64 | -64 | -67 | -57.5 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 0 | 0 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations.

**Table 7.6.6.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations R1 and R3**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 53 |
| Highest reported value (SSB#1) | - | 72 |

**Table 7.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations R4**

| | T1 | T2 |
|---|---|---|
| Lowest DIFF SINR reported (SSB#0) | - | 5 |
| Highest DIFF SINR reported (SSB#0) | - | 12 |

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

### 7.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

### 7.6.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting long DRX cycle and L1-SINR measurement.

### 7.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.3.

### 7.6.6.3.4 Test description

#### 7.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.3.4.1-1.

**Table 7.6.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 7.6.6.3.4.1-2: General test parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS as CMR configuration | 1 | | CSI-RS.3.3 TDD |
| CSI-RS as IMR configuration | 1 | | CSI-RS.3.2A TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | DRX.3 |
| reportConfigType | 1 | | aperiodic |
| reportQuantity-r16 | 1 | | cri-SINR-r16 |
| Number of reported RS | 1 | | 2 |
| qcl-Info | 1 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1 | | 26 |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 7.6.6.3.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.6.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

### 7.6.6.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.6.3.5-1. T1 starts.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.3.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 7.6.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.6.3.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions CSI-RS and APERIODIC<br>Table H.3.6A-3 with conditions APERIODIC<br>Table H.3.7-1 with condition DRX.3<br>Table H.3.4-1 |

**Table 7.6.6.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| } | | | |
| } | | | |

7.6.6.3.5 Test requirement

Table 7.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.6.3.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based CMR and CSI-RS based IMR L1-SINR measurement**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 1.5 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -94.5 | -87.0 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.2 | -57.5 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 1.5 | 9 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 1440ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.3.5-2 the corresponding relative accuracy requirements in Table 7.6.6.3.5-3.

**Table 7.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values R2**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 54 |
| Highest reported value (CSI-RS#1) | 71 |

**Table 7.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values R3**

| | T1 |
|---|---|
| Lowest DIFF SINR reported (CSI-RS#0) | 4 |
| Highest DIFF SINR reported (CSI-RS#0) | 10 |

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 7.6.7 to 7.6.12

# 7.6.13 UE Rx-Tx time difference measurements for PDC

## 7.6.13.0 Minimum conformance requirements

### 7.6.13.0.1 PRS based UE Rx-Tx time difference for propagation delay compensation

When UE is configured with *prs-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [13] and provided with PRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_PRS}$, where:

$$T_{UERxTx,PRS} = \left\lceil \frac{N_{PRS}^{slot}}{N'} \right\rceil * N_{sample} * K_{layer3} * LCM(T_{PRS}, T_{DRX})$$

Where:

$N_{PRS}^{slot}$ is the maximum number of DL PRS resources configured in a slot,

N′ is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumberPRS-ResourceProcessedPerSlot-r17* as specified in TS38.331 [13],

$N_{sample}$ is the number of UE Rx-Tx time difference measurement samples and $N_{sample}$ = 4,

$T_{PRS}$ is the PRS resource periodicity specific for RTT-based propagation delay compensation,

$T_{DRX}$ is the DRX cycle length when DRX is in use, 1ms otherwise.

$K_{layer3}$ is

$N_{total}$ / $N_{available}$, when $N_{available}$>0

Where,

- For a window W of duration LCM($T_{PRS}$, MGRP_max, $T_{SMTC}$), where $T_{SMTC}$ is the periodicity of SMTC for intra-frequency measurement without gap, and MGRP_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as the PDC PRS for UE

supporting *concurrentMeasGap-r17*, or is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as the PDC PRS for UE not supporting *concurrentMeasGap-r17*,starting at the beginning of any PRS resource occasion:

- $N_{total}$ is the total number of PRS resource occasions within the window W, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{available}$ is the number of PRS resource occasions that are not overlapped with:
  - For FR2: any measurement gap occasions nor any SMTC occasions within window W. And for a UE supporting *concurrentMeasGap-r17* after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 nor any SMTC occasions within the window W.

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on PRS within the active DL BWP.

When UE is configured to perform UE Rx-Tx time difference measurement based on PRS, the requirements apply provided that the SCS of the PRS is same as that of the active BWP on PCell.

For FR2, the requirements apply if QCL information is provided for all the PRS resources in the resource set and for each resource one RS has QCL-TypeD.

If PRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the measurement report mapping requirements specified in clause 10.1.25.3, with k = 5.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

**Table 7.6.13.0.1-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

| Reported Quantity Value | Measured Quantity Value | Unit |
|---|---|---|
| RX-TX_TIME_DIFFERENCE_0000 | $T_{UE\ Rx-Tx} < -985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001 | $-985024 \le T_{UE\ Rx-Tx} < -984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002 | $-984992 \le T_{UE\ Rx-Tx} < -984960$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_30782 | $-32 \le T_{UE\ Rx-Tx} < 0$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_30783 | $0 \le T_{UE\ Rx-Tx} < 32$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_61563 | $984960 \le T_{UE\ Rx-Tx} < 984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61564 | $984992 \le T_{UE\ Rx-Tx} < 985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565 | $985024 \le T_{UE\ Rx-Tx}$ | $T_c$ |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC DL PRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 7.6.13.0.1-2 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 7.6.13.0.1-2: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

| Accuracy | Conditions | | | | | |
|---|---|---|---|---|---|---|
| | PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition $(T_{\text{rep}}^{\text{PRS}} * L_{\text{PRS}} / K_{\text{comb}}^{\text{PRS}}$ Note 3 | Io Note 4 range | |
| | | | | | Minimum Io Note 1 | Maximum Io |
| Tc Note 5 | dB | RB | kHz | | dBm / $SCS_{PRS}$ | dBm/$BW_{Channel}$ |
| ± [22+δ+ε] | -3 | ≥[24] | 60 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [15+δ+ε] | | ≥[64] | | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+δ+ε] | | ≥[132] | | ≥[1] | NOTE 6 | NOTE 6 |
| ± [12+δ+ε] | | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [7+δ+ε] | | ≥[64] | | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+δ+ε] | | ≥[128] | | ≥[1] | NOTE 6 | NOTE 6 |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: $T_{\text{rep}}^{\text{PRS}}$, $L_{\text{PRS}}$, $K_{\text{comb}}^{\text{PRS}}$ are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined in TS 37.355 [34].
NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.
NOTE 5: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 7: δ is the margin determined from Table 10.1.39.2-4.
NOTE 8: ε is the margin for reporting quantitization error and ε=16 Tc.

**Table 7.6.13.0.1-3: Margin for UE Rx-Tx time difference measurement accuracy in FR2**

| Min(PRS BW, SRS BW) (MHz) | | Margin (Tc Note 1) |
|---|---|---|
| SCS = 60 kHz | SCS = 120 kHz | |
| ≥ 24 | N/A | 76 |
| ≥ 64 | ≥ 32 | 32 |
| ≥ 132 | ≥ 64 | 24 |
| N/A | ≥ 128 | 20 |

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

### 7.6.13.0.2 TRS based UE Rx-Tx time difference for propagation delay compensation

When UE is configured with *csi-RS-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [13] and provided with TRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx\text{-}Tx_TRS}$, where:

$$T_{UERxTx,TRS} = N_{sample} * K_{layer3} * LCM(T_{TRS}, T_{DRX})$$

Where

$N_{sample}$ is the number of UE Rx-Tx time difference measurement samples and $N_{sample}$ is 4,

$T_{TRS}$ is the TRS resource periodicity specific for RTT-based propagation delay compensation,

$T_{DRX}$ is the DRX cycle length when DRX is in use, 1ms otherwise.

$K_{layer3}$ is

$N_{total}$ / $N_{available}$ when $N_{available}$>0

Where,

- For a window W of duration LCM($T_{TRS}$, MGRP_max, $T_{SMTC}$) and starting at the beginning of any TRS resource occasion, where $T_{SMTC}$ is the periodicity of SMTC for intra-frequency measurement without gap and MGRP_max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as PCell for a UE that support *concurrentMeasGap-r17* and is configured with concurrent measurement gaps, otherwise MGRP_max is the MGRP of configured per-UE measurement gap or per-FR measurement gap within the same FR as PCell:
  - $N_{total}$ is the total number of TRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of TRS resource occasions that are not overlapped with
    - For FR2: any measurement gap occasions nor any SMTC occasions within window W. And for a UE supporting *concurrentMeasGap-r17* after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3 nor any SMTC occasions within the window W.

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on TRS within the active DL BWP. When UE is configured to perform UE Rx-Tx time difference measurement based on TRS, the requirements apply provided that the SCS of the TRS is same as that of the active BWP on PCell.

For FR2, the requirements apply if QCL information is provided for all the TRS resources in the resource set and for each resource one RS has QCL-TypeD.

If TRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the

measurement report mapping requirements specified in clause TS 38.133 [6] 10.1.25.3, with k = 5.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

**Table 7.6.13.0.2-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

| Reported Quantity Value | Measured Quantity Value | Unit |
|---|---|---|
| RX-TX_TIME_DIFFERENCE_0000 | $T_{UE\ Rx-Tx} < -985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0001 | $-985024 \le T_{UE\ Rx-Tx} < -984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_0002 | $-984992 \le T_{UE\ Rx-Tx} < -984960$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_30782 | $-32 \le T_{UE\ Rx-Tx} < 0$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_30783 | $0 \le T_{UE\ Rx-Tx} < 32$ | $T_c$ |
| … | … | … |
| RX-TX_TIME_DIFFERENCE_61563 | $984960 \le T_{UE\ Rx-Tx} < 984992$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61564 | $984992 \le T_{UE\ Rx-Tx} < 985024$ | $T_c$ |
| RX-TX_TIME_DIFFERENCE_61565 | $985024 \le T_{UE\ Rx-Tx}$ | $T_c$ |

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

- $N_{TA_offset}$ defined in TS 38.133 [6] Table 7.1.2-2 changes during the UE Rx-Tx measurement period or
- if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC TRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in 7.6.13.0.2-2 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to TS 38.133 [6] Annex B.2.13 for a corresponding Band.

AWGN propagation condition.

**Table 7.6.13.0.2-2: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

| Accuracy | Conditions | | | | |
|---|---|---|---|---|---|
| | TRS Ês/Iot | Minimum TRS bandwidth | TRS SCS | Io[Note 3] range | |
| | | | | Minimum Io[Note 1] | Maximum Io |
| Tc[Note 4] | dB | RB | kHz | dBm / $SCS_{TRS}$ | dBm/$BW_{Channel}$ |
| [29+δ+ε] | -3 | ≥[24] | 60 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [14+δ+ε] | | ≥[64] | | NOTE 5 | NOTE 5 |
| [7+δ+ε] | | ≥[132] | | NOTE 5 | NOTE 5 |
| [15+δ+ε] | | ≥[32] | 120 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [7+δ+ε] | | ≥[64] | | NOTE 5 | NOTE 5 |
| [4+δ+ε] | | ≥[128] | | NOTE 5 | NOTE 5 |

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: The Io is defined in TRS slots. The same Io range applies to TRS and non-TRS symbols. Io levels are different in TRS and non-TRS symbols within the same slot.
NOTE 4: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the TRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 6: δ is the margin determined from Table 10.1.39.3-4.
NOTE 7: ε is the margin for reporting quantitization error and ε=16 Tc.

**Table 7.6.13.0.2-3: Margin for UE Rx-Tx time difference measurement accuracy in FR2**

| Min(TRS BW, SRS BW) (MHz) | | Margin (Tc [Note 1]) |
|---|---|---|
| SCS = 60 kHz | SCS = 120 kHz | |
| ≥ 24 | N/A | 76 |
| ≥ 64 | ≥ 32 | 32 |
| ≥ 132 | ≥ 64 | 24 |
| N/A | ≥ 128 | 20 |

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: If SRS and TRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

## 7.6.13.1 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using PRS

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

#### 7.6.13.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.1 in AWGN propagation condition in FR2 in standalone scenario.

#### 7.6.13.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-PRS-r17 or gNB-SideRTT-BasedPDC-r17.*

#### 7.6.13.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.13.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.1, 9.12.5, 10.1.39.2 and A.7.6.13.1.

#### 7.6.13.1.4 Test description

##### 7.6.13.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.13.1.4.1-1

**Table 7.6.13.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.13.1-1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 7.6.13.1.4.1-2.

**Table 7.6.13.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for SA FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.13.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.13.1.4.1-3.
2. Message contents are defined in clause 7.6.13.1.4.3.
3. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.13.1.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value |
|---|---|---|---|
| Active cell | | 1 | Cell 1 |
| RF Channel Number | | 1 | 1 |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 |
| SSB configuration | | 1 | SSB.2 FR2 |
| SMTC configuration | | 1 | SMTC.1 |

| | | | |
|---|---|---|---|
| Measurement gap | | 1 | GP#24 or GP#13 Note 1 |
| CP length | | 1 | Normal |
| DRX | | 1 | OFF |
| T1 | s | 1 | 5 |
| T2 | s | 1 | 20 |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | |

#### 7.6.13.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. The Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

The *MeasObjectRxTxDiff-r17* is configured with *prs-Ref-r17*, *measObject* with *measObjectRxTxDiff-r17*, and *NR-DL-PRS-PDC-Info* is defined ~~in~~ as per 7.6.13.1.4.3 and shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE $\Delta T$ ms before the start of T2, where $\Delta T$ = [TBD] ms. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 7.6.13.1.4.1-3 and Table 7.6.13.1.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.13.1.5-1 as appropriate.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.13.1.5-1. T2 starts.
6. The UE shall transmit periodically MeasurementReport messages.
7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. The result-k5 value is outside the limits in Table 7.6.13.0.1-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 7.6.13.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

| **Default Message Contents** | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76B in 38.508-1 [14] with condition PRS_REF |
| Specific message contents exceptions for Test Configuration 7.6.13.1-1 | Table 4.6.3-84AC in 38.508-1 [14] with condition SCS120 |

7.6.13.1.5 Test requirements

Table 7.6.13.1.4.1-3 and Table 7.6.13.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR2 SA.

**Table 7.6.13.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | 1 | Setup 1 as specified in clause A.9.1 | |
| Beam Assumption Note 4 | | 1 | Rough | |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| TRS Configuration | | 1 | TRS.2.1 TDD | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| PRS configuration | | 1 | PRS.1.1 FR2 | |
| PRS muting info | | 1 | '10' | |
| SRS configuration | | 1 | PDC-SRS.3 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -89 | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | |
| PRS $\hat{E}_s / I_{ot}$ | dB | 1 | -Infinity | -2.41 |
| PRS $\hat{E}_s / N_{oc}$ | dB | 1 | -Infinity | -2 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 |
| Propagation Condition | | 1 | AWGN | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.6.13.1.5-2: SRS Configuration for FR2 Propagation Delay Compensation**

| | PDC-SRS.3 | |
|---|---|---|
| **Field** | | **Comment** |
| c-SRS | Same as NRB,c in the test case | |
| b-SRS | 0 | |
| b-hop | 0 | Frequency hopping is disabled |

| | | |
|---|---|---|
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| pathlossReferenceRS ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 | |
| startPosition | 5 | resourceMapping setting |
| nrofSymbols | 4 | |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n4 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | |
| periodicityAndOffset-p | Sl1280, 160 | SRS transmission periodicity |

The UE Rx-Tx time difference measurement time shall fulfils the requirements specified in clause 7.6.13.0.1. The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1, for k=5.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 7.6.13.0.1 for Cell 1.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.13.2 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using TRS

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3

### 7.6.13.2.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.2 for measurement delay and clause 10.1.39.2 for measurement accuracy in AWGN propagation condition in FR2 in standalone scenario.

### 7.6.13.2.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-CSI-RS-ForTracking-r17 or gNB-SideRTT-BasedPDC-r17*.

### 7.6.13.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.13.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.2, 9.12.5, 10.1.39.3 and A.7.6.13.2.

### 7.6.13.2.4 Test description

#### 7.6.13.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.13.2.4.1-1

**Table 7.6.13.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.13.2-1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 7.6.13.2.4.1-2.

**Table 7.6.13.2.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for SA FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.13.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.13.2.4.1-3.
2. Message contents are defined in clause 7.6.13.2.4.3.
3. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I

**Table 7.6.13.2.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value |
|---|---|---|---|
| Active cell | | 1 | Cell 1 |
| RF Channel Number | | 1 | 1 |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 |
| SSB configuration | | 1 | SSB.2 FR2 |
| SMTC configuration | | 1 | SMTC.1 |
| Measurement gap | | 1 | GP#24 or GP#13 Note 1 |
| CP length | | 1 | Normal |
| DRX | | 1 | OFF |
| T1 | s | 1 | 5 |
| T2 | s | 1 | 20 |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | |

### 7.6.13.2.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 does not have TRS transmission during T1 and transmits TRS during T2.

The measurement control information with *MeasObjectRxTxDiff* set to 'csi-RS-Ref' as defined in clause 7.6.13.2.4.3 shall be provided to the UE during T1. The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [10] ms is the maximum processing time of the measurement request. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 7.6.13.2.4.1-3 and Table 7.6.13.2.5-1, respectively. The test consists of two sub-tests with different TRS BW.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.13.2.5-1 as appropriate.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.13.2.5-1. T2 starts.
6. The UE shall transmit periodically MeasurementReport messages.
7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. The result-k5 value is outside the limits in Table 7.6.13.0.2-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 7.6.13.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

| **Default Message Contents** | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 4.6.3-76B in 38.508-1 [14] with condition CSI-RS_REF |

### 7.6.13.2.5 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in 7.6.13.0.2

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.39.3.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified [in clause 10.1.25.3.1, for k=5].

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

Table 7.6.13.2.4.1-3 and Table 7.6.13.2.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR2 SA.

**Table A.7.6.13.2.5-1: Cell specific test parameters**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| AoA setup | | 1 | Setup 1 as specified in clause A.9.1 | |

| | | | | |
|---|---|---|---|---|
| Beam Assumption Note 7 | | 1 | Rough | |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| TRS Configuration | | 1 | TRS.2.1 TDD | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| SRS configuration | | 1 | PDC-SRS.3 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -89 + TT | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 + TT | |
| TRS $\hat{E}_s/I_{ot}$ | dB | 1 | -Infinity | -2.41 + TT |
| TRS $\hat{E}_s/N_{oc}$ | dB | 1 | -Infinity | -2 + TT |
| TRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 + TT |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 + TT |
| Propagation Condition | | 1 | AWGN | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: TRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: TRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.6.13.2.5-2: SRS Configuration for FR2 Propagation Delay Compensation**

| | **PDC-SRS.3** | |
|---|---|---|
| **Field** | | **Comment** |
| c-SRS | Same as NRB,c in the test case | |
| b-SRS | 0 | |
| b-hop | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| pathlossReferenceRS ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | usagePDC-r17 | |

| | | |
|---|---|---|
| startPosition | 5 | resourceMapping setting |
| nrofSymbols | 4 | |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n4 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | |
| periodicityAndOffset-p | Sl1280, 160 | SRS transmission periodicity |

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.14 SA event triggered reporting tests with Pre-MG

### 7.6.14.0 Minimum conformance requirements

#### 7.6.14.0.1 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

When a measurement gap is provided or an activated Pre-MG is provided without any pre-MG status changed during the measurement period, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2 with SCS smaller or equal to 480 kHz.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \quad ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 7.6.14.0.1-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.14.0.1-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS38.133[6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps or not supporting [concurrent measurement gaps]. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

-- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

$N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in TS38.133[6] section 9.1.8.3.

When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2-1 power class 1 or 5, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2-1 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-1 power class 4, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync\ with_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync\ with_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync\ with_gaps}$ = 36.

$M_{meas_period_with_gaps}$: For a UE supporting FR2-1 power class 1 or 5, $M_{meas_period_with_gaps}$ =40. For a UE supporting FR2-1 power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting FR2-1 power class 4, $M_{meas_period\ with_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{meas_period_with_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_with_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_with_gaps}$ = 36.

The UE shall be able to identify a new detectable intra-frequency cell within the time period specified in TS 38.133 [6].

For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated

The normative reference for this Intra-frequency measurements with measurement gaps requirement is in TS 38.133 [6] clauses 9.2.2, 9.2.4.3 and 9.2.6.

**Table 7.6.14.0.1-1: Time period for PSS/SSS detection (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil( $M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.<br>NOTE 2: $K_{FR}$ is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1. For FR2-2: KFR = 1 if the SCS of the SSB of the cell being detected is 120 kHz, KFR = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and KFR = 3 if the SCS of the SSB of the cell being detected is 960 kHz. | |

**Table 7.6.14.0.1-2: Measurement period for intra-frequency measurements with gaps(FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, ceil($M_{meas_period\ with_gaps}$ x $K_{gap}$ ) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) [Note 1] x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil( $M_{meas_period\ with_gaps}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer. | |

[TS 38.133 [6], clause 9.2.2]

The requirements in TS 38.133 [6] clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ as defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected. In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

## 7.6.14.1 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and autonomous activation/deactivation

- Editor's Note: This test case has been completed for the following configurations:
- Test frequency f ≤ 40.8 GHz
- UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.14.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event with autonomous activation/deactivation of Pre-MG. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

### 7.6.14.1.2 Test applicability

This test applies to all types of NR UEs supporting 5GS NR SA FR2, BWP adaptation of at least 2 BWPs, BWP operation without bandwidth restriction, DCI and timer-based active BWP switching delay Type1 or Type2, CSI-RS-based RLM *and preconfiguredUE-AutonomousMeasGap-r17* capability from release 17 onwards.

### 7.6.14.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.14.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.14.1.

7.6.14.1.4 Test description

7.6.14.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.14.1.4.1-1

**Table 7.6.14.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.14.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.14.1.4.1-2.

**Table 7.6.14.1.4.1-2: Initial conditions for SA event triggered reporting tests with Pre-MG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.14.1.4.1-3.
2. Message contents are defined in clause 7.6.14.1.4.3.
3. The AoA setup for this test is Setup 3 as defined in clause A.3.15.3. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.14.1.4.1-3: General test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | PCell (Cell 1) | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | SMTC.1 | |
| A4-Thresholds | dBm/SCS | -120 | |
| CP length | | Normal | |
| Hysteresis | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | |
| Gap Pattern Id | | 13 | |
| Measurement gap offset | ms | 39 | |
| Time offset between Cell 1 and Cell 2 | | 3 μs | Synchronous cells |
| T1 | s | 0.1 | |
| T2 | s | 0.2 | |
| T3 | s | 5 | |

7.6.14.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

There are two different UE-specific BWPs configured in Cell 1, BWP-1 which contains the cell defining SSB, and BWP-2 which does not contain any SSB of Cell 1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A4 is used.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 7.6.14.1.4.1-3, 7.6.14.1.5-1, and 7.6.14.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. SS shall transmit an *RRCReconfiguration* message which include with Measurement configuration and 2 different UE-specific bandwidth parts for Cell 1 (PCell), BWP-1 and BWP-2.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

   - Pre-MG status is assumed to be ‘deactivated’ when the BWP is active.

   - BWP-1 includes bandwidth of the initial DL BWP and SSB.

   - BWP-2 does not include bandwidth of the initial DL BWP and SSB.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending for those PDSCHs scheduled in the slots overlapped with the pre-MG occasions in T1.

6. When T1 expires, at the start of time duration T2, the serving gNB trigger Pre-MG activation starts via the DCI format 1_1 command for PCell DL BWP switch, is received at the UE side in PCell’s slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2. And UE is expected to complete the Pre-MG activation within the beginning of PCell’s DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

7. At the start of time duration T3, the SS shall switch the power setting from T2 to T3 as specified in Table 7.6.14.1.5-2.

8. The UE shall NOT be able to receive PDSCH and report corresponding ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

9. The UE shall transmit a *MeasurementReport* message triggered by Event A4. With the overall delays measured from the beginning of time period T3 is less than 3.20 ms for UE supporting power class 1,5, 1.92 ms for UE supporting power class 2, 3, and 4.

10. After the SS receive the *MeasurementReport* message in step 9 or when T3 expires, the SS shall:

    - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause

4.5),
Or
- if the device has been switched off, switcheson the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.14.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.14.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions GAP NEEDED<br>Table H.3.1-4AA with A4-offset = -120dB<br>Table H.3.1-5<br>Table H.3.1-6 with conditions Pattern #13, MGe and Pre-CFG<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 7.6.14.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | entry 1<br>BWP-1 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP-Id2 | entry 2<br>BWP-2 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 0 | Initial BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | entry 1<br>BWP-1 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP-Id2 | entry 2<br>BWP-2 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 7.6.14.1.4.3-3: *BWP-Downlink***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | BWP-Id1 |
| | 2 | | BWP-Id2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.6 | | BWP-Id1 |

| | | | |
|---|---|---|---|
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.5 | | BWP-Id2 |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.14.1.4.3-4: *BWP-Uplink***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | BWP-Id1 |
| | 2 | | BWP-Id2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.6 | | BWP-Id1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.5 | | BWP-Id2 |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.14.1.4.3-5: *PDSCH-TimeDomainResourceAllocationList***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 3 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in TS 38.133 [6], Table 8.6.2-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | S=2, L=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | S=2, L=12 | |
| } | | | |
| } | | | |

**Table 7.6.14.1.4.3-6: *MeasObjectNR***

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells, NOT SS-SINR and MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 2 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.14.1.5 Test requirements

Table 7.6.14.1.4.1-3, 7.6.14.1.5-1, and Table 7.6.14.1.5-2 defines the primary level settings for all tests.

**Table 7.6.14.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 24 | | | 24 | | |
| Initial BWP configuration | | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| BWP-1 Configuration | | DLBWP.1.6 ULBWP.1.6 | | | N/A | | |
| BWP-2 Configuration | | DLBWP.1.5 ULBWP.1.5 | | | N/A | | |
| RLM-RS | | CSI-RS | | | N/A | | |
| PDSCH RMC configuration | | SR.3.2 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | CR.3.1 TDD | | | N/A | | |
| Dedicated CORESET RMC configuration | | CCR.3.1 TDD | | | N/A | | |
| TRS configuration | | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI states | | TCI.State.2 | | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | 120 | | |
| OCNG Patterns | | OP.5 | | | N/A | | |
| cellIndividualOffset | dB | N/A | | | 16 | | |
| SSB | | SSB.3 FR2 | | | SSB.7 FR2 | | |
| Propagation Condition | | No external noise (Note 1) | | | No external noise (Note 1) | | |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | | | | | | |

**Table 7.6.14.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 defined in A.3.15.3 | | | | | |

| | | AoA1 | | | AoA2 | | |
|---|---|---|---|---|---|---|---|
| Beam assumption Note 3 | | Rough | | | Rough | | |
| $E_s$ | dBm/SCS | -89 | -89 | -89 | -infinity | -Infinity | -89 |
| $\hat{E}_s / I_{ot}$ BB Note 4 | dB | -0.12 | -0.12 | -0.12 | -Infinity | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | -89 | -89 | -89 | -infinity | -Infinity | -89 |
| *Io* | dBm/95.04M Hz | -64.41 | -64.41 | -64.41 | -Infinity | -Infinity | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | Defined in Figure 7.6.1.1.1-1 | | | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

During T1, the UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

During T2 and T3, the UE shall not report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions, starting from the 1st complete Pre-MG occasion after the beginning of PCell's DL slot ($i+T_{BWPswitchDelay}$) + 5ms as defined in TS 38.133 [6] clause 8.19.2.

The UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than Y ms from the beginning of time period T3, where Y is

- 3.2s for a UE supporting power class 1 and 5,
- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.14.2 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.14.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event with network-controlled activation/deactivation of Pre-MG. This test will partly verify the TDD intra-frequency cell search requirements in 38.133 [6] clause 9.2.6.2 and 9.2.6.3.

#### 7.6.14.2.2 Test applicability

This test applies to all types of NR UEs supporting 5GS NR SA FR1, BWP adaptation of at least 2 BWPs, BWP operation without bandwidth restriction, DCI and timer-based active BWP switching delay Type1 or Type2, CSI-RS-based RLM *and* *preconfiguredNW-ControlledMeasGap-r17* capability from release 17 onwards.

#### 7.6.14.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.14.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.14.2.

#### 7.6.14.2.4 Test description

##### 7.6.14.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.14.2.4-1.

**Table 7.6.14.2.4.1-1: supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.14.2.4.1-2.

**Table 7.6.14.2.4.1-2: Initial conditions for SA event triggered reporting tests with Pre-MG**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.14.2.4.1-3.
2. Message contents are defined in clause 7.6.14.2.4.3.
3. There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell.
4. The AoA setup for this test is Setup 3 as defined in clause A.3.15.3. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.14.2.4.1-3: General test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | PCell (Cell 1) | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | SMTC.1 | |
| A3-Offset | dB | -11 | |
| CP length | | Normal | |
| Hysteresis | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |

| | | | |
|---|---|---|---|
| DRX | | OFF | |
| Gap Pattern Id | | 13 | |
| Measurement gap offset | ms | 39 | |
| Time offset between Cell 1 and Cell 2 | | 3 μs | Synchronous cells |
| T1 | s | 0.1 | |
| T2 | s | 0.2 | |
| T3 | s | 5 | |

#### 7.6.14.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2 and T3, respectively.

There are two BWPs configured in Cell 1, BWP-1 which contains the cell defining SSB, and BWP-2 which does not contain any SSB of Cell 1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1.

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. A pre-MG is configured before the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.14.2.4.1-3 and Table 7.6.14.2.5-1 and Table 7.6.14.2.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. SS shall transmit an *RRCReconfiguration* message which include with Measurement configuration and 2 different UE-specific bandwidth parts for Cell 1 (PCell), BWP-1 and BWP-2.

   - UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

   - Pre-MG status is assumed to be ‘deactivated’ when the BWP is active.

   - BWP-1 includes bandwidth of the initial DL BWP and SSB with preConfGapStatus for BWP-1 is set to ‘0’ as ‘deactivated’.

   - BWP-2 does not include bandwidth of the initial DL BWP and SSB with preConfGapStatus for BWP-2 is set to ‘1’ as ‘activated’.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending for those PDSCHs scheduled in the slots overlapped with the pre-MG occasions in T1.

6. When T1 expires, at the start of time duration T2, the serving gNB trigger Pre-MG activation starts via the DCI format 1-1 command for PCell DL BWP switch, is received at the UE side in PCell’s slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2. And UE is expected to complete the Pre-MG activation within the beginning of PCell’s DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

7. The UE shall NOT be able to receive PDSCH and report corresponding ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

8. At the start of time duration T3, the SS shall switch the power setting from T2 to T3 as specified in Table 7.6.14.2.5-2., the serving gNB trigger Pre-MG deactivation via the DCI format 1-1 command for PCell DL BWP switch, is received at the UE side in PCell’s slot # denoted i. The UE shall switch its bandwidth part from BWP-2 to BWP-1. And UE is expected to complete the Pre-MG dectivation within the beginning of PCell’s DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2.

9. The UE shall be able to receive PDSCH and report corresponding ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions.

10. The UE shall transmit a *MeasurementReport* message triggered by Event A3. With the overall delays measured from the beginning of time period T3 is less than 962 ms.

11. After the SS receive the *MeasurementReport* message in step 10 or when T3 expires, the SS shall:

    - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

12. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

13. Depending on the choice in Step 11, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    Or
    - if the device has been switched off, switcheson the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

14. Repeat step 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.14.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.14.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions GAP NEEDED<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-6 with conditions Pattern #13, MGe and Pre-CFG<br>Table H.3.1-7 with condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 7.6.14.2.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | entry 1<br>BWP-1 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP-Id2 | entry 2<br>BWP-2 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 0 | Initial BWP | |
| uplinkConfig SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | entry 1 BWP-1 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP-Id2 | entry 2 BWP-2 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP1 | |
| } | | | |
| } | | | |

**Table 7.6.14.2.4.3-3: *BWP-DownlinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-DownlinkDedicated ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] { | BWP-1 | DLBWP.1.6 configuration | |
| EXTENSION { | | | |
| preConfGapStatus-r17 | 00000000 | | |
| } | | | |
| } | | | |
| BWP-Downlink[2] { | BWP-2 | DLBWP.1.5 configuration | |
| EXTENSION { | | | |
| preConfGapStatus-r17 | 10000000 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.14.2.5 Test requirement

Table 7.6.14.2.4.1-3, 7.6.14.2.5-1, and Table 7.6.14.2.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.6.14.2.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| **Parameter** | **Unit** | **Cell 1** | | | **Cell 2** | | |
|---|---|---|---|---|---|---|---|
| | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 24 | | | 24 | | |
| Initial BWP configuration | | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| BWP-1 Configuration | | DLBWP.1.6 ULBWP.1.6 | | | N/A | | |
| BWP-2 Configuration | | DLBWP.1.5 ULBWP.1.5 | | | N/A | | |
| RLM-RS | | CSI-RS | | | N/A | | |
| PDSCH RMC configuration | | SR.3.2 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | CR.3.1 TDD | | | N/A | | |
| Dedicated CORESET RMC configuration | | CCR.3.1 TDD | | | N/A | | |
| TRS configuration | | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI states | | TCI.State.2 | | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | 120 | | |
| OCNG Patterns | | OP.5 | | | N/A | | |
| cellIndividualOffset | dB | N/A | | | 16 | | |

| SSB | | SSB.3 FR2 | SSB.7 FR2 |
|---|---|---|---|
| Propagation Condition | | No external noise (Note 1) | No external noise (Note 1) |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] | | | |

**Table.7.6.14.2.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting with network-controlled activation/deactivation of Pre-MG**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 defined in A.3.15.3 | | | | | |
| | | AoA1 | | | AoA2 | | |
| Beam assumption Note 3 | | Rough | | | Rough | | |
| $E_S$ | dBm/SCS | -89 | -89 | -89 | -infinity | -infinity | -89 |
| $\hat{E}_s/I_{ot}$ BB Note 4 | dB | -0.12 | -0.12 | -0.12 | -Infinity | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | -89 | -89 | -89 | -infinity | -infinity | -89 |
| *Io* | dBm/95.04MHz | -64.41 | -64.41 | -64.41 | -Infinity | -Infinity | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | Defined in Figure A.7.6.1.1.1-1 | | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

During T1,

The UE shall report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions. (BWP-1)

During T2,

The UE is expected to complete the Pre-MG activation within the beginning of PCell's DL slot (i+TBWPswitchDelay) + 5ms in T2 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2. (BWP-1 -> BWP-2)

During T3,

The UE is expected to complete the Pre-MG deactivation within the beginning of PCell's DL slot (i+TBWPswitchDelay) + 5ms in T3 as defined in TS 38.133 [6] clause 8.6.2 and clause 8.19.2. (BWP-2 -> BWP-1)

The UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots overlapped with the Pre-MG occasions after BWP switch complete.

The UE shall send one Event A3 triggered measurement report, with an overall measurement reporting delay less than X ms from the beginning of time period T3, where X is

- 1.6s for a UE supporting power class 1 and 5,
- 0.96s for a UE supporting power class 2, 3 and 4

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

$T_{PSS/SSS_sync_intra}$ = 960 ms

$T_{SSB_measurement_period_intra}$ = 960 ms

TTI insertion uncertainty = 2 ms

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

Note: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.15 SA event triggered reporting tests with concurrent gaps

### 7.6.15.0 Minimum conformance requirements

#### 7.6.15.0.1 Minimum conformance requirements for Intra-frequency measurement

The UE shall be able to identify a new detectable intra-frequency cell within the time period specified in TS 38.133 [6].

Intra-frequency measurements without measurement gaps:

When UE supports concurrentMeasGap-r17 and is configured with concurrent measurement gaps,

For FR2, $K_{layer1_measurement}$ is scaling factor for sharing between L3 and L1 measurement.

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.3, 9.2.5 and 9.2.6.

#### 7.6.15.0.2 Minimum conformance requirements for Inter-frequency measurement

The UE shall be able to identify a new detectable inter-frequency cell within the time period specified in TS 38.133 [6].

Inter-frequency measurements without measurement gaps:

When UE supports concurrentMeasGap-r17 and is configured with concurrent measurement gaps,

For FR2, $K_{layer1_measurement}$ is scaling factor for sharing between L3 and L1 measurement.

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by inter-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by inter-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3, 9.3.9.

#### 7.6.15.0.3 Minimum conformance requirements for PRS measurement

When physical layer receives last of *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message from LMF via LPP [37], the UE shall be able to measure multiple (up to the UE capability specified in TS 38.133 [6] clause 9.9.3.3) PRS-RSRP measurements, defined in TS 38.215 [10].

During the measurement period defined in TS 38.133 [6] clause 9.9.3.5, $K_{p,PRS,i}$ is a scaling factor for a positioning frequency layer to be measured within the associated measurement gap pattern, which is defined as $K_{p,PRS,i} = N_{total} / N_{available}$ for UE configured with concurrent measurement gap, and $K_{p,PRS,i} = 1$ for UE not configured with concurrent measurement gap.

- For a window W of duration max($T_{PRS,i}$, MGRP_max), where $T_{PRS,i}$ is the maximum PRS resource periodicity among all PRS resources in positioning frequency layer i , and where MGRP_max is the maximum MGRP across all configured per-UE MG and per-FR MG within the same FR as the positioining frequency layer, and starting at the beginning of any associated gap occasions covering the PRS occasion:
  - $N_{total}$ is the total number of associated gap occasions covering PRS occasions within the window, including both dropped and non-dropped instances of the associated measurement gap within the window, and
  - $N_{available}$ is the number of non-dropped associated gap occasions covering PRS occasions within the window W, after further accounting for MG collisions by applying the selected gap collision rule
  - Requirements do not apply if $N_{available}$ =0.

The normative reference for this requirement is TS 38.133 [6] clause 9.9.3.

### 7.6.15.1 NR SA FR2 event triggered reporting tests with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

#### 7.6.15.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

#### 7.6.15.1.2 Test applicability

his test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

#### 7.6.15.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.15.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.15.1.

#### 7.6.15.1.4 Test description

##### 7.6.15.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.15.1.4.1-1

**Table 7.6.15.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.15.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.15.1.4.1-2.

**Table 7.6.15.1.4.1-2: Initial conditions for SA inter-frequency event triggered reporting for FR2 with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.15.1.4.1-3.
2. Message contents are defined in clause 7.6.15.1.4.3.
3. There are three NR carriers and three cells specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.15.1.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR2 with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2, 3 | Three FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 and 3 | NR cell 2 is on NR RF channel number 2. NR cell 3 is on NR RF channel number 3. |
| Gap Pattern Id | | Config 1 | 14 for both gaps | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 79 for MG#1<br>19 for MG#2 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 and 3 measurement object |
| A3-Offset | dB | Config 1 | -11 | |

| | | | | |
|---|---|---|---|---|
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Cell 2 and 3 are synchronous cells to cell 1. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 10.4 for PC1; 6.5 for other PC | |

#### 7.6.15.1.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR2 on NR RF channel 1, NR cell 2 as neighbour cell in FR2 on NR RF channel 2, and NR cell 3 as neighbour cell in FR2 on NR RF channel 3. The test parameters and configurations are given in Tables 7.6.15.1.4.1-1, 7.6.15.1.4.1-2, and 7.6.15.1.5-1.

Two measurement gaps with pattern configuration # 14 as defined in Table 7.6.15.1.4-3 are provided for UE. The measurement object for NR RF channel 2 is associated with MG#1, and measurement object for NR RF channel 3 is associated with MG#2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 or NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.15.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.15.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell 2 and Cell 3's overall delays measured from the beginning of time period T2 is less than 10240 ms for UE supporting power class 1 and 6400 ms for UE supporting other power class, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR

- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.15.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.15.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with conditions INTER-FREQ MO, MGe and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Cell 3 | Table H.3.1-3 with conditions INTER-FREQ MO, MGe and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.6.15.1.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 with condition INTER-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |

**Table 7.6.15.1.4.3-3: *MeasGapConfig***

| Derivation Path: Table H.3.1-6 with condition MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 SEQUENCE{ | 2 entries | | |
| GapConfig-r17[1] SEQUENCE{ | | entry 1 | |
| measGapId-r17 | 1 | | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 79 | | |
| mgl-r17 | ms5dot5 | | |
| mgrp-r17 | ms80 | | |
| mgta-r17 | ms0 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE{ | | entry 2 | |
| measGapId-r17 | 2 | | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 19 | | |
| mgl-r17 | ms5dot5 | | |
| mgrp-r17 | ms80 | | |
| mgta-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.15.1.4.3-4: *MeasIdToAddModList***

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| MeasIdToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | NR Cell 2 measurement object | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 3 | NR Cell 3 measurement object | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |

7.6.15.1.5 Test requirements

Table 7.6.15.1.4.1-3, 7.6.15.1.5-1 defines the primary level settings for all tests.

**Table 7.6.15.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements**

| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | | **Cell 3** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **T1** | **T2** | **T1** | **T2** | **T1** | **T2** |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.3.15 | | | | | |
| | | | | AoA1 | | AoA2 | | AoA2 | |
| Beam Assumption[Note 4] | | | 1,2 | Rough | | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | | 120 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TRS configuration | | Config 1 | TRS.2.1 TDD | | N/A | | N/A | |
| PDSCH/PDCCH TCI state | | Config 1 | TCI.State.2 | | N/A | | N/A | |
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| SSBRP Note 2 | dBm/SCS Note3 | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 5 | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 | -Infinity | 1.89 |
| Io Note 2 | dBm/95.04 MHz Note3 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1 | No external noise (Note 6) | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18]

The UE shall send one Event A3 triggered measurement report for each neighboring cell, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1, or

6400 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.15.2 NR SA FR2 event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2)

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.15.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for each neighbour cell. This test will partly verify the SA inter-frequency NR cell search requirements and collision handling between two partially overlapping gaps in TS 38.133 [6] clause 9.1.8.

### 7.6.15.2.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

### 7.6.15.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.15.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.15.2.

### 7.6.15.2.4 Test description

#### 7.6.15.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.15.2.4.1-1.

**Table 7.6.15.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.15.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.15.2.4.1-2.

**Table 7.6.15.2.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.15.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.15.2.4.1-3.
2. Message contents are defined in clause 7.6.15.2.4.3.
3. There are three NR carriers and three cells specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.15.2.4.1-3: General test parameters for NR FR2 SA event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2)**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2, 3 | Three FR2 NR carrier frequencies are used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| 1st Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| 2nd Neighbour cell | | Config 1 | NR cell 3 | NR cell 3 is on NR RF channel number 3. |
| 1st Gap Pattern Id | | Config 1 | 13 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| 2nd Gap Pattern Id | | Config 1 | 14 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| 1st gap offset | | Config 1 | 39 | |
| 2nd gap offset | | Config 1 | 4 | |
| 1st gap priority | | Config 1 | 2 | Second level priority |
| 2nd gap priority | | Config 1 | 1 | Highest priority |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 and NR Cell 3 measurement objects |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 10.4 for PC1; 6.5 for other PC | |

#### 7.6.15.2.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR2 on NR RF channel 1, NR cell 2 as 1st neighbour cell in FR2 on NR RF channel 2, and NR cell 3 as 2nd neighbour cell in FR2 on NR RF channel 3. The test parameters are given in Tables 7.6.15.2.4.1-3 and Table 7.6.15.2.5-1 respectively.

Two measurement gaps are configured to UE with measurement gap pattern configuration #13 and #14 respectively. Measurement gap with pattern #13 is associated with inter-frequency measurement on NR cell 2, and measurement gap with pattern #14 is associated with inter-frequency measurement on NR cell 3. Measurement gap with pattern #14 is configured with a higher priority than measurement gap with pattern #13. Measurement gap with pattern #13 and #14 as defined in Table 7.6.15.2.4.1-3 are provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 or NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.15.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report. Two concurrent per-UE measurement gap patterns are configured. Gap Pattern Id #14 for NR cell 3 is configured with a higher priority than Gap Pattern Id #13 for NR cell 2.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.15.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell 2 and Cell 3's overall delays measured from the beginning of time period T2 is less than 10240 ms for UE supporting power class 1 and 6400 ms for UE supporting other power class, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),

   OR

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.15.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.15.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5Table H.3.1-7 with condition INTER-FREQ |
| Specific message contents exceptions for Cell 2 | Table 7.6.15.2.4.3-3 with conditions INTER-FREQ MO and MGe with MeasGapId-r17=13<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Cell 3 | Table 7.6.15.2.4.3-3 with conditions INTER-FREQ MO and MGe with MeasGapId-r17=14<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.7 |

**Table 7.6.15.2.4.3-2: MeasConfig (Step3)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod SEQUENCE { | 3 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | Entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTRA-FREQ MO | NR Cell 1 | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | Entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 2 | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[3] SEQUENCE { | | Entry 3 | |
| measObjectId | 3 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with condition INTER-FREQ MO | NR Cell 3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod SEQUENCE { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | Entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT | | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod SEQUENCE { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | Entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | NR Cell 2 | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | Entry 2 | |
| measId | 2 | | |
| measObjectId | 3 | NR Cell 3 | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | MeasGapConfig-Concurrent | | |
| } | | | |

**Table 7.6.15.2.4.3-3: MeasObjectNR-DEFAULT: NR FR2-FR2 measurement object configuration**

| Derivation Path: Table H.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of the SSB associated to serving cell | MO for Cell 1 | |
| | ARFCN-ValueNR of the SSB associated to cell 2 | MO for Cell 2 | |
| | ARFCN-ValueNR of the SSB associated to cell 3 | MO for Cell 3 | |

| | | | |
|---|---|---|---|
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| deriveSSB-IndexFromCell | true | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 0 | SS-RSRP < -156dB | |
| } | | | |
| offsetMO SEQUENCE { | | | |
| rsrpOffsetSSB | dB0 | MO for Cell 1 | |
| | dB16 | MO for Cell 2 and MO for Cell 3 | |
| } | | | |
| associatedMeasGapSSB-r17 | 1 | MO for Cell 2 | |
| | 2 | MO for Cell 3 | |
| } | | | |

**Table 7.6.15.2.4.3-4: MeasGapConfig-Concurrent**

| Derivation path: Table H.3.1-6 with condition MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| measGapId-r17 | 1 | NR Cell 2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms5dot5 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | Entry 2 | |
| measGapId-r17 | 2 | NR Cell 3 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 4 | | |
| mgl-r17 | ms5dot5 | | |
| mgrp-r17 | ms80 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.6.15.2.5 Test requirement

Table 7.6.15.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.15.2.5-1: Cell specific test parameters for SA event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2)**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1 | Setup 3 as specified in TS 38.133 [6] clause A.3.15 | | | | | |
| | | | AoA1 | | AoA2 | | AoA3 | |
| Beam Assumption[Note 7] | | 1,2 | Rough | | Rough | | Rough | |
| NR RF Channel Number | | Config 1 | 1 | | 2 | | 3 | |
| Duplex mode | | Config 1 | TDD | | TDD | | TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | | N/A | |
| OCNG Patterns defined in A.2.1-1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | | - | |
| SMTC configuration defined in A.4-1 | | | Config 1 | SMTC.1 | | SMTC.1 | | SMTC.7 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $\hat{E}_s$ | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| SSBRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | | Config 1 | No external noise (Note 9) | | | | No external noise (Note 9) | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Void |
| Note 3: | SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Void |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone |
| Note 7: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation |
| Note 8: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4. |
| Note 9: | The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18] |

The UE shall send one Event A3 triggered measurement report for each neighbouring cell, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1, or

6400 for UE supporting other power class.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 7.6.15.3 NR SA FR2 event triggered reporting tests with concurrent measurement gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3.

This test case is incomplete for test frequencies > 40.8 GHz.

#### 7.6.15.3.1 Test purpose

The purpose of this test is to verify that the concurrent gap capable UE makes correct reporting of events. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4 and PRS-RSRP measurement delay requirements specified in TS 38.133 [6] clause 9.9.3.5.

#### 7.6.15.3.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

#### 7.6.15.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.15.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.15.3.

7.6.15.3.4 Test description

7.6.15.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.15.3.4.1-1.

**Table 7.6.15.3.4.1-1 Supported test configurations**

| Config | Description |
|---|---|
| 7.6.15.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.15.3.4.1-2.

**Table 7.6.15.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.15.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.15.3.4.1-3.
2. Message contents are defined in clause 7.6.15.3.4.3.
3. There are three NR carriers and three cells specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.15.3.4.1-3: General test parameters for NR SA FR2 event triggered reporting tests with concurrent gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1: Cell 1 and Cell 3<br>2: Cell 2 | Two TDD carrier frequencies are used for the NR cells |
| Active cell | | Config 1 | NR cell 1 (PCell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data |
| Neighbour cell | | Config 1 | NR cell 2, NR cell 3 | Cell 2 is an inter-frequency cell neighbor cell<br>Cell 3 is a neighbour cell in the positioning assistance data |
| Gap Pattern Id | | Config 1 | 0 for MeasGapId #0<br>1 for MeasGapId #1 | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1 | 7 for MeasGapId #0<br>11 for MeasGapId #1 | |
| A3-Offset | dB | Config 1 | -12 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |

| | | | | |
|---|---|---|---|---|
| Time offset between cell 1 and neighbour cell 2 | | Config 1 | 3μs | Synchronous cells |
| Time offset between cell 1 and neighbour cell 3 | | Config 1 | 3μs | Synchronous cells |
| Expected RSTD between cell 1 and cell 3 | μs | Config 1 | 3 | |
| Expected RSTD uncertainty between cell 1 and cell 3 | μs | Config 1 | 5 | |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 11 | |

#### 7.6.15.3.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR2 on NR RF channel 1, NR cell 2 as inter neighbour cell in FR2 on NR RF channel 2, and NR cell 3 as intra neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables 7.6.15.3.4.1-3 and Table 7.6.15.3.5-1 respectively.

Two measurement gap patterns (MeasGapId #0 and MeasGapId #1) are configured with the gap pattern ID #0 and #1 as defined in Table 7.6.15.3.4.1-3. MeasGapId #1 is configured with a higher priority than MeasGapId #0. MeasGapId #0 and MeasGapId #1 are associated with the MOs for RF channel numbers #1 and #2 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for carrier 2. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 and NR cell 3. Cell 1 and Cell 3 transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 [38] shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance of MeasGapId #1 containing the PRS resources that is $\Delta T$ after slot #n, where $\Delta T$ = 50 ms is the maximum processing time of the assistance data and location information request.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.15.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report. Two concurrent per-UE measurement gap patterns are configured. MeasGapId #1 for inter-frequency measurement is configured with a higher priority than MeasGapId #0 for PRS measurement.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.15.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell 2's overall delays measured from the beginning of time period T2 is less than 10240 ms for UE supporting power class 1 and 6400 ms for UE supporting other power class, and if the reported PRS RSRP measurement is within the PRS RSRP reporting range specified in TS 38.133 [6] clause 10.1.24.3, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

- switch the UE off.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current Cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),

   OR

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.15.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.15.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ and MGe with MeasGapId-r17=1<br>Table H.3.1-7 with condition INTER-FREQ |
| Specific message contents exceptions for Cell 3 | Table H.3.1-3 with condition INTRA-FREQ and MGe with MeasGapId-r17=0<br>Table H.3.1-7 with condition INTRA-FREQ |

**Table 7.6.15.3.4.3-2: MeasGapConfig (Step3)**

| Derivation path: Table H.3.1-6 with condition MGe and PRS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entry | | |
| GapConfig-r17[1] SEQUENCE { | | Entry 1 | |
| measGapId-r17 | 0 | NR Cell 1 and NR Cell 3 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 7 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | Entry 2 | |
| measGapId-r17 | 1 | NR Cell 2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 11 | | |

| | | | |
|---|---|---|---|
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms80 | | |
| mgta-r17 | ms0 | | |
| gapAssociationPRS-r17 | true | | |
| gapPriority-r17 | 1 | | |
| } | | | |
| } | | | |
| } | | | |

7.6.15.3.5 Test requirement

Table 7.6.15.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.15.3.5-1: Cell specific test parameters for NR SA FR2 event triggered reporting tests with concurrent gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 1 as specified in TS 38.133 [6] clause A.3.15 | | | | | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | Rough | | Rough | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | | | Config 1 | TDD | | TDD | | TDD | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | | | |
| OCNG Patterns defined in A.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | | - | |
| Dedicated CORESET RMC configuration | | | Config 1 | CCR.3.1 TDD | | - | | - | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | - | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | | 120 | |
| SSB parameters | | | Config 1 | SSB.1 FR2 | | SSB.1 FR2 | | SSB.1 FR2 | |
| SMTC configuration defined in A.4-1 | | | Config 1 | SMTC.4 | | SMTC.4 | | SMTC.4 | |
| PRS configuration | | | Config 1 | PRS.1.1 FR2 | | N/A | | PRS.1.2 FR2 | |
| PRS muting configuration | | | Config 1 | '10' | | N/A | | '01' | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -102 | | -104.7 | | -102 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -93 | | -95.7 | | -93 | |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 | -Infinity | -87.3 |
| SSB $\hat{E}_s/N_{oc}$ | dB | Config 1 | 3.3 | 3.3 | -Infinity | 9.0 | -Infinity | 6.3 |
| PRS-RSRP Note 3 | dBm/SCS Note5 | Config 1 | -Infinity | -96 | N/A | N/A | -Infinity | -102.8 |
| PRS $\hat{E}_s/I_{ot}$ | dB | Config 1 | -Infinity | -3 | N/A | N/A | -Infinity | -9.8 |
| PRS $\hat{E}_s/N_{oc}$ | dB | Config 1 | -Infinity | -3 | N/A | N/A | -Infinity | -9.8 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -59.05 | -55.65 | -66.7 | -57.2 | -59.05 | -55.65 |
| Propagation Condition | | Config 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that active cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io values were derived for symbols without PRS.

Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send one Event A3 triggered measurement report Cell 2, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1, or

6400 for UE supporting other power class.

The PRS RSRP measurement time fulfils the requirements specified in TS 38.133 [6] clause 9.9.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 3, with respect to the reference cell (Cell 1) in the DL-AoD assistance data, within the time duration specified in TS 38.133 [6] section 9.9.3.5 starting from the beginning of time interval T2. The reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in TS 38.133 [6] clause 10.1.24.3, i.e., between PRS RSRP_0 and PRS RSRP_126.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 7.6.16 SA event triggered reporting tests with NCSG

## 7.6.16.0 Minimum conformance requirements

### 7.6.16.0.1 Minimum conformance requirements for intra-frequency measurement

For the UE supporting NCSG, if NCSG is provided, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 7.6.16.0.1-1 and 7.6.16.0.1-2 (deactivated SCell).

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.16.0.1-3 and 7.6.16.0.1-4 (deactivated SCell).

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to CSSFwithin_ncsg,i in TS 38.133 [6] clause 9.1.5.3 for measurement conducted within NCSG.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1 or 5, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, Mmeas_period with_gaps =24.

**Table 7.6.16.0.1-1: Time period for PSS/SSS detection with NCSG (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(VIRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(VIRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{pss/sss_sync_with_gaps}$ x max(VIRP, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.16.0.1-2: Time period for PSS/SSS detection with NCSG (deactivated SCell) (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | 5 x max(measCycleSCell, VIRP) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, VIRP, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, VIRP, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.16.0.1-3: Measurement period for intra-frequency measurements with NCSG (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400ms, $M_{meas_period\ with_gaps}$ x max(VIRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(VIRP, SMTC period, DRX cycle)) [Note 1] x $CSSF_{intra}$ |
| DRX cycle>320ms | $M_{meas_period\ with_gaps}$ x max(VIRP, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.16.0.1-4: Measurement period for intra-frequency measurements with NCSG (deactivated SCell) (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | 5 x max(measCycleSCell, VIRP) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | 5 x max(measCycleSCell, VIRP, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | 5 x max(measCycleSCell, VIRP, DRX cycle) x $CSSF_{intra}$ |

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.3 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.8 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.13 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.3.1.1 and 10.1.3.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.8.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.13.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.3.1.1, 10.1.3.1.2, 10.1.8.1.1 and 10.1.13.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.7.1. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.7.1, and 9.2.7.2.

### 7.6.16.0.2 Minimum conformance requirements for inter-frequency measurement

For the UE supporting NCSG, if NCSG is provided, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured. Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 7.6.16.0.2-1.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 7.6.16.0.2-2.

$M_{pss/sss_sync_inter}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_inter}$ = 64 samples. For a UE supporting FR2 power class 2, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_inter}$ = 40 samples.

$M_{SSB_index_inter}$: For a UE supporting FR2 power class 1 or 5, $M_{SSB_index_inter}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{SSB_index_inter}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1 or 5, $M_{meas_period_inter}$ =64 samples. For a UE supporting FR2 power class 2, $M_{meas_period_inter}$=40 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 40 samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_ncsg,i}$ in TS 38.133[6] clause 9.1.5.x for measurement conducted within NCSG.

**Table 7.6.16.0.2-1: Time period for PSS/SSS detection with NCSG (FR2)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $Max(600ms, M_{pss/sss_sync_inter} \times Max(VIRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(600ms, (1.5 \times M_{pss/sss_sync_inter}) \times Max(VIRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $M_{pss/sss_sync_inter} \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 7.6.16.0.2-2: Measurement period for inter-frequency measurements with NCSG (FR2)**

| Condition NOTE1,2 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | $Max(400ms, M_{meas_period_inter} \times Max(VIRP, SMTC\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(400ms, (1.5 \times M_{meas_period_inter}) \times Max(VIRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $M_{meas_period_inter} \times DRX\ cycle \times CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

When NCSG are provided for inter-frequency measurements, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 7.6.16.0.2-2.

For UE supporting *nr-NeedForGapNCSG-reporting-r17* and indicating *NeedForGapNCSG-InfoNR* for inter-frequency measurement,

- An inter-frequency SSB measurement is defined as measurement with NCSG if
  - the UE indicates 'ncsg' via *NeedForGapNCSG-InfoNR* for the inter-frequency measurement, and
  - the SSB is not completely contained in the active BWP of the UE

  When network configures NCSG, the delay requirements are specified in TS 38.133 [6] clause 9.3.10.
- For inter-frequency SSB based measurements with NCSG, UE may cause scheduling restriction as specified in TS 38.133 [6] clause 9.3.10.3.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.6.3, and 9.3.10.

#### 7.6.16.0.3 Minimum conformance requirements for interruptions

It is up to UE implementation whether or not the UE is able to conduct transmission in the following slot(s),

- when *mgta* is not applied, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after the last each of the interrupted slots after VIL1 and VIL2.

where UL slot denotes that all the symbols in the slot are uplink symbols, and L=1 if $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ for the UL transmission is less than the length of one slot; L=2 otherwise.

Note: Network is supposed to take into account the possible difference between the estimated TA at network and actual TA at UE when scheduling UE in the above slot(s).

The interruptions of NCSG in number of slots are listed in Table 7.6.16.0.3-1 on all serving cells when per-UE NCSG is configured or on FR1 serving cells when per-FR FR1 NCSG is configured to *ncsg-MeasGapPerFR-r17* capable UE. There are two interruptions in each NCSG occasion, VIL1 before ML and VIL2 after ML, in NR standalone (with single carrier or NR CA). Each of them has number of interrupted slots captured in Table 7.6.16.0.3-1.

**Table 7.6.16.0.3-1: Number of interrupted slots on FR2 serving cells for FR2 NCSG during each VIL in NR standalone operation (with single carrier, NR CA)**

| NR SCS (kHz) | Number of interrupted slots on serving cells | |
|---|---|---|
| | When MG timing advance of 0ms is applied | When MG timing advance of 0.75ms is applied |
| | VIL=0.75ms | VIL=0.75ms |
| 60 | 3 | 3 |
| 120 | 6 | 6 |
| NOTE 1: Void | | |

## 7.6.16.1 NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX

- Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- This test case is incomplete for UE power classes other than PC3

- This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.16.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.7.1 and 9.2.7.2, and also verify the scheduling availability during intra-frequency measurement with NCSG in TS 38.133 [6] clause 9.2.7.3.

### 7.6.16.1.2 Test applicability

This test applies to all types of NR UE from release 17 onwards supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and NR NCSG capability. The UE is capable of NCSG and report '*ncsg*' through *NeedForGapNCSG-InfoNR* for PCell. Test 1 is applicable to UEs not supporting per-FR NCSG (ncsg-MeasGapPerFR-r17, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR NCSG.

#### 7.6.16.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.16.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.16.1.

#### 7.6.16.1.4 Test description

##### 7.6.16.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.16.1.4.1-1

**Table 7.6.16.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.16.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.16.1-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 7.6.16.1.4.1-2.

**Table 7.6.16.1.4.1-2: Initial conditions for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE NCSG without DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.16.1.4.1-3.
2. Message contents are defined in clause 7.6.16.1.4.3.
3. Two cells are deployed in the test, which are FR1 PCell(Cell 1) and FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.16.1.4.1-3: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE NCSG without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| NCSG type | | 1, 2 | per-FR | |
| NCSG pattern | | 1, 2 | 13 | |
| NCSG repitition periodicity | ms | 1, 2 | 40 | |
| ML | ms | 1, 2 | 5 | |
| NCSG offset | ms | 1, 2 | 39 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.3.2 TDD | |
| A3-Offset | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

#### 7.6.16.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The PCell shall continuously scheduled with data in the DL starting from T2 until the UE has sent the measurement report during T2. The test parameters are given in Table 7.6.16.1.4.1-3, 7.6.16.1.5-1, and 7.6.16.1.5-2 respectively.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.16.1.5-2.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.16.1.5-2. T2 start.

6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 3.20 s for UE supporting power class 1, 1.92 s for UE supporting power class 2, 3, and 4, and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.16.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.16.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.6.16.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | entry 1 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | entry 1 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | |
| } | | | |
| } | | | |

**Table 7.6.16.1.4.3-3: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17[1] SEQUENCE { | | entry 1 | |
| measGapId-r17 | 1 | | |
| gapType-r17 | perUE | | Test1 |
| | perFR2 | | Test2 |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms5 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| ncsgInd-r17 | true | | |
| } | | | |
| } | | | |

**Table 7.6.16.1.4.3-4: *BWP-Downlink***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.2 | | BWP-Id1 |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.16.1.4.3-5: *BWP-Uplink***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.2 | | BWP-Id1 |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.16.1.4.3-6: *MeasObjectNR*(Step 3)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells, NOT SS-SINR and MGe | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 2 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.16.1.5 Test requirements

Table 7.6.16.1.4.1-3, 7.6.16.1.5-1, and Table 7.6.16.1.5-2 defines the primary level settings for all tests.

**Table 7.6.16.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE NCSG without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |

| | | | | |
|---|---|---|---|---|
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | ULBWP.1.1 |
| RLM-RS | | 1, 2 | CSI-RS | SSB |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | N/A |
| | | 2 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | CR.3.1 TDD |
| | | 2 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | CCR.3.1 TDD |
| | | 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | N/A |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | 120 |
| OCNG Patterns | | 1, 2 | OP.5 | N/A |
| cellIndividualOffset | dB | 1~2 | N/A | 16 |
| SSB | | 1 | SSB.3 FR2 | SSB.7 FR2 |
| | | 2 | SSB.4 FR2 | SSB.8 FR2 |
| Propagation Condition | | 1, 2 | AWGN | AWGN |

**Table 7.6.16.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE NCSG without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.3.15.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 4] | | 1,2 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| *Io* | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in Figure 7.6.1.1.5-1 | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Void
Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

During T2, UE shall send HARQ ACK/NACK for the corresponding PDSCH scheduled in PCell in all the slots except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.16.2 NR SA FR2 event triggered reporting tests on inter-frequency measurement with NCSG when DRX is not used (PCell in FR2)

- Editor's Note: This test case has been completed for the following configurations:
- Test frequency f ≤ 40.8 GHz
- UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.16.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.3.10.1 and 9.3.10.2, and also verify the scheduling availability during inter-frequency measurement with NCSG in 39.133 [6] clause 9.3.10.3.

### 7.6.16.2.2 Test applicability

This test applies to all types of NR UEs supporting NR NCSG capability from release 17 onwards. The serving frequency and the target frequency should be selected such that UE reports ‘ncsg’ for the target frequency given the serving frequency.

### 7.6.16.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.16.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.16.2.

### 7.6.16.2.4 Test description

#### 7.6.16.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.16.2.4.1-1.

**Table 7.6.16.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: Void. | |

Test environment parameters are given in Table 7.6.16.2.4.1-2.

**Table 7.6.16.2.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.16.2.4.1-3.

2. Message contents are defined in clause 7.6.16.2.4.3.

3. There are two NR cells on two carriers specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings are according to Annex C.1.2 and C.1.3 for this test.

**Table 7.6.16.2.4.1-3: General test parameters for SA inter-frequency event triggered reporting with NCSG for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| NCSG Pattern Id | | Config 1 | 0 | | As specified in TS 38.133[6].clause 9.1.9.3-1. |
| NCSG offset | | Config 1 | 39 | | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | Config 1 | -11 | | |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 5.2 for PC1 and PC5; 3.5 for other PC | | |

### 7.6.16.2.4.2 Test procedure

Two cells are deployed in the test: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell2 as neighbour cell in FR1 on NR RF channel 2. NR RF channel 1 and NR RF channel 2 should be selected such the UE reports 'ncsg' for the target frequency on NR RF channel 2. The test parameters are given in Table 7.6.16.2.4.1-3 and Table 7.6.16.2.5-1 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.16.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.16.2.5-1. T2 starts.

6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5120ms for UE supporting power class 1 or 5, 3200ms for UE supporting power class 2, 3 and 4, and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

8. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.16.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.16.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with conditions INTER-FREQ<br><br>Table H.3.1-4 with A3-offset = -11dB<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with condition INTER-FREQ |

**Table 7.6.16.2.4.3-2: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | | |
| gapType-r17 | perUE | | |
| | | | |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms5 | | |
| mgrp-r17 | ms40 | | |
| mgta-r17 | ms0 | | |
| ncsgInd-r17 | true | | |
| } | | | |

**Table 7.6.16.2.4.3-3: MeasObjectNR for INTER-FREQ MO (Step 3)**

| Derivation Path: H.3.1-3 with Condition INTER-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| offsetMO ::= SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |
| associatedMeasGapSSB-r17 | 1 | | |
| } | | | |

## 7.6.16.2.5 Test requirement

Table 7.6.16.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 7.6.16.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting with NCSG for FR2 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.9.3 | | | |
| | | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 7] | | | 1,2 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | | | Config 1 | OP.2 | | OP.2 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| $\hat{E}_s / N_{oc}$ | dB | Config 1 | 8.7 | 8.7 | -Infinity | 9 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1 | -87.0 | -87.0 | -Infinity | -86.7 |
| $\hat{E}_s / I_{ot\ BB}$ Note 8 | dB | Config 1 | 8.7 | 8.7 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -57.4 | -57.4 | -66.7 | -57.2 |
| Propagation Condition | | Config 1 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133[6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1 and 5, or

3200 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall be scheduled on PCell continuously throughout the test. During the time duration T2, the interruption on PCell shall not be more than the values specified for SA in TS 38.133[6] clause 9.1.9.1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE: For a UE that supports per-FR NCSG, it only needs to pass test case with per-FR NCSG, otherwise, it only needs to pass test case with per-UE NCSG.

## 7.6.16.3 NR SA FR2 event triggered reporting tests on deactivated SCell measurement via NCSG in non-DRX

- Editor's Note: This test case has been completed for the following configurations:
- Test frequency f ≤ 40.8 GHz
- UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for test frequencies > 40.8 GHz

### 7.6.16.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for NCSG with SSB-based measurement with deactivated SCell.

### 7.6.16.3.2 Test applicability

This test applies to all types of NR UEs supporting NR NCSG capability from release 17 onwards supporting 2DL CA.

### 7.6.16.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.16.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.16.3.

### 7.6.16.3.4 Test description

#### 7.6.16.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR Cells are shown in Table 7.6.16.3.4.1-1.

**Table 7.6.16.3.4.1-1: Supported test configurations for FR2 deactivated SCell measurement via NCSG**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note 1: Same configuration applies to both PCell and SCell | |

Test environment parameters are given in Table 7.6.16.3.4.1-2.

**Table 7.6.16.3.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

1. The general test parameter settings are set up according to Table 7.6.16.3.4.1-3.

2. Message contents are defined in clause 7.6.16.3.4.3.

3. Three cells are deployed in the test, which are FR2 PCell (Cell 1), FR2 SCell (Cell2) and FR2 neighbour cell (Cell3) on the same frequency as the SCell. Cell 1 and Cell 2 shall be configured according to Annex C.1.1 and C.1.2.

**Table 7.6.16.3.4.1-3: General test parameters for FR2 deactivated SCell measurement via NCSG**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two NR radio channels are used for this test. Cell 1 uses RF channel 1. Cell 2 and Cell 3 use RF channel 2. |
| Hysteresis | dB | 0 | |
| A3-Offset | dBm | -11 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | DRX is not used |
| NCSG Pattern Id | | 0 | As specified in TS 38.133[6] clause Table 9.1.9.3-1. |
| NCSG offset | ms | 39 | |
| NCSG mgta | ms | 0 | |
| Time offset between Cell 2 and Cell 3 | us | 3 | Synchronous cells |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| T1 | s | 5 | |
| T2 | s | 15 | |

### 7.6.16.3.4.2 Test procedure

Three cells are deployed in the test, which are FR2 PCell (Cell1), FR2 SCell(Cell2) and FR2 neighbour cell(Cell3) on the same frequency as the SCell. The SCell is deactivated during the test. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered with Event A6 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The PCell shall continuously schedule with data in the DL starting from T1 until the UE has sent the measurement report during T2. The test parameters are given in Table 7.6.16.3.4.1-3 and Table 7.6.16.3.5-1 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.16.3.5-1.

3. SS shall configure SCell (Cell2) on the SCC as per TS 38.508-1[14] clause 7.5.1 and provide measurement configurations.

4. T1 starts, SS continuously schedules on PCell with data in the DL starting from T1 and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.16.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A6. If the overall delays measured from the beginning of time period T2 is less than 12.8s for UE support power class 1 or 5, 7.68s for UE supporting power class 2, 3, and 4 and DTX in PCell is not observed by the SS for the corresponding PDSCH scheduled in PCell in all the slots expect for the case where PDSCH or PUCCH is overlapped with VIL of NCSG pattern, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays

measured requirements or DTX in PCell is observed by the SS except for the case where PDSCH or PUCCH is overlapped with the VIL of NCSG pattern, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.16.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.16.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br><br>Table H.3.1-2 with conditions Deactivated SCell<br><br>Table H.3.1-5<br><br>Table H.3.1-7 with condition Deactivated SCell |

**Table 7.6.16.3.4.3-2: ServingCellConfig (Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| servingCellMO | 2 | MeasObjectId for SCell in Table H.3.1-2 | |
| } | | | |

**Table 7.6.16.3.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |

| | | | |
|---|---|---|---|
| cellsToAddModList ::= SEQUENCE {(SIZE (1..maxNrofCekkMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod SEQUENCE { | | | |
| phyCellId | Cell 3 physical cell identity | | |
| cellIndividualoffet | dB16 | | |
| } | | | |
| } | | | |
| measCycleSCell-v1530 | sf160 | | |
| associatedMeasGapSSB-r17 | 1 | | |
| } | | | |

**Table 7.6.16.3.4.3-4: ReportConfigNR(Step 3)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA6 SEQUENCE { | | | |
| a6-Offset CHOICE { | | | |
| rsrp | -22 | The actual value is field value * 0.5 dB. | |
| } | | | |
| hysteresis | 0 | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| | | | |

**Table 7.6.16.3.4.3-5: MeasGapConfig(Step 3)**

| Derivation Path: Table H.3.1-6 with condition MGe and NCSG | | |
|---|---|---|
| **Information Element** | **Value/remark** | **Comment** |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 1 entry | |
| GapConfig-r17[1] SEQUENCE { | | |
| measGapId-r17 | 1 | |
| gapOffset-r17 | 39 | |
| mgl-r17 | ms5 | |
| mgrp-r17 | ms40 | |
| mgta-r17 | ms0 | |
| ncsgInd-r17 | true | |
| } | | |

### 7.6.16.3.5 Test requirement

Table 7.6.16.3.4.1-3, 7.6.16.3.5-1 , and Table 7.6.16.3.5-2 defines the primary level settings including test tolerances for all tests.

**Table 7.6.16.3.5-1: Cell specific test parameters for FR2 deactivated SCell measurement via NCSG**

| Parameter[Note 5] | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|
| SSB ARFCN | | freq1 | freq2 | freq2 |
| Duplex mode | | TDD | | |
| TDD configuration | | TDDConf.3.1 | | |
| Downlink initial BWP Configuration | | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| Uplink initial BWP configuration | | ULBWP.0.1 | ULBWP.0.1 | ULBWP.0.1 |

| | | | | |
|---|---|---|---|---|
| Uplink dedicated BWP configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| TRS configuration | | TRS.2.1 TDD | TRS.2.1 TDD | N/A |
| TCI state | | TCI.State.0 | TCI.State.0 | N/A |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 24 | 24 | 24 |
| PDSCH Reference measurement channel | | SR.3.2 TDD | SR.3.2 TDD | N/A |
| RMSI CORESET Parameters | | CR.3.1 TDD | - | N/A |
| Dedicated CORESET Parameters | | CCR.3.1 TDD | CCR.3.1 TDD | N/A |
| OCNG Patterns | | OP.1 | OP.5 | N/A |
| SSB Configuration | | SSB.1 FR2 | SSB.3 FR2 | SSB.7 FR2 |
| SMTC Configuration | | SMTC.1 | SMTC.1 | |
| cellIndividualOffset | | N/A | N/A | 16 |
| EPRE ratio of PSS to SSS | dB | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation conditions | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 7.6.16.3.5-2: OTA related test parameters for FR2 deactivated SCell measurement via NCSG**

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 defined in A.9.3 | | | | | |
| | | AoA1 | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 3 | | Rough | | Rough | | Rough | |
| $E_s$ | dBm/SCS | -89 | | -89 | -89 | -infinity | -89 |
| SSB_RP Note2 | dBm/SCS Note4 | -89 | | -89 | -89 | -infinity | -89 |
| $\hat{E}_s/I_{ot}$ BB Note 4 | dB | -0.12 | | -0.12 | -0.12 | -infinity | -0.12 |
| Io Note2 | dBm/95.04 MHz Note4 | -64.41 | | -64.41 | -64.41 | -infinity | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | N/A | | Defined in Figure A.7.6.1.1.1-1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| Note 3: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | |
| Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4 | | | | | | | |

UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

12.8s for UE supporting power class 1 and 5, or

7.68s for UE supporting other power class.

UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

During the T1 and T2, UE be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those slots overlapped with

VIL1, ML and VIL2 of NCSG for intra-band FR2 CA

VIL1 and VIL2 of NCSG for inter-band FR2 CA

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.17 SA event triggered reporting tests for concurrent measurement gaps with Pre-MG in FR2

### 7.6.17.0 Minimum conformance requirements

#### 7.6.17.0.1 Minimum conformance requirements for SA event triggered reporting with one pre-configured gap and one measurement gap

FFS

## 7.6.17.1 NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing in 38.522

Message contents are FFS

Test procedure is missing

Minimum conformance requirement is FFS

#### 7.6.17.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event with one pre-configured gap and one measurement gap for SSB-based measurements.

#### 7.6.17.1.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting preconfiguration of MGs in RRC signalling.

#### 7.6.17.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.17.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.17.1.

#### 7.6.17.1.4 Test description

##### 7.6.17.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.17.1.4.1-1

**Table 7.6.17.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.17.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.17.1.4.1-2.

**Table 7.6.17.1.4.1-2: Initial conditions for TBD**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.17.1.4.1-3.
2. Message contents are defined in clause 7.6.17.1.4.3.
3. Three cells are deployed in the test. NR cell 1 as PCell in FR2 on NR RF channel 1, NR cell 2 as intra-frequency neighbour cell in FR2 on NR RF channel 1, and NR cell 3 as inter-frequency neighbour cell in FR2 on NR RF channel 2.

**Table 7.6.17.1.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR2 with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR Cell 2 and 3 | NR Cell 2 is on NR RF channel number 1. NR Cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 14 for MG#1 (80 ms MGRP)<br>13 for MG#2 (40 ms MGRP) | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1 | 79 for MG#1<br>4 for MG#2 | |
| SMTC configuration | | Config 1 | SMTC.1 for MO#1<br>SMTC.7 for MO#2 | As specified in clause A.4 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 and 3 measurement object |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between Cell 1 and Cell 2 | | Config 1 | 3μs | Cell 2 is synchronous to Cell 1 |
| Time offset between Cell 1 and Cell 3 | | Config 1 | 5 ms | Cell 3 is asynchronous to Cell 1 |
| T1 | s | Config 1 | 5.2 | |
| T2 | s | Config 1 | 6.5 | |

### 7.6.17.1.4.2 Test procedure

TBD

### 7.6.17.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

FFS

### 7.6.17.1.5 Test requirements

Table 7.6.17.1.4.1-3, 7.6.17.1.5-1, and Table 7.6.17.1.5-2 defines the primary level settings for all tests.

**Table 7.6.17.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1 | Setup 3 as specified in clause A.3.15 | | | | | |
| | | | AoA1 | | AoA2 | | AoA2 | |
| Beam Assumption[Note 4] | | Config 1 | Rough | | Rough | | Rough | |
| NR RF Channel Number | | Config 1 | 1 | | 1 | | 2 | |
| Duplex mode | | Config 1 | TDD | | TDD | | TDD | |
| TDD configuration | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | Config 1 | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | |
| Data PRBs allocated | | Config 1 | 66 | | 66 | | 66 | |
| BWP-1 Configuration | | Config 1 | DLBWP.1.6<br>ULBWP.1.6 | | N/A | | N/A | |
| BWP-2 Configuration | | Config 1 | DLBWP.1.5<br>ULBWP.1.5 | | N/A | | N/A | |
| SSB configuration | | | SSB.3 FR2 | | SSB.7 FR2 | | SSB.3 FR2 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1 | OP.1 | | N/A | | N/A | |
| PDSCH Reference measurement channel | | Config 1 | SR.3.1 TDD | | N/A | | N/A | |
| CORESET Reference Channel | | Config 1 | CR.3.1 TDD | | N/A | | N/A | |
| TRS configuration | | Config 1 | TRS.2.1 TDD | | N/A | | N/A | |
| PDSCH/PDCCH TCI state | | Config 1 | TCI.State.2 | | N/A | | N/A | |
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1 | -87+TT | -87+TT | -Infinity | -87+TT | -87+TT | -87+TT |
| SSB_RP [Note 2] | dBm/SCS [Note3] | Config 1 | -87+TT | -87+TT | -Infinity | -87+TT | -87+TT | -87+TT |
| $\hat{E}_s/I_{ot}$ BB [Note 5] | dB | Config 1 | 1.89+TT | 1.89+TT | -Infinity | 1.89+TT | 1.89+TT | 1.89+TT |
| Io[Note 2] | dBm/95.04 MHz [Note3] | Config 1 | -58.01+TT | -58.01+TT | -Infinity | -58.01+TT | 58.01+TT | -58.01+TT |
| Propagation Condition | | Config 1 | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 4: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

For UE supporting FG 32-2:

During T1, the UE shall report ACK/NACK for PDSCHs scheduled in the slots that are not overlapped with the MG#2 occasions. The UE shall send one Event A3 triggered measurement report for Cell 3, with a measurement reporting delay less than X ms from the beginning of time period T1, where X is

5120 for UE supporting power class 1 and 5, or

3200 for UE supporting other power class.

For UE not supporting FG 32-2:

During T1, the UE shall report ACK/NACK at least for PDSCHs scheduled in the slots that are not overlapped with the non-dropped MG#2 occasions. The UE shall send one Event A3 triggered measurement report for Cell 3, with a measurement reporting delay less than X ms from the beginning of time period T1, where X is

10240 for UE supporting power class 1 and 5, or

6400 for UE supporting other power class.

For both UE supporting FG 32-2 and not supporting FG 32-2:

During T2, the UE shall report ACK/NACK for PDSCHs scheduled in the slots that are not overlapped with the MG#1 occasions or non-dropped MG#2 occasions after MG#1 is activated, i.e. starting from the 1 $s^t$ complete MG#1 occasion after the beginning of PCell's DL slot ($i+T_{BWPswitchDelay}$) + 5 ms as defined in clause 8.19.2. The UE shall send one Event A3 triggered measurement report for Cell 2, with a measurement reporting delay less than Y ms from the beginning of time period T2, where Y is

6480 for UE supporting power class 1 and 5, or

3920 for UE supporting other power class.

Y is derived based on the requirements for intra-frequency measurement plus 80 ms, considering that the first MG#1 occasion in T2 may collide with the pre-configured gap activation delay.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.17.2 NR SA FR2-FR2 event-triggered reporting with two concurrent Pre-MGs

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing in 38.522

Message contents are FFS

Test procedure is missing

Minimum conformance requirement is FFS

### 7.6.17.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event with autonomous activation/deactivation of Pre-MGs within FR2 concurrent gaps. The test will partly verify the TDD inter-frequency cell search requirements in TS 38.133 [6] clause 9.2.6.and 9.3.4. Also, this test will also jointly verify pre-configured measurement gap activation/deactivation delay in TS 38.133 [6] clause 8.19.2.

### 7.6.17.2.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting pre-configuration of MGs in RRC signalling.

#### 7.6.17.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.17.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.17.2.

#### 7.6.17.2.4 Test description

##### 7.6.17.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.17.2.4.1-1

**Table 7.6.17.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.17.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.17.2.4.1-2.

**Table 7.6.17.2.4.1-2: Initial conditions for NR SA FR2-FR2 event-triggered reporting with two concurrent Pre-MGs**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.17.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are set up according to Table 7.6.17.2.4.1-3.
2. Message contents are defined in clause 7.6.17.2.4.3.
3. Two cells are deployed in the TBD.

**Table 7.6.17.2.4.1-3: General test parameters for intra-frequency event triggered reporting with autonomous activation/deactivation of Pre-MG**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | Config 1 | PCell (Cell 1) | |
| Neighbour cell | | Config 1 | Cell 2 | Cell to be identified. |
| RF Channel Number | | Config 1 | 1: Cell 1 , 2: Cell 2 | |
| SMTC configuration | | Config 1 | SMTC.1 | Same configuration for MO1 and MO2 |
| A4-Threshold | dBm | Config 1 | -120 | |
| CP length | | Config 1 | Normal | |
| Hysteresis | dB | Config 1 | 0 | |
| Time To Trigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | |
| Gap Pattern Id | | Config 1 | 13 | For both pre-conifgured gaps |
| Measurement gap offset | ms | Config 1 | 9 for MeasGapId #1<br>19 for MeasGapId #2 | No overlapping cases |
| Time offset between serving and neighbour cells | | Config 1 | 3 μs | Synchronous cells |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 0.2 | |
| T3 | s | Config 1 | 10.4 for PC1 and PC5; 6.5 for other PC | |

7.6.17.2.4.2 Test procedure

FFS

7.6.17.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

FFS

7.6.17.2.5 Test requirements

Table 7.6.17.2.4.1-3, 7.6.17.2.5-1, and Table 7.6.17.2.5-2 define the primary level settings for all tests.

**Table 7.6.17.2.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting with autonomous activation/deactivation of Pre-MG**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 100: $N_{PRB,c}$ = 66 | | | 100: $N_{PRB,c}$ = 66 | | |
| Data PRBs allocated | | 24 | | | 24 | | |
| Intial BWP configuration | | DLBWP.0.1 ULBWP.0.1 | | | DLBWP.0.1 ULBWP.0.1 | | |
| BWP-1 Configuration | | DLBWP.1.6 ULBWP.1.6 | | | N/A | | |
| BWP-2 Configuration | | DLBWP.1.5 ULBWP.1.5 | | | N/A | | |
| RLM-RS | | CSI-RS | | | N/A | | |
| PDSCH RMC configuration | | SR.3.2 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | CR.3.1 TDD | | | N/A | | |
| Dedicated CORESET RMC configuration | | CCR.3.1 TDD | | | N/A | | |
| TRS configuration | | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI states | | TCI.State.2 | | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | 120 | | |
| OCNG Patterns | | OP.5 | | | N/A | | |
| cellIndividualOffset | dB | N/A | | | 16 | | |
| SSB | | SSB.1 FR2 | | | SSB.7 FR2 | | |
| Propagation Condition | | AWGN | | | AWGN | | |

**Table 7.6.17.2.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting with automous activation/deactivation of Pre-MG**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 defined in A.3.15.3 | | | | | |
| | | AoA1 | | | AoA2 | | |
| Beam assumption[Note 3] | | Rough | | | Rough | | |
| $E_S$ | dBm/SCS | -89+TT | -89+TT | -89+TT | -infinity | -89+TT | -89+TT |
| $\hat{E}_s/I_{ot}$ [BB Note 4] | dB | -0.12+TT | -0.12+TT | -0.12+TT | -Infinity | -0.12+TT | -0.12+TT |
| SSB_RP | dBm/SCS | -89+TT | -89+TT | -89+TT | -infinity | -89+TT | -89+TT |
| *Io* | dBm/95.04 MHz | -64.41+TT | -64.41+TT | -64.41+TT | -Infinity | -64.41+TT | -64.41+TT |
| Time multiplexing of the downlink transmissions from each AoA | | Defined in figure A.7.6.1.1.1-1 | | | | | |

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| NOTE 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| NOTE 3: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |
| NOTE 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

During T1, the UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the Pre-MG#2 occasions.

During T2 and T3, the UE shall be able to receive PDSCH and report corresponding valid ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the Pre-MG#1 or Pre-MG#2 occasions, starting from the 1 $s^t$ complete Pre-MG#1 occasion after the beginning of PCell's DL slot $(i+T_{BWPswitchDelay})$ + 5 ms as defined in clause 8.19.5.

The UE shall send one Event A3 triggered measurement report for measurements on cell 2, with a measurement reporting delay less than Y ms from the beginning of time period T3, where Y is

- 5120 ms for a UE supporting power class 1 and 5,
- 3200 ms for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.18 SA event triggered reporting tests with concurrent gaps and NCSG

### 7.6.18.0 Minimum conformance requirements

#### 7.6.18.0.1 Minimum conformance requirements for concurrent measurement gaps with NCSG

When UE supports *concurrentMeasGapsNCSG-r18* capability, network can provide multiple measurement gaps with at least one of the measurement gaps is NCSG configured by RRC message(s) as specified in TS 38.331 [13].

If the UE requires concurrent measurement gaps and/or NCSG to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports *concurrentMeasGapsNCSG-r18* but does not support *independentGapConfig* or *ncsg-MeasGapPerFR-r17* in order for the requirements in the following clauses to apply, the network can provide one per-UE concurrent measurement gap and one per-UE NCSG or at most two per-UE NCSGs for monitoring of all frequency layers.

If the UE requires concurrent measurement gaps and/or NCSG to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports *concurrentMeasGapsNCSG-r18, independentGapConfig* and *ncsg-MeasGapPerFR-r17* in order for the requirements defined for concurrent measurement gaps with NCSG to apply, the network can provide the concurrent measurement gap with NCSG combinations configurations specified in table 7.6.18.0.1-1 for monitoring of all frequency layers.

**Table 7.6.18.0.1-1: The number of Gap Combination Configurations by UE supporting concurrent measurement gap with NCSG patterns, per-FR NCSG patterns and independent measurement gap patterns**

| Gap Combination Configuration Id | The number of simultaneous configured measurement gap patterns | | |
|---|---|---|---|
| | per-FR1 measurement gap/NCSG | per-FR2 measurement gap/NCSG | per-UE measurement gap/NCSG |

| | | | |
|---|---|---|---|
| 0 | 2 | 1 | 0 |
| 1 | 1 | 2 | 0 |
| 2 | 0 | 0 | 2 |
| 3Note 1 | 1 | 0 | 1 |
| 4Note 1 | 0 | 1 | 1 |
| 5Note 1 | 1 | 1 | 1 |
| 6 | 2 | 0 | 0 |
| 7 | 0 | 2 | 0 |

Note 1: Gap Combination Configuration Id #3, #4, #5 will be only applied when the per-UE measurement gap (and cannot be NCSG) is associated to measure PRS for any RSTD, PRS-RSRP, RSCP, RSCPD, UE Rx-Tx time difference and PRS-RSRPP measurement defined in TS 38.215 [10], and when the per-FR measurement gap in an FR is NCSG.

Note 2: In Gap Combination Configuration Id #0, #1, #6, #7, one per-FR measurement gap in an FR (and cannot be NCSG) can be associated to measure PRS for any RSTD, PRS-RSRP, RSCP, RSCPD, UE Rx-Tx time difference and PRS-RSRPP measurement defined in TS 38.215 [4] provided that UE supports *independentGapConfigPRS-r17*.

Note 3: In Gap Combination Configuration Id #0, #1, #2, #6, #7, one FR can be configured with up to 2 NCSGs, regardless they are per-UE or per-FR configured. Otherwise, the gaps can only be configured as Gap(s) configured via *GapConfig* without suffix or Gap(s) configured via *GapConfig-r17* without *ncsgInd-r17*.

For UE configured in the SA operation mode, when monitoring of multiple inter-RAT E-UTRAN carrier frequency layers, intra-frequency NR carrier frequency layers and/or inter-frequency NR carrier frequency layers as configured by PCell using gaps, each monitored carrier frequency layer, including following measurement types:

- a measurement object with SSB based measurement,
- E-UTRA inter-RAT measurement object,

can be associated to either one concurrent measurement gap pattern or one NCSG pattern, while the following measurement types:

- a measurement object with CSI-RS based measurement,
- E-UTRAN inter-RAT RSTD measurement,
- NR PRS-based positioning measurement,

can be only associated to one measurement gap pattern. Requirements for UE capable of *concurrentMeasGapsNCSG-r18* apply provided that each frequency layer is only associated with one concurrent measurement gap or one NCSG, and at least one of the gaps is NCSG. There can be one or more frequency layers associated with each concurrent measurement gap or each NCSG. Furthermore, if the UE is not capable of *concurrentMeasGapEUTRA-r17*[2], all E-UTRAN measurement objects shall be associated with a single concurrent measurement gap or NCSG for the requirement to apply.

When UE supports *concurrentMeasGapsNCSG-r18*, where at least one of the concurrent gaps is NCSG, supported concurrent measurement gap patterns are listed in TS 38.133 [6] table 9.1.2-1 based on the applicability specified in TS 38.133 [6] table 9.1.2-3, while supported NCSG patterns are listed in TS 38.133 [6] table 9.1.9.3-1 based on the applicability specified in TS 38.133 [6] table 9.1.9.3-2.

The requirements in TS 38.133 [6] clause 9.1.2 are also applicable for the UE capable of *concurrentMeasGapsNCSG-r18* and configured with multiple measurement gap or NCSG patterns within each concurrent measurement gap pattern. The requirements in TS 38.133 [6] clause 9.1.9 are also applicable for the UE capable of *concurrentMeasGapsNCSG-r18* and configured with multiple measurement gap or NCSG patterns within each NCSG pattern.

### 7.6.18.1 NR SA FR2 event-triggered reporting with concurrent Type-2 measurement gap and NCSG

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability is missing in 38.522
- Message contents are FFS

- Test procedure is missing

### 7.6.18.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for each neighbour cell. This test will partly verify the SA inter-frequency NR cell search requirements and collision handling between partially overlapped concurrent gaps and NCSG.

### 7.6.18.1.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting *concurrentMeasGapsNCSG-r18* capability.

### 7.6.18.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.18.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.18.1.

### 7.6.18.1.4 Test description

#### 7.6.18.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.18.1.4.1-1

**Table 7.6.18.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.18.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.18.1.4.1-2.

**Table 7.6.18.1.4.1-2: Initial conditions for TBD**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.18.1.4.1-3.
2. Message contents are defined in clause 7.6.18.1.4.3.
3. NR cell 1 as PCell in FR2 on NR RF channel 1, NR cell 2 as neighbour cell in FR2 on NR RF channel 2 and NR cell 3 as another neighbour cell in FR2 on NR RF channel 3.

**Table 7.6.18.1.4.1-3: General test parameters for event-triggered reporting with concurrent Type-2 measurement gap and NCSG**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2, 3 | Three FR2 NR carrier frequencies are used |
| Active cell | | Config 1 | NR cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1 |
| 1 s$^{t}$ Neighbour cell | | Config 1 | NR cell 2 | NR cell 2 is on NR RF channel number 2 |

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| 2nd Neighbour cell | | Config 1 | NR cell 3 | NR cell 3 is on NR RF channel number 3 |
| Measurement Gap Pattern ID | | Config 1 | 13 | As specified in table 9.1.2-1 |
| NCSG Pattern Id | | Config 1 | 14 | As specified in table 9.1.9.3-1 |
| Measurement Gap offset | ms | Config 1 | 39 | |
| NCSG offset | ms | Config 1 | 4 | |
| Measurement Gap priority | | Config 1 | 2 | Second level priority |
| NCSG priority | | Config 1 | 1 | Highest priority |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 and NR Cell 3 measurement objects |
| A3-Offset | dB | Config 1 | -11 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 5.2 for PC1 and PC5; 3.5 for other PC | |

### 7.6.18.1.4.2 Test procedure

TBD

### 7.6.18.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

TBD

### 7.6.18.1.5 Test requirements

Table 7.6.18.1.4.1-3, 7.6.18.1.5-1, and Table 7.6.18.1.5-2 defines the primary level settings for all tests.

**Table 7.6.18.1.5-1: Cell specific test parameters for event-triggered reporting with concurrent Type-2 measurement gap and NCSG**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.3.15 | | | | | |
| | | | | AoA1 | | AoA2 | | AoA3 | |
| Beam Assumption[Note 7] | | | 1,2 | Rough | | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | |
| Data PRBs allocated | | | Config 1 | 66 | | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | | N/A | |

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.7 | | | Config 1 | SMTC.1 | | SMTC.1 | | SMTC.7 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $\hat{E}_s$ | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| SSBRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note 5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | | Config 1 | AWGN | | | | AWGN | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void
NOTE 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

For both NR cell 2 and NR cell 3, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

10240 for UE supporting power class 1 and 5, or

6400 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

During the T1 and T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those slots overlapped with

VIL1 and VIL2 of NCSG

Measurement gap

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.19.0 Minimum conformance requirements

### 7.6.19.0.1 Minimum conformance requirements for Intra-frequency measurements with measurement gaps

When a measurement gap is provided or an activated Pre-MG is provided without any pre-MG status changed during the measurement period, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2 with SCS smaller or equal to 480 kHz.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}\ ms$$

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}\ ms$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in tables 7.6.19.0.1-1 or 7.6.19.0.1-2.

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC $\leq$ 40ms, $T_{PSS/SSS_sync_intra}$ is given in table 7.6.19.0.1-2; otherwise, $T_{PSS/SSS_sync_intra}$ is given in table 7.6.19.0.1-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given table 7.6.19.0.1-3 (for FR2-2).

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.19.0.1-7 or 7.6.19.0.1-4.

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC $\leq$ 40ms, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.1-5; otherwise, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.1-4.

- For power class 6 UE supporting *measEnhCAInterFreqFR2-r18* when *highSpeedMeasFlagFR2-r17* is configured, the $T_{SSB_measurement_period_intra}$ given in table 7.6.19.0.1-5 (if SMTC $\leq$ 40ms) and table 7.6.19.0.1-4 (if SMTC > 40ms) shall apply for SCC.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with or the UE does not support concurrent GAPs or MUSIM gaps. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, xRP_max), where xRP_max is the maximum xRP across all configured per-UE GAPs, periodic MUSIM gaps and per-FR GAPs within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other GAP and MUSIM gap occasions within the window, and

  $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for GAP and MUSIM gap collisions by applying the collision rules for GAP and MUSIM gap in clauses 9.1.8.3, 9.1.10.4, 9.1.10.5, 9.1.12.3, and 9.1.13.3, respectively.

- xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

When concurrent GAPs are configured, requirements in this clause do not apply if $N_{available}$ =0.

When UE supports [*MUSIM-GapConfig-17*] and the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in clause 9.1.10.4 is applied, longer cell identification period for the target intra-frequency is expected.

$M_{pss/sss_sync_with_gaps}$ : For a UE supporting FR2-1 power class 1 or 5, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2-1 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-1 power class 4, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-1 power class 6, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync\ with_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync\ with_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync\ with_gaps}$ = 36.

$M_{meas_period_with_gaps}$: For a UE supporting FR2-1 power class 1 or 5, $M_{meas_period_with_gaps}$ =40. For a UE supporting FR2-1 power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting FR2-1 power class 4, $M_{meas_period\ with_gaps}$ =24. For a UE supporting FR2-1 power class 6, $M_{meas_period\ with_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{meas_period_with_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_with_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_with_gaps}$ = 36.

- $M_{SSB_index_intra}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra}$ = 72. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra}$ = 48. For a UE supporting FR2 power class 3, $M_{SSB_index_intra}$ = 48.

If the higher layer signalling in TS 38.331 [13] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in table 7.6.19.0.1-1 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in table 7.6.19.0.1-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

**Table 7.6.19.0.1-1: Time period for PSS/SSS detection (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600 ms, $M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(600 ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320 ms | Ceil($M_{pss/sss_sync_with_gaps}$ x $K_{FR}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent GAPs, if multiple concurrent GAPs are configured, the MGRP is the periodicity of the activated Pre-MG or the MG pattern associated to the intra-frequency layer.<br>NOTE 2: $K_{FR}$ is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, $K_{FR}$ = 1. For FR2-2: $K_{FR}$ = 1 if the SCS of the SSB of the cell being detected is 120 kHz, $K_{FR}$ = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and $K_{FR}$ = 3 if the SCS of the SSB of the cell being detected is 960 kHz. | |

**Table 7.6.19.0.1-2: Time period for PSS/SSS detection when *highSpeedMeasFlagFR2-r17* is configured, (FR2) when SMTC period ≤ 40ms**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600 ms, $M1^{Note\ 2}$ x $K_{gap}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 80 ms | max(600 ms, ceil($M1^{Note2}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| 80 ms< DRX cycle≤ 320 ms | max(600 ms, ceil($M_{pss/sss_sync_with_gaps}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |

| | |
|---|---|
| DRX cycle>320 ms | Ceil( $M_{pss/sss_sync_with_gaps}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent GAPs, if multiple concurrent GAPs are configured, the MGRP is the periodicity of the activated Pre-MG or the MG pattern associated to the intra-frequency layer. | |
| NOTE 2: For UE supporting power class 6, M1 = 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1 = 18 if *highSpeedMeasFlagFR2-r17* = set2 | |
| NOTE 3: Void | |

**Table 7.6.19.0.1-3: Time period for time index detection (FR2-2)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(200 ms, ceil($M_{SSB_index_intra}$ x $K_{gap}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(200 ms, ceil(1.5 x $M_{SSB_index_intra}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle) x $CSSF_{intra}$) |
| DRX cycle>320 ms | Ceil($M_{SSB_index_intra}$ x $K_{gap}$)x DRX cycle x $CSSF_{intra}$ |

The requirements in this clause apply when a measurement gap is provided or when an activated Pre-MG is provided without any pre-MG status changed during the measurement period.

The measurement period for FR2 intra-frequency measurements with gaps is as shown in table 7.6.19.0.1-4.

For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC $\leq$ 40ms, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.1-5; otherwise, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.1-4.

For power class 6 UE supporting *measEnhCAInterFreqFR2-r18* when *highSpeedMeasFlagFR2-r17* is configured, the $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.1-5 (if SMTC $\leq$ 40ms) and table 7.6.19.0.1-4 (if SMTC > 40ms) shall apply for SCC.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in table 7.6.19.0.1-4, shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in table 7.6.19.0.1-4, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2 serving cell, longer measurement period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

**Table 7.6.19.0.1-4: Measurement period for intra-frequency measurements with gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period\ with_gaps}$ x $K_{gap}$ ) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(400 ms, ceil(1.5 x $M_{meas_period\ with_gaps}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320 ms | Ceil( $M_{meas_period\ with_gaps}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent GAPs, if multiple concurrent GAPs are configured, the MGRP is the periodicity of the activated Pre-MG or the MG pattern associated to the intra-frequency layer. | |

**Table 7.6.19.0.1-5: Measurement period for intra-frequency measurements with gaps when *highSpeedMeasFlagFR2-r17* is configured (FR2-1) when SMTC period≤40ms**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400 ms, ceil(M1 Note 2 x $K_{gap}$ ) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 80 ms | max(400 ms, ceil(M1 Note 2 x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| 80 ms< DRX cycle≤ 320 ms | max(400 ms, ceil($M_{meas_period\ with_gaps}$ x $K_{gap}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320 ms | Ceil( $M_{meas_period\ with_gaps}$ x $K_{gap}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: For a UE supporting concurrent GAPs, if multiple concurrent GAPs are configured, the MGRP is the periodicity of the activated Pre-MG or the MG pattern associated to the intra-frequency layer. | |
| NOTE 2: For UE supporting power class 6, M1 = 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1 = 18 if *highSpeedMeasFlagFR2-r17* = set2 | |
| NOTE 3: Void | |

### 7.6.19.0.2 Minimum conformance requirements for Intra-frequency measurements without measurement gaps

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2 with SCS smaller or equal to 480 kHz.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC ≤ 40ms, $T_{PSS/SSS_sync_intra}$ is given in table 7.6.19.0.2-3; otherwise, $T_{PSS/SSS_sync_intra}$ is given in table 7.6.19.0.2-1.
- For UE indicating *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{PSS/SSS_sync_intra}$ is given in table 7.6.19.0.2-1 for FR2. For UE indicating *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{PSS/SSS_sync_intra}$ is given in table and table 7.6.19.0.2-6 for FR2.

- Otherwise, $T_{PSS/SSS_sync_intra}$ is given in tables, 7.6.19.0.2-1, or 7.6.19.0.2-2 (deactivated SCell) or 7.6.19.0.2-3 or 7.6.19.0.2-4 (deactivated PSCell).

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured

- For UE indicating *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_time_index_intra}$ is given in table 7.6.19.0.2-5 for FR2-2.
- Otherwise, $T_{SSB_time_index_intra}$ is given in tables 7.6.19.0.2-5 (FR2-2).
- $T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement
  - For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC ≤ 40ms, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-9; otherwise, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-7.
  - For UE indicating *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_measurement_period_intra}$ is given in table table 7.6.19.0.3-7 for FR2. For UE indicating *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-11 for FR2.
  - For power class 6 UE supporting *measEnhCAInterFreqFR2-r18* when *highSpeedMeasFlagFR2* is configured, the $T_{SSB_measurement_period_intra}$ given in table 7.6.19.0.3-9 (if SMTC ≤ 40ms) and table 7.6.19.0.3-7 (if SMTC > 40ms) shall apply for SCC.
- Otherwise, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-7, 7.6.19.0.3-8 (deactivated SCell) or 7.6.19.0.3-10 (deactivated PSCell).
- $CSSF_{intra}$: it is a carrier specific scaling factor and is determined
  - according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e.
    - when intra-frequency SMTC is fully non overlapping or partially overlapping with GAP, or
    - when intra-frequency SMTC is fully non overlapping with GAP for UE indicating *no-gap-with-interruption*, or
    - when intra-frequency SMTC is fully non overlapping or partially overlapping with GAP for UE indicating *no-gap-no-interruption*, or

For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated.

if the higher layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2-1 power class 1 or 5, $M_{pss/sss_sync_w/o_gaps}$ =40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2-1 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2-1 power class 6, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_w/o_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_w/o_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ = 36.

$M_{meas_period_w/o_gaps}$: For a UE supporting FR2-1 power class 1 or 5, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2-1 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting FR2-1 power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 6, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting FR2-2 power class 1, $M_{meas_period_w/o_gaps}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_w/o_gaps}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_w/o_gaps}$ = 36.

$M_{SSB_index_intra}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra}$ = 72 samples. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra}$ = 48 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_intra}$ = 48 samples.

When UE supports concurrent GAPs, i.e., supports the following capability or capabilities' combination:

- concurrentMeasGap-r17, or
- concurrentMeasGapsPreMG-r18, or
- concurrentMeasGapsNCSG-r18,

Or when UE supports *musim-GapPreference-r17* or both concurrent measurement GAPs and *musim-GapPreference-r17* and UE concurrent GAPs or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured

$K_p$ is the scaling factor for an SSB frequency layer to be measured without GAP. $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

- For a window W of duration max(SMTC period, xRP_max), where xRP_max is the maximum xRP across all configured per-UE GAPs, periodic MUSIM gaps, and/or per-FR GAPs within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:
  - $N_{total}$ is the total number of SMTC occasions within the window, including those overlapped with GAP and MUSIM gap occasions within the window, and
  - $N_{available}$ is the number of SMTC occasions that are not overlapped with any non-dropped GAP or non-dropped MUSIM gap occasions within the window W, after accounting for measurement GAP and MUSIM gap collisions by applying the collision rules for GAP and MUSIM gap in clauses 9.1.8.3, 9.1.10.4, 9.1.10.5, 9.1.12.3, and 9.1.13.3, respectively.

    $K_p = 1$ when $N_{available} = 0$.
  - xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

    Requirements in this clause do not apply when $N_{available} = 0$ due to fully overlapping between SMTC occasions and MUSIM gap occasions within the window W.

When UE supports [*MUSIM-GapConfig-17]* and the SMTC occasion of the target frequency layer is overlapping with the configured aperiodic MUSIM gap, longer cell identification period for the target frequency layer is expected.

- Otherwise, when the UE is not configured with or UE does not support concurrent GAPs and the UE is not configured with periodic MUSIM gaps or UE does not support MUSIM gaps:

  When intra-frequency SMTC is fully non overlapping with measurement gaps or NCSG, or intra-frequency SMTC is fully overlapping with MGs or NCSG, Kp=1

When intra-frequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When intra-frequency SMTC is partially overlapping with NCSG, $K_p$ = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP. For calculation of $K_p$, if the higher layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

  $K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in table, table 7.6.19.0.2-1 table 7.6.19.0.2-2 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in table , table 7.6.19.0.2-1, table 7.6.19.0.2-2, table 7.6.19.0.2-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

- When the target SSB is completely contained in active BWP of UE or the active downlink BWP is initial BWP, the intra-frequency measurement shall be conducted without gap and without interruption regardless of the NeedForGaps' status reporting.

**Table 7.6.19.0.2-1: Time period for PSS/SSS detection, (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600 ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(600 ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320 ms | ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: $K_{FR}$ is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1. For FR2-2: $K_{FR}$ = 1 if the SCS of the SSB of the cell being detected is 120 kHz, $K_{FR}$ = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and $K_{FR}$ = 3 if the SCS of the SSB of the cell being detected is 960 kHz. | |

**Table 7.6.19.0.2-2: Time period for PSS/SSS detection, deactivated SCell (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320 ms | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: The requirements also apply to deactivated SCG SCell. | |

**Table 7.6.19.0.2-3: Time period for PSS/SSS detection when *highSpeedMeasFlagFR2-r17* is configured, (FR2) when SMTC period ≤ 40ms**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600 ms, ceil($M1^{Note\ 2}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ |
| DRX cycle≤ 80 ms | max(600 ms, ceil($M1^{Note\ 2}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| 80 ms< DRX cycle≤ 320 ms | ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ $^{Note\ 3}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle) x $CSSF_{intra}$ |
| DRX cycle>320 ms | ceil($M_{pss/sss_sync_w/o_gaps}$ $^{Note\ 3}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: For UE supporting power class 6, M1 = 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1 = 18 if *highSpeedMeasFlagFR2-r17* = set2<br>NOTE 3: Void | |

**Table 7.6.19.0.2-4: Time period for PSS/SSS detection, deactivated PSCell (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x measCyclePSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x max(measCyclePSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320 ms | Ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_p$) x max(measCyclePSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.19.0.2-5: Time period for time index detection (FR2-2)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(200 ms, ceil($M_{SSB_index_intra}$ x $K_p$ x SMTC period) x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(200 ms, ceil(1.5 x $M_{SSB_index_intra}$ x $K_p$) x max(SMTC period, DRX cycle) x $CSSF_{intra}$) |
| DRX cycle>320 ms | Ceil($M_{SSB_index_intra}$ x $K_p$ )x DRX cycle x $CSSF_{intra}$ |

**Table 7.6.19.0.2-6: Time period for PSS/SSS detection for UE indicating *no-gap-with-interruption*, (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600 ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_{layer1_measurement}$) x max (80 ms, SMTC period ))$^{Note\ 1}$ x $CSSF_{intra}$ |
| [DRX cycle≤ 320 ms] | max(600 ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_{layer1_measurement}$) x [max(80 ms, SMTC period,DRX cycle)]) x $CSSF_{intra}$ |
| [DRX cycle>320 ms] | [ceil($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ x $K_{layer1_measurement}$) x DRX cycle] x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: $K_{FR}$ is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1.<br>NOTE 3: Requirements only apply when measurement gap is not configured, or measurement gap is fully non-overlapped with SMTC on any carrier on which UE indicates *no-gap-with-interruption*. | |

Editor's note: RAN4 has to decide the UE behaviour when DRX is configured whether interruptions are allowed.

The measurement period for intra-frequency measurements without gaps is as shown in table 7.6.19.0.3-7, 7.6.19.0.3-8 (deactivated SCell) or 7.6.19.0.3-10 (deactivated SCG applicable for PSCell). When UE *highSpeedMeasFlagFR2-r17* is configured, if SMTC ≤ 40ms, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-9; otherwise, $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-7. For power class 6 UE supporting *measEnhCAInterFreqFR2-r18* when *highSpeedMeasFlagFR2-r17* is configured, the $T_{SSB_measurement_period_intra}$ is given in table 7.6.19.0.3-9 (if SMTC ≤ 40ms) and table 7.6.19.0.3-7 (if SMTC > 40ms) shall apply for SCC.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$

For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified table 7.6.19.0.3-7, table 7.6.19.0.3-8 shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in table 7.6.19.0.3-7, table 7.6.19.0.3-8, table 7.6.19.0.3-10, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

### 7.6.19.0.3 Minimum conformance requirements for Inter-frequency measurements without measurement gaps

UE satisfying the applicability conditions specified in TS 38.133 [6] clause 9.3.1 on the requirement in this clause shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured for the FR2-1 target frequency layers and UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*. Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

- For inter-frequency SSB based measurements without measurement gaps in active BWP, it is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR2, SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection

- For inter-frequency SSB based measurements without measurement gaps in active BWP, and UE supports *interFrequencyMeas-Nogap-r16*, $T_{PSS/SSS_sync_inter}$ is given in table 7.6.19.0.3-1.
- For UE indicating *no-gap-no-interruption*, $T_{PSS/SSS_sync_inter}$ is given in table 7.6.19.0.3-1 for FR2
- For UE indicating *no-gap-with-interruption*, $T_{PSS/SSS_sync_inter}$ is given in table 7.6.19.0.3-2 for FR2.

- $T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured
  - For inter-frequency SSB based measurements without measurement gaps in active BWP, and UE supports *interFrequencyMeas-Nogap-r16*, $T_{SSB_time_index_inter}$ is given in table 7.6.19.0.3-3.
  - For UE *indicating no-gap-no-interruption*, $T_{SSB_time_index_inter}$ is given in table 7.6.19.0.3-3 for FR2
  - For UE indicating *no-gap-with-interruption*, $T_{SSB_time_index_inter}$ is given in table 7.6.19.0.3-4 for FR2.
- $T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement
  - For inter-frequency SSB based measurements without measurement gaps in active BWP, and UE supports *interFrequencyMeas-Nogap-r16*, $T_{SSB_measurement_period_inter}$ is given in table 7.6.19.0.3-5, table is configured, and UE supports *measurementEnhancementInterFreq-r17*.
  - For UE indicating *no-gap-no-interruption*, $T_{SSB_measurement_period_inter}$ is given in table table 7.6.19.0.3-5 for FR2.
  - For UE indicating *no-gap-with-interruption*, $T_{SSB_measurement_period_inter}$ is given in table 7.6.19.0.3-6 for FR2.
- For UE supporting power class 6 and *measEnhCAInterFreqFR2-r18* with *highSpeedMeasFlagFR2-r17* configured, if SMTC $\leq$ 40ms, $T_{SSB_measurement_period_inter}$ is given in table 9.3.9.2-x; otherwise, $T_{SSB_measurement_period_inter}$ is given in table 7.6.19.0.3-5.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside GAP, i.e. when inter-frequency SMTC is fully non overlapping or partially overlapping with GAPs.

- when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps for UE *indicating no-gap-no-interruption* or
- when inter-frequency SMTC is fully non overlapping with measurement gaps for UE indicating *no-gap-with-interruption*.

For inter-frequency SSB based measurements without measurement gaps in active BWP

$M_{pss/sss_sync_inter}$: For a UE supporting FR2-1 power class 1 or 5, $M_{pss/sss_sync_inter}$ = 40. For a UE supporting FR2-1 power class 2, $M_{pss/sss_sync_inter}$ = 24. For a UE supporting FR2-1 power class 3, $M_{pss/sss_sync_inter}$ = 24. For a UE supporting FR2-1 power class 4, $M_{pss/sss_sync}$ = 24. For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_inter}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_inter}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_inter}$ = 36.

$M_{SSB_index_inter}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_inter}$ = 72. For a UE supporting FR2-2 power class 2, $M_{SSB_index_inter}$ = 48. For a UE supporting FR2-2 power class 3, $M_{SSB_index_inter}$ = 48.

$M_{meas_period_inter}$: For a UE supporting FR2-1 power class 1 or 5, $M_{meas_period_inter}$ = 40. For a vehicle mounted UE supporting FR2-1 power class 2, $M_{pss/sss_sync_inter}$=24. For a UE supporting FR2-1 power class 3, $M_{meas_period_inter}$ = 24. For a UE supporting FR2-1 power class 4, $M_{meas_period_inter}$ = 24. For a UE supporting FR2-2 power class 1, $M_{meas_period_inter}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_inter}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_inter}$ = 36.

If the UE indicates 'nogap-noncsg' via *NeedForGapNCSG-InfoNR* for the inter-frequency measurement or the UE indicates either *no-gap-with-interruption* or *no-gap-no-interruption* via *NeedForInterruptionInfoNR-r18*,

$M_{pss/sss_sync_inter}$: For a UE supporting FR2-1 power class 1 or 5, $M_{pss/sss_sync_inter}$ = 64 samples. For a UE supporting FR2-1 power class 2, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2-1 power class 3, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2-1 power class 4, $M_{pss/sss_sync_inter}$ = 40 samples. For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_inter}$ = 96. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_inter}$ = 60. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_inter}$ = 60.

$M_{SSB_index_inter}$: For a UE supporting FR2-1 power class 1 or 5, $M_{SSB_index_inter}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2-1 power class 3, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2-1 power class 4, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2-2 power class 2 or 3, $M_{SSB_index_inter}$ = 48 samples. For a UE supporting FR2 power class 1, $M_{SSB_index_inter}$ = 72 samples.

$M_{meas_period_inter}$: For a UE supporting FR2-1 power class 1 or 5, $M_{meas_period_inter}$ =64. For a UE supporting FR2-1 power class 2, $M_{meas_period_inter}$=40. For a UE supporting FR2-1 power class 3, $M_{meas_period_inter}$ =40. For a UE supporting FR2-1 power class 4, $M_{meas_period_inter}$ = 40. For a UE supporting FR2-2 power class 1, $M_{meas_period_inter}$ = 96. For a UE supporting FR2-2 power class 2, $M_{meas_period_inter}$ = 60. For a UE supporting FR2-2 power class 3, $M_{meas_period_inter}$ = 60.

When UE supports *concurrentMeasGap-r17* or *musim-GapPreference-r17* or both concurrent measurement GAP and *musim-GapPreference-r17* and the UE is configured with concurrent GAPs or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps,

$K_p$ is a scaling factor for an SSB frequency layer to be measured without GAP. $K_p = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, xRP_max), where xRP_max is the maximum xRP across all configured per-UE GAPs, periodic MUSIM gaps, and per-FR GAPs within the same FR as the SSB frequency layer, and starting at the beginning of any SMTC occasion:

$N_{total}$ is the total number of SMTC occasions within the window, including those overlapped with GAP and MUSIM gap occasions within the window, and

$N_{available}$ is the number of SMTC occasions that are not overlapped with any non-dropped GAP or non-dropped MUSIM gap occasions within the window W, after accounting for GAP and MUSIM gap collisions by applying the collision rules for the measurement GAP and MUSIM gap in clauses 9.1.8.3, 9.1.10.4 and 9.1.10.5, respectively.

- xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

$K_p$ = 1 when $N_{available}$ = 0.

Requirements in this clause do not apply when $N_{available}$ = 0 due to fully overlapping between SMTC occasions and MUSIM gap occasions within the window W.

Editor Note: FSS for the case when $N_{available}$ = 0 due to fully overlapping between SMTC occasions and the union of MUSIM gap and measurement gap occasions within the window W.

When UE supports [*musim-GapPreference-r17]* and the SMTC occasions of the target frequency layer is fully or partially overlapping with the configured aperiodic MUSIM gap, longer cell identification period for the target frequency layer is expected.

Otherwise, when UE is not configured with or UE does not support concurrent GAPs and the UE is not configured with MUSIM gaps:

When inter-frequency SMTC is fully non overlapping with measurement gaps or NCSG, or interfrequency SMTC is fully overlapping with MGs or NCSG, $K_p$ =1.

When inter-frequency SMTC is partially overlapping with measurement gaps, $K_p$ = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When inter-frequency SMTC is partially overlapping with NCSG, $K_p$ = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP.

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by inter-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by inter-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

For calculation of $K_p$, if the higher layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

**Table 7.6.19.0.3-1: Time period for PSS/SSS detection, (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | $\max(600\text{ ms}, \text{ceil}(M_{pss/sss_sync_inter} \times K_p \times K_{layer1_measurement}) \times \text{SMTC period})^{\text{Note 1}} \times CSSF_{inter}$ |
| DRX cycle≤ 320 ms | $\max(600\text{ ms}, \text{ceil}(1.5 \times M_{pss/sss_sync_inter} \times K_p \times K_{layer1_measurement}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times CSSF_{inter}$ |
| DRX cycle>320 ms | $\text{ceil}(M_{pss/sss_sync_inter} \times K_p \times K_{layer1_measurement}) \times \text{DRX cycle} \times CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void | |

**Table 7.6.19.0.3-2: Time period for PSS/SSS detection, when UE indicate no-gap-with-interruption (FR2)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max(600 ms, ceil($M_{pss/sss_sync_inter}$ x $K_{layer1_measurement}$) x max(80 ms, SMTC period))[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320 ms | max(600ms, ceil(1.5 x $M_{pss/sss_sync_inter}$ x $K_{layer1_measurement}$) x max(80ms, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320 ms | ceil($M_{pss/sss_sync_inter}$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Void | |

**Table 7.6.19.0.3-3: Time period for time index detection (FR2)**

| Condition [NOTE1,2] | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | Max(200 ms, Ceil($M_{SSB_index_inter}$ x $K_p$) × SMTC period) × $CSSF_{inter}$ |
| DRX cycle ≤ 320 ms | Max(200 ms, Ceil(1.5 × $M_{SSB_index_inter}$ x $K_p$) × Max(SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320 ms | Ceil($M_{SSB_index_inter}$ x $K_p$) × DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: Kp is applicable for UE supporting *concurrentMeasGap-r17* | |

**Table 7.6.19.0.3-4: ime period for time index detection, when UE indicate *no-gap-with-interruption* (FR2)**

| Condition [NOTE1,2] | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | Max(200 ms, $M_{SSB_index_inter}$ × max(80 ms, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320 ms | Max(200 ms, Ceil(1.5 × $M_{SSB_index_inter}$) × Max(80 ms, SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320 ms | $M_{SSB_index_inter}$ × DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: Kp is applicable for UE supporting [concurrent gaps] and MUSIM gaps | |

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 7.6.19.0.3-5, if UE supports inter-frequency measurement without measurement gaps.

**Table 7.6.19.0.3-5: Measurement period for inter-frequency measurements without gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period_inter}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320 ms | max(400 ms, ceil(1.5x $M_{meas_period_inter}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320 ms | ceil($M_{meas_period_inter}$ x$K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 7.6.19.0.3-6: Measurement period for inter-frequency measurements without gaps when UE indicate no-gap-with-interruption (FR2)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period_inter}$ x $K_{layer1_measurement}$) x max(80 ms, SMTC period))[Note 1] x $CSSF_{inter}$ |
| DRX cycle≤ 320 ms | max(400 ms, ceil(1.5x $M_{meas_period_inter}$ x $K_{layer1_measurement}$) x max(80 ms, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle>320 ms | ceil($M_{meas_period_inter}$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 7.6.19.0.3-7: Measurement period for intra-frequency measurements without gaps (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(400 ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320 ms | ceil($M_{meas_period_w/o_gaps}$ x$K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 7.6.19.0.3-8: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x measCycleSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320 ms | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: The requirements also apply to deactivated SCG SCell. | |

**Table 7.6.19.0.3-9: Measurement period for intra-frequency measurements without gaps when *highSpeedMeasFlagFR2-r17* is configured (FR2) when SMTC period <= 40 ms**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400 ms, ceil(M1[Note 2] x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 80 ms | max(400 ms, ceil(M1[Note 2] x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| 80 ms< DRX cycle≤ 320 ms | ceil(1.5 x $M_{meas_period_w/o_gaps}$ [Note 3] x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle) x $CSSF_{intra}$ |
| DRX cycle>320 ms | ceil($M_{meas_period_w/o_gaps}$ [Note 3] x$K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: For UE supporting power class 6, M1 = 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1 = 18 if *highSpeedMeasFlagFR2-r17* = set2 | |

**Table 7.6.19.0.3-10: Measurement period for intra-frequency measurements without gaps (deactivated SCG applicable for PSCell) (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x measCyclePSCell x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x max(measCyclePSCell, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320 ms | Ceil($M_{meas_period_w/o_gaps}$ x $K_p$) x max(measCyclePSCell, DRX cycle) x $CSSF_{intra}$ |

**Table 7.6.19.0.3-11: Measurement period for intra-frequency measurements without gaps for UE indicating *no-gap-with-interruption* (FR2)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period_w/o_gaps}$ x $K_{layer1_measurement}$) x (80 ms, SMTC period ))[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320 ms | max(400 ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x $K_{layer1_measurement}$) x [max(80, SMTC period,DRX cycle)]) x $CSSF_{intra}$ |
| DRX cycle>320 ms | ceil($M_{meas_period_w/o_gaps}$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified<br>NOTE 2: Requirements only apply when measurement gap is not configured, or measurement gap is fully non-overlapped with SMTC on any carrier on which UE indicates *no-gap-with-interruption* via *NeedForInterruptionInfoNR-r18*. | |

Editor's note: RAN4 has to decide the UE behavior when DRX is configured whether interruptions are allowed.

## 7.6.19.1 NR SA FR2 event-triggered reporting without interruption outside gap

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing in 38.522

### 7.6.19.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. The test partly verifies the TDD intra-frequency cell search and measurement requirements in TS 38.133 [6] clause 9.2.6.1 and 9.2.6.2. This test also verifies that the UE does not cause interruption outside measurement gap when SMTC occasions overlap with measurement gap occassions.

### 7.6.19.1.2 Test applicability

This test applies to all types of NR UE from release 18 onwards.

The UE which passes this test can skip the corresponding Rel-15 test cases.

### 7.6.19.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.19.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.19.1.

### 7.6.19.1.4 Test description

In the test the UE is configured to perform measurements on the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE operates in an active BWP which does not contain cell-defined SSB so that the UE uses configured measurement gaps to measure on the intra-frequency target SSB.

The TE schedules continuous DL data on PCell throughout the test.

Figure 7.6.19.1.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival.

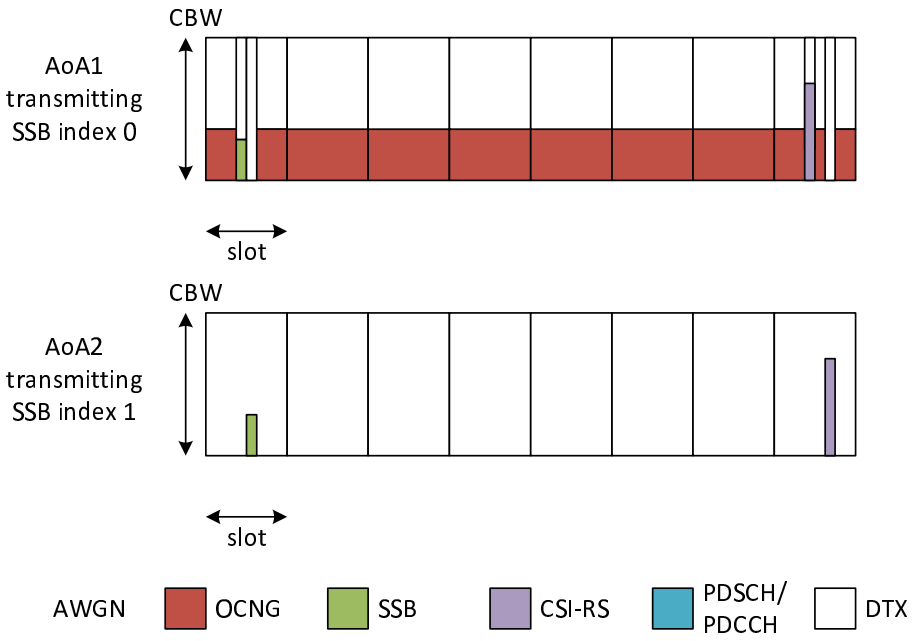



**Figure 7.6.19.1.4-1: Time multiplexed downlink transmissions (Config 1 example)**

#### 7.6.19.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.19.1.4.1-1

**Table 7.6.19.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.19.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.19.1.4.1-2.

**Table 7.6.19.1.4.1-2: Initial conditions for intra-frequency event triggered reporting for SA with TDD PCell in FR2**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.19.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.19.1.4.1-3.
2. Message contents are defined in clause 7.6.19.1.4.3.
3. Two cells are deployed in the test, a FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The serving frequency selected for this test case should be one in which the UE reports *NeedForGapsInfoNR-r16* = 'nop-gap' and *NeedForInterruptionInfoNR-r18* = 'no-gap-with-interruption' for the PCell.

**Table 7.6.19.1.4.1-3: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | PCell (Cell 1) | |
| Neighbour cell | | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1 | SMTC.1 | 20 ms SMTC periodicity |
| Measurement gap pattern | | 1 | 13 | Half of the SMTC occasions are overlapped in MG. |
| Measurement gap offset | | 1 | 39 | |
| A3-Offset | dB | 1 | -11 | |
| CP length | | 1 | Normal | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 μs | Synchronous cells |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 5 | |

#### 7.6.19.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.19.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsIntraFreq-r16* set to 'no-gap' and *intraFreq-needForInterruption-r18* set to 'no-gap-with-interruption'.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
7. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
8. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.19.1.5-1. T2 start.
9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 3202 ms for a UE supporting power class 1 and 5, and 1922 ms for a UE supporting power class 2, 3 and 4, and if UE does not cause interruption outside measurement gap, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or the rate of UE does cause interruption outside measurement gap, then the number of failure tests is increased by one.
10. After the SS receive the *MeasurementReport* message in step 9 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.19.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.19.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions (step 5) | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.7 FR2, SMTC pattern 1 and Synchronous cells for 7.6.19.1-1<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 7.6.19.1.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

**Table 7.6.19.1.4.3-3: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.19.1.4.3-4**: ***RRCReconfigurationComplete* (step 6)**

| Derivation Path: TS 38.508 [25], Table 4.6.1-14 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | no-gap | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | Not checked | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-with-interruption | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.19.1.5 Test requirements

Table 7.6.19.1.4.1-3, 7.6.19.1.5-1, and Table 7.6.19.1.5-2 defines the primary level settings for all tests.

**Table 7.6.19.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | |
| Data PRBs allocated | | 1 | 24 | | 24 | |
| Intial BWP configuration | | 1 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1 | CSI-RS | | N/A | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | N/A | |
| TRS configuration | | 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1 | TCI.State.2 | | N/A | |

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 120 | | 120 | |
| OCNG Patterns | | 1 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1 | N/A | | 16 | |
| CD-SSB | | 1 | SSB.1 FR2 | | SSB.7 FR2 | |
| Propagation Condition | | 1 | AWGN | | AWGN | |

**Table 7.6.19.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 3 defined in A.3.15.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption[Note 4] | | 1 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| *Io* | dBm/95.04 MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1 | Defined in figure A.7.6.19.1.1-1 | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Void
NOTE 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3200 ms for a UE supporting power class 1 and 5,
- 1920 ms for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

UE shall report corresponding HARQ-ACK/NACK for those PDSCHs scheduled in the slots that are not overlapped with the measurement gap. UE is not allowed to cause any interruption outside the configured measurement gap occasions.

## 7.6.19.2 NR SA FR2 event triggered reporting test without gap without interruption

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing in 38.522

#### 7.6.19.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

#### 7.6.19.2.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting TBD.

#### 7.6.19.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.19.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.19.1.

#### 7.6.19.2.4 Test description

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The TE schedules continuous DL data on PCell throughout the test.

Figure 7.6.19.2.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival.

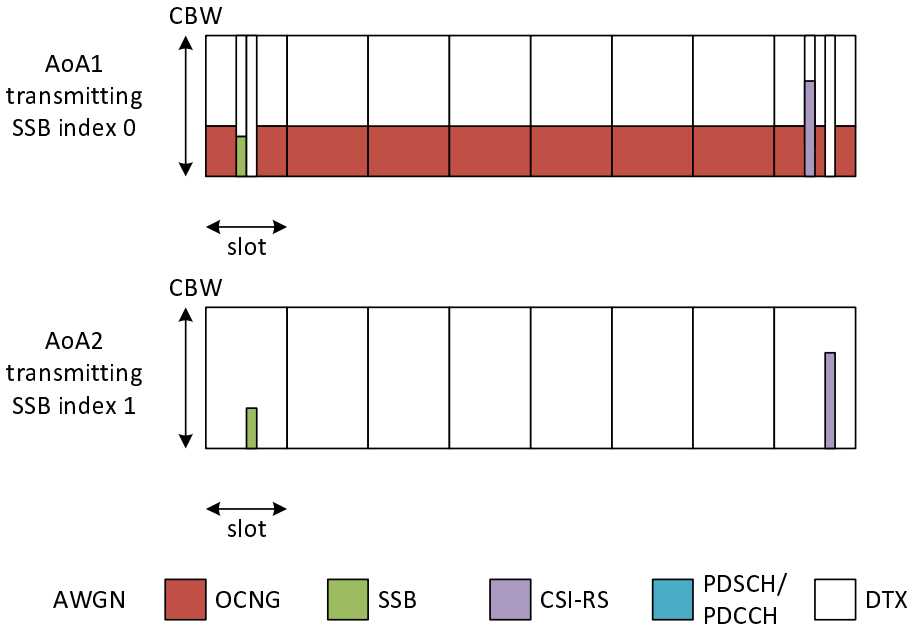



**Figure 7.6.19.2.4-1: Time multiplexed downlink transmissions (Config 1 example)**

#### 7.6.19.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.19.2.4.1-1

**Table 7.6.19.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.19.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.19.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 7.6.19.2.4.1-2.

**Table 7.6.19.2.4.1-2: Initial conditions for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.19.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.19.2.4.1-3.
2. Message contents are defined in clause 7.6.19.2.4.3.
3. Two cells are deployed in the test. PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell.

**Table 7.6.19.2.4.1-3: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.3.2 TDD resource #0 | Resource #1 is not used |
| A3-Offset | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 7.6.19.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.19.2.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsInterFreq-r16* set to ‘no-gap’ and *interFreq-needForInterruption-r18* set to ‘no-gap-no-interruption’.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.19.2.5-1. T2 start.

8. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1600 ms for a UE supporting power class 1 and 5, or 1080 ms for a UE supporting power class 2, 3 and 4, and if UE transmits ACK/NACK for the corresponding PDSCH scheduled in PCell in all slots from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed from T2, then the number of failure tests is increased by one.

10. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.19.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.19.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.7 FR2 and SMTC.1 for configuration 7.6.19.2-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.8 FR2 and SMTC.1 and synchronous cells for configuration 7.6.19.2-2<br>Table H.3.1-4 with A3-offset = -11dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 7.6.19.2.4.3-2: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BWP-Id1 | Active BWP (BWP2) |

**Table 7.6.19.2.4.3-3: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

S

**Table 7.6.19.2.4.3-4**: ***RRCReconfigurationComplete*** **(step 6)**

| Derivation Path: TS 38.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | no-gap | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | Not checked | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-without-interruption | | |
| } | | | |
| } | | | |
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.19.2.5 Test requirements

Table 7.6.19.2.4.1-3, 7.6.19.2.5-1, and Table 7.6.19.2.5-2 defines the primary level settings for all tests.

**Table 7.6.19.2.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{PRB,c}$ = 66 | | 100: $N_{PRB,c}$ = 66 | |
| Data PRBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |
| Intial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | N/A | |
| | | 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | N/A | |
| | | 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns | | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1~2 | N/A | | 16 | |
| SSB | | 1 | SSB.1 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.2 FR2 | | SSB.8 FR2 | |
| Propagation Condition | | 1, 2 | AWGN | | AWGN | |

**Table 7.6.19.2.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.3.15.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption[Note 4] | | 1,2 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| *Io* | dBm/95.04 MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in figure A.7.6.19.2.1-1 | | | |

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation.
NOTE 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 1.6 s for a UE supporting power class 1 and 5,
- 1.08 s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

UE shall report corresponding HARQ-ACK/NACK for all PDSCHs scheduled during the test.

## 7.6.19.3 NR SA FR2-FR2 event triggered reporting test without gap without interruption under non-DRX

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Test applicability is missing in 38.522

### 7.6.19.3.1 Test purpose

The purpose of this test is to verify that if UE reports "*no-gap*" via *interFreq-needForGap-r16* and reports "*no-gap-no-interruption*" via *interFreq-needForInterruption-r18*, the UE makes correct reporting of an event. The test will partly verify the inter-frequency without gap cell search requirements in TS 133 [6] clause 9.3.9.

### 7.6.19.3.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting inter-frequency measurements without gap.

#### 7.6.19.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.19.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.19.3.

#### 7.6.19.3.4 Test description

##### 7.6.19.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.19.3.4.1-1

**Table 7.6.19.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.6.19.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Test environment parameters are given in Table 7.6.19.3.4.1-2.

**Table 7.6.19.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.19.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 7.6.19.3.4.1-3.
2. Message contents are defined in clause 7.6.19.3.4.3.
3. Two cells are deployed in the test. NR cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

**Table 7.6.19.3.4.1-3: General test parameters for inter-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without interruption**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | PCell (Cell 1) | NR Cell 1 is on NR RF channel number 1 |
| Neighbour cell | | 1 | Cell 2 | NR cell 2 is on NR RF channel number 2 |
| RF Channel Number | | 1 | 1, 2 | Two FR2 NR carrier frequencies are used |
| SMTC configuration | | 1 | SMTC.1 | |
| A3-Offset | dB | 1 | -6 | |
| CP length | | 1 | Normal | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 μs | Synchronous cells |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 5 | |

#### 7.6.19.3.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.19.3.5-1.
3. SS shall transmit an *RRCReconfiguration* message with *needForGapsConfigNR-r16* and *needForInterruptionConfigNR-r18* enabled.
4. The UE shall transmit *RRCReconfigurationComplete* message with *NeedForGapsInterFreq-r16* set to 'no-gap' and *interFreq-needForInterruption-r18* set to 'no-gap-no-interruption'.
5. SS shall transmit an *RRCReconfiguration* message.
6. The UE shall transmit RRCReconfigurationComplete message. T1 starts.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.19.3.5-1. T2 start.
8. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
9. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2400ms for a UE supporting power class 1, and 1440ms for a UE supporting power class 2, 3 and 4, and if UE transmits ACK/NACK for the corresponding PDSCH scheduled in PCell in all slots from T2, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements or DTX in PCell is observed from T2, then the number of failure tests is increased by one.
10. After the SS receive the *MeasurementReport* message in step 9 or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
12. Depending on the choice in Step 10, the SS:
    - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.19.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 7.6.19.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.3 FR2 and SMTC.1<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ |

**Table 7.6.19.3.4.3-2: *RRCReconfiguration* (step 3)**

| Derivation Path: Table H.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | Not present | | |
| NeedForGapsConfigNR-r16 CHOICE { | | | |
| setup SEQUENCE{ | | | |
| requestedTargetBandFilterNR-r16 SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicatorNR { | 1 entries | | |
| FreqBandIndicatorNR[0] | tested band | | |
| } | | | |
| } | | | |
| needForInterruptionConfigNR-r18 | enabled | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.19.3.4.3-3**: ***RRCReconfigurationComplete*** **(step 6)**

| Derivation Path: TS 38.508 [25], Table 4.6.1-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| needForGapsInfoNR-r16 SEQUENCE { | | | |
| NeedForGapsIntraFreqList-r16 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForGapsIntraFreq-r16 { | | | |
| NeedForGapsIntraFreq-r16[0] SEQUENCE { | | | |
| servCellId-r16 | 0 | | |
| gapIndicationIntra-r16 | Not checked | | |
| } | | | |
| NeedForGapsBandListNR-r16 SEQUENCE (SIZE (1..maxBands)) OF NeedForGapsNR-r16 { | | | |
| NeedForGapsInterFreq-r16[0] SEQUENCE { | | | |
| bandNR-r16 | Tested band | | |
| gapIndicationInter-r16 | no-gap | | |
| } | | | |
| } | | | |
| needForInterruptionInfoNR-r18 SEQUENCE { | | | |
| NeedForInterruptionIntraFreqList-r18 SEQUENCE (SIZE (1..maxNrofServingCells)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | Not checked | | |
| } | | | |
| } | | | |
| | | | |

| | | | |
|---|---|---|---|
| NeedForInterruptionBandListNR-r18 SEQUENCE (SIZE (1..maxBands)) OF NeedForInterruptionNR-r18 { | | | |
| NeedForInterruptionNR-r18[0] SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-no-interruption | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

7.6.19.3.5 Test requirements

Table 7.6.19.3.4.1-3, 7.6.19.3.5-1, and Table 7.6.19.3.5-2 defines the primary level settings for all tests.

**Table 7.6.19.3.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Intial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | | - | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | | - | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | | - | |
| RLM-RS | | 1 | SSB | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| TRS configuration | | 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1 | TCI.State.2 | | N/A | |
| OCNG Patterns | | 1 | OP.1 | | OP.1 | |
| SSB | | 1 | SSB.3 FR2 | | SSB.3 FR2 | |
| Propagation Condition | | 1 | AWGN | | | |

**Table 7.6.19.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.3.15.1 | | | |
| Beam assumption[Note 4] | | 1 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | 4 | -Infinity | 8 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -102 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -93 | | | |
| SS-RSRP | dBm/SCS | 1 | -89 | -89 | -Infinity | -85 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 8 |
| $Io$ | dBm/95.04MHz | 1 | -58.56 | | -55.38 | |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in annex B.2.1.3, and does not limit UE implementation or test system implementation |

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

During the T1 and T2, UE shall be able to report ACK/NACK for all slots with PDCCH/PDSCH on PCell excluding those symbles as defined in clause 9.3.9.4.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 7.6.20 LTM Intra-frequency L1-RSRP measurement

### 7.6.20.0 Minimum conformance requirements

#### 7.6.20.0.1 Minimum conformance requirements for SSB-based intra-frequency L1-RSRP measurement

If a neighbor cell is known according to TS 38.133 [6] clause 9.14.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ if *deriveSSB-IndexFromCell* is enabled or UE has reported SSB index in L3 measurement report of the same cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}+T_{SSB_time_index_intra}$, where $T_{SSB_time_index_intra}$ is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] clause 9.2.5.1.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ is defined for FR2 in Table 7.6.20.0.1-1 for UE incapable of *multiCellL1-measRTD-greaterThan-CP-r18* and in Table 7.6.20.0.1-2 for UE capable of *multiCellL1-measRTD-greaterThan-CP-r18*, where

- M = 1
- N = 8
- P value for SSB resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ in FR2 with $N_{available} = 0$
  - $N_{total} / N_{available}$ in FR2 with $N_{available} > 0$

  For a window W of duration max ($T_{L1}$, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:

  - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W
- $T_{L1}$ is periodicity of the target SSB.
- $P_{sharing\ factor}$ = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{sharing\ factor}$ = 3, otherwise.

- $P_{L1_sharing}$ is defined as
  - When number of neighboring cells configured with SSB based L1-RSRP measurement is 1
    - $P_{L1_sharing}$ = 2, if any symbol of the SSBs from serving cell and neighbor cell are overlapping or adjacent (in time domain)
    - $P_{L1_sharing}$ = 1, otherwise
  - When number of neighboring cells configured with SSB based L1-RSRP measurement is more than 1
    - When none of TCI state(s) of the intra-frequency neighbor cells or inter-frequency neighbor cells without gap are not in the active TCI state list
      - $P_{L1_sharing} = 3*N_{Neighbor_Cell}$, where $N_{Neighbor_Cell}$ is the number of neighbor cells (to measure on intra-frequency and inter-frequency without gap) whose TCI state(s) are not in the active TCI state list
    - Otherwise
      - $P_{L1_sharing} = 3*N_{Neighbor_Cell_in_list}$, where $N_{Neighbor_Cell_in_list}$ is the number of neighbor cells (including intra-frequency neighbor cells and inter-frequency without gap neighbor cells) whose TCI state(s) are in the active TCI state list. No requirements are defined for any other cell(s) whose TCI state(s) is not in the active TCI state list.

If the higher layer in TS 38.331 [6] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer measurement period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer measurement period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 7.6.20.0.1-1: Intra-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ in FR2 for UE incapable of *multiCellL1-measRTD-greaterThan-CP-r18***

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*P_{L1_sharing}*N)*T_{SSB_NBC})$ |

| | |
|---|---|
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P*$P_{L1_sharing}$ *N)*max($T_{DRX}$,$T_{SSB_NBC}$) ) |
| DRX cycle > 320ms | ceil(1.5*M*P*$P_{L1_sharing}$*N)*$T_{DRX}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbor cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: The requirements apply when the max RTD between the serving cell and any candidate cell on which UE is required to perform L1-RSRP measurement on the same frequency layer is not larger than CP length of the cell on the frequency layer.<br>Note 3: When the number of neighbor cells to be measured on intra-frequency and inter-frequency without gap is more than 1 and TCI state(s) of at least one of these neighbor cells is in the active TCI state list, the requirements apply only to the cell(s) that have TCI state(s) is in the active TCI state list. | |

**Table 7.6.20.0.1-2: Intra-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ in FR2 for UE capable of *multiCellL1-measRTD-greaterThan-CP-r18***

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_intra}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P*$P_{L1_sharing}$*N)*$T_{SSB_NBC}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P*$P_{L1_sharing}$*N)*max($T_{DRX}$,$T_{SSB_NBC}$)) |
| DRX cycle > 320ms | ceil(1.5*M*P*$P_{L1_sharing}$*N)*$T_{DRX}$ |
| Note 1: $T_{SSB_NBC}$ is the periodicity of the neighbor cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: When the number of neighbor cells to be measured on intra-frequency and inter-frequency without gap is more than 1 and TCI state(s) of at least one of these neighbor cells is in the active TCI state list, the requirements apply only to the cell(s) that have TCI state(s) is in the active TCI state list. | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.14.3.1, 9.14.5, 9.14.6 and 9.14.7.

## 7.6.20.1 NR SA FR2 Intra-frequency SSB based L1-RSRP measurement

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is complete for UE PC3
- TT analysis is complete for test frequencies f ≤ 40.8 GHz

### 7.6.20.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of SSB based intra-frequency L1-RSRP measurement on neighbor cell in FR2 within L1-RSRP measurement requirements specified in TS 38.133 [6] clause 9.14.

### 7.6.20.1.2 Test applicability

This test applies to all types of NR UEs supporting intra-frequency L1 measurement and reports for LTM from release 18 and forward. Test 2 is applicable only to UEs supporting *multiCellL1-measRTD-greaterThan-CP-r18,* otherwise Test 1 is applicable.

### 7.6.20.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.20.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.20.1.

7.6.20.1.4 Test description

7.6.20.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.20.1.4.1-1.

**Table 7.6.20.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.20.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.20.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Test environment parameters are given in Table 7.6.20.1.4.1-2.

**Table 7.6.20.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.20.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without LTE link | | |

1. The general test parameter settings are set up according to Table 7.6.20.1.4.1-3.
2. Message contents are defined in clause 7.6.20.1.4.3.
3. There are one NR carrier and two cells specified in the tests. Cell 1 (PCell) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (intra neighbour cell) is on the same frequency as the Cell 1.
4. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX beam peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.20.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | | Cell 1 | | |
| Neighbouring cell | | | Cell 2 | | Cell 2 is the candidate cell |
| A3-Offset | | dB | -15 | | |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | ms | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | OFF | | DRX is not used |
| Time offset between cells | | | 0.2µs | 2µs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | | | Enabled | | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 1.5 | | |
| T2 | | s | ≤ 2 | | |

#### 7.6.20.1.4.2 Test procedure

There are two tests in the test case, test 1 and test 2:

- In test 1, time offset between cells is within CP length.
- In test 2, time offset between cells is larger than CP length.

If a UE does not support *multiCellL1-measRTD-greaterThan-CP-r18*, it is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. SSB_RP of Cell 2 in T1 and T2 are different. No gap patterns are configured in the test case.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.20.1.5-1.
3. SS shall transmit *RRCReconfiguration* message to configure Event A3 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.
6. SS shall transmit *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.
7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 320 slots.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.20.1.5-1. T2 starts at the beginning of a frame with an odd SFN.
10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    -R1: the UE shall start to transmit valid reports no later than 1000 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 7.6.20.1.5-3 for test configuration 1 and Table 7.6.20.1.5-4 for test configuration 2). For candidate Cell 2, the reported L1-RSRP value in T2 shall be larger than the value reported in T1. If the first valid report is received earlier than the specified time, and includes a larger L1-RSRP value of Cell 2, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    -R2: the UE shall transmit reports every 320 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    -R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the reported value is outside the limits in Table 7.6.20.1.5-3 for test configuration 1 and in Table 7.6.20.1.5-4 for test configuration 2, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.
12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
14. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

OR

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.20.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 7.6.20.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-7 with conditions INTRA-FREQ and SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with conditions INTRA-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.6.20.1.4.3-2: ReportConfigNR (a3-Offset) (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.20.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-5 with condition SCS120<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-9 with conditions FR2 and SSB#1 |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-9 with conditions FR2 and SSB#0 |

### 7.6.20.1.5 Test requirement

Table 7.6.20.1.5-1 and Table 7.6.20.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 7.6.20.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| SSB GSCN | 1~2 | | Freq1 | | | |
| Duplex mode | 1~2 | | TDD | | | |
| TDD Configuration | 1~2 | | TDDConf.3.1 | | | |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{PRB,c}$ = 66 | | | |
| Data RBs allocated | 1~2 | | 66 | | | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | kHz | 120 | | | |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD | | N/A | |
| | 2 | | SR.3.3 TDD | | N/A | |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | | N/A | |
| | 2 | | CR.3.2 TDD | | N/A | |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | | N/A | |
| | 2 | | CCR.3.7 TDD | | N/A | |
| SSB configuration | 1 | | SSB.3 FR2 | | SSB.7 FR2 | |
| | 2 | | SSB.8 FR2 | | SSB.4 FR2 | |
| OCNG Patterns | 1~2 | | OP.4 | | N/A | |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | | | |
| SMTC configuration | 1~2 | | SMTC.1 | | | |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | | N/A | |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | | |
| Propagation condition | 1~2 | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

**Table 7.6.20.1.5-2: NR OTA cell specific test parameters**

| Parameter | Config | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|

| | | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | | | |
| Beam Assumption[Note 4] | 1~2 | | Rough | | Rough | |
| $\hat{E}s/Iot_{BB}$[Note 5] | 1~2 | dB | -0.15 | 16.5 | -0.15 | 16.5 |
| SSB_RP[Note 3] | 1 | dBm/SSB SCS | -101.84 | -85.19 | -101.84 | -85.19 |
| | 2 | | -98.83 | -82.18 | -98.83 | -82.18 |
| Io[Note 3] | 1 | dBm/95.04MHz | -72.85 | -56.20 | -72.85 | -56.20 |
| | 2 | | -72.85 | -56.20 | -72.85 | -56.20 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE shall send L1-RSRP report every 320 slots in T2. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 960 ms plus 320 slots from the beginning of time period T2. During T2, each L1-RSRP measurement report of Cell 2 shall meet the corresponding absolute accuracy requirement in Table 7.6.20.1.5-3 for test configuration 1, and the corresponding absolute accuracy requirements in Table 7.6.20.1.5-4 for test configuration 2.

**Table 7.6.20.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 47 |
| Highest reported value (Cell 2) | 105 |

**Table 7.6.20.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 50 |
| Highest reported value (Cell 2) | 108 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

# 7.6.21 LTM Inter-frequency L1-RSRP measurement with measurement gap

## 7.6.21.0 Minimum conformance requirements

### 7.6.21.0.1 Minimum conformance requirements for SSB-based inter-frequency L1-RSRP measurement with gap

If an inter-frequency neighbor cell is known according to TS 38.133 [6] clause 9.15.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ if *deriveSSB-IndexFromCellInter-r17* is enabled or UE has reported SSB index in L3 measurement report of the same cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter}+T_{SSB_time_index_inter}$, where $T_{SSB_time_index_inter}$ is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] clause 9.3.4.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter}$ is defined in Table 7.6.21.0.1-1 for FR2, where

- M = 2
- N = 8
- $CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap}$ in TS 38.133 [6] clause 9.1.5.4 for L1-RSRP measurement conducted within measurement gaps.

**Table 7.6.21.0.1-1: Inter-frequency L1-RSRP measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ for known cells in FR2**

| Condition | $T_{L1\text{-}RSRP_Measurement_Period_SSB_Inter}$ |
|---|---|
| No DRX | $Max(T_{report}, Ceil(K_{gap} \times M*N) \times Max(MGRP, SSB\ period)) \times CSSF_{inter}$ |
| DRX cycle ≤ 320ms | $Max(T_{report}, Ceil(1.5 * K_{gap} \times M*N) \times Max(MGRP, SSB\ period, DRX\ cycle)) \times CSSF_{inter}$ |
| DRX cycle > 320ms | $Ceil(K_{gap} \times M*N) \times DRX\ cycle \times CSSF_{inter}$ |
| Note 1: The definition of $K_{gap}$ is the same as L3 measurement which is a scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern.<br>Note 2: If the UE is incapable of *multiCellL1-measRTD-greaterThan-CP-r18*, the requirements apply for the cells configured by *LTM-CSI-ResourceConfig-r18* on which UE is required to perform L1 measurements, when the max RTD among the cells on the same inter-frequency layer is not larger than CP length. | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.15.3.1 and 9.15.5.1.

## 7.6.21.1 NR SA FR2 Inter-frequency SSB-based L1-RSRP measurement with measurement gap for LTM

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is complete for UE PC3
- TT analysis is complete for test frequencies f ≤ 40.8 GHz

### 7.6.21.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of inter-frequency SSB based L1-RSRP measurement with measurement gap for candidate neighbour cell in FR2 within L1-RSRP measurement requirements specified in TS 38.133 [6] clause 9.15.

### 7.6.21.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements with measurement gaps and reports for LTM from release 18 and forward.

### 7.6.21.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.21.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.21.1.

### 7.6.21.1.4 Test description

#### 7.6.21.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.21.1.4.1-1.

**Table 7.6.21.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.6.21.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 7.6.21.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 7.6.21.1.4.1-2.

**Table 7.6.21.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clauses 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.21.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without LTE link | | |

1. The general test parameter settings are set up according to Table 7.6.21.1.4.1-3.
2. Message contents are defined in clause 7.6.21.1.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (PCell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.
4. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX beam peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.6.21.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active cell | | | Cell 1 | |
| Neighbouring cell | | | Cell 2 | Cell 2 is the candidate cell |
| A3-Offset | | dB | -15 | |
| Hysteresis | | dB | 0 | |
| offsetMO | | dB | 16 | Applied to NR Cell 2 measurement object |
| Time To Trigger | | ms | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| reportQuantityRS-Indexes | | | rsrp | |
| maxNrofRS-IndexesToReport | | | 1 | |
| includeBeamMeasurements | | | true | |
| DRX | | | OFF | DRX is not used |
| Time offset between cells | | | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| Gap Pattern Id | | | 13 | |
| Measurement gap offset | | ms | 39 | |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | |
| | spCellInclusion | | N/A | |
| ltm-ConfigComplete | | | true | Candidate cell's configuration is complete configuration |
| T1 | | s | 2 | |
| T2 | | s | ≤ 2 | |

#### 7.6.21.1.4.2 Test procedure

UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. SSB_RP of Cell 2 in T1 and T2 are different. Measurement gap pattern configuration defined in Table 7.6.21.1.4.1-3 is provided.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.21.1.5-1.

3. SS shall transmit *RRCReconfiguration* message to configure Event A3 triggered measurement report.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. The UE shall transmit *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.

6. SS shall transmit *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.

7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 320 slots.

9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.21.1.5-1. T2 starts.

10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    - R1: the UE shall start to transmit valid reports no later than 1320 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 7.6.21.1.5-2 for test configuration 1 and Table 7.6.21.1.5-3 for test configuration 2). For candidate Cell 2, the reported L1-RSRP value in T2 shall be larger than the value reported in T1. If the first valid report is received earlier than the specified time and includes a larger L1-RSRP value of Cell 2, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    - R2: the UE shall transmit reports every 320 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    - R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the reported value is outside the limits in Table 7.6.21.1.5-2 for test configuration 1 and in Table 7.6.21.1.5-3 for test configuration 2, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.

12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

14. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

    OR

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.21.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 7.6.21.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-6 with conditions gapUE and Pattern #13<br>Table H.3.1-7 with conditions INTER-FREQ and SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.6.21.1.4.3-2: ReportConfigNR (a3-Offset) (step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | The actual value is field value * 0.5 dB | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.21.1.4.3-3: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-5 with condition SCS120<br>Table H.3.12-6<br>Table H.3.12-8<br>Table H.3.12-9 with conditions FR2 and SSB#0 |

### 7.6.21.1.5 Test requirement

Table 7.6.21.1.5-1 and Table 7.6.21.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 7.6.21.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 | freq 2 |
| Duplex mode | 1~2 | | TDD | |
| TDD Configuration | 1~2 | | TDDConf.3.1 | |
| BWchannel | 1~2 | MHz | 100: $N_{PRB,c}$ = 66 | |
| Data RBs allocated | 1~2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | kHz | 120 | |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD | N/A |
| | 2 | | SR.3.3 TDD | N/A |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | N/A |
| | 2 | | CR.3.2 TDD | N/A |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | N/A |
| | 2 | | CCR.3.7 TDD | N/A |
| SSB configuration | 1 | | SSB.3 FR2 | SSB.3 FR2 |
| | 2 | | SSB.4 FR2 | SSB.4 FR2 |
| OCNG Patterns | 1~2 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | N/A |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | N/A |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | |
| Propagation condition | 1~2 | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 7.6.21.1.5-2: NR OTA cell specific test parameters**

| Parameter | Config | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | | | |
| Beam Assumption Note 4 | 1~2 | | Rough | | Rough | |
| $\hat{E}s/Iot_{BB}$ Note 5 | 1~2 | dB | 16.5 | 16.5 | 4.5 | 16.5 |
| SSB_RP Note 3 | 1 | dBm/SSB SCS | -85.19 | -85.19 | -97.19 | -85.19 |
| | 2 | | -82.18 | -82.18 | -94.18 | -82.18 |
| Io Note 3 | 1 | dBm/95.04MHz | -56.20 | -56.20 | -68.20 | -56.20 |
| | 2 | | -56.20 | -56.20 | -68.20 | -56.20 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE shall send L1-RSRP report every 320 slots in T2. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 960 ms plus 320 slots from the beginning of time period T2. During T2, each L1-RSRP measurement report of Cell 2 shall meet the corresponding absolute accuracy requirements in Table 7.6.21.1.5-3 for test configuration 1, and the corresponding absolute accuracy requirements in Table 7.6.21.1.5-4 for test configuration 2.

**Table 7.6.21.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 47 |
| Highest reported value (Cell 2) | 105 |

**Table 7.6.21.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (Cell 2) | 50 |
| Highest reported value (Cell 2) | 108 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.6.22 LTM Inter-frequency L1-RSRP measurement without measurement gap

### 7.6.22.0 Minimum conformance requirements

When configured by the network and the inter-frequency cell's SSB is completely contained in the DL active BWP, the UE shall be able to perform L1-RSRP measurements without gaps and without interruptions based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$.

If a neighbor cell is known according to TS TS 38.133 [6] clause 9.15.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ if *deriveSSB-IndexFromCellInter-r17* is enabled or UE has reported SSB index in L3 measurement report of the same

cell. Otherwise, UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}+T_{SSB_time_index_inter}$, where $T_{SSB_time_index_inter}$ is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.3.9.1-4 for FR2.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ is defined for FR2 in table 7.6.22.0-1, where

- M=1
- N= 8.
- P value for SSB resource to be measured is defined as
  - $N_{total}$ / $N_{outside_MG}$ in FR1
  - $P_{sharing\ factor}$ * $N_{total}$ / $N_{outside_MG}$ in FR2 with $N_{available}$ = 0
  - $N_{total}$ / $N_{available}$ in FR2 with $N_{available}$ > 0

  For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:
  - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
  - $N_{available}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W
  - $T_{L1}$ is periodicity of the target SSB.
- $P_{sharing\ factor}$ = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{sharing\ factor}$ = 3, otherwise.
- $P_{L1_sharing}$ is defined as
  - When number of neighboring cells to be measured is 1
    - $P_{L1_sharing}$ = 2, if any symbol of the SSBs from serving cell and neighbor cell are overlapping or adjacent (in time domain)
    - $P_{L1_sharing}$ = 1, otherwise
  - When number of neighboring cells to be measured is more than 1
    - When none of TCI state(s) of the intra-frequency neighbor cells or inter-frequency neighbor cells without gap are in the active TCI state list
      - $P_{L1_sharing}$ = 3*$N_{Neighbor_Cell}$, where $N_{Neighbor_Cell}$ is the number of neighbor cells to measure on intra-frequency and inter-frequency without gap
      - Otherwise

- $P_{L1_sharing} = 3*N_{Neighbor_Cell_in_list}$, where $N_{Neighbor_Cell_in_list}$ is the number of neigbour cells (including intra-frequency neighbour cell(s) and inter-frequency neighbor cell(s) without gap) whose TCI state(s) are in the active TCI state list. No requirements are defined for any other neighbor cell(s) whose TCI state(s) is not in the active TCI state list.

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer measurement period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

For either an FR1 or FR2 cell, longer measurement period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 7.6.22.0-1: Measurement delay for inter frequency L1-RSRP measurement without measurement gaps in FR2 for UE capable of *multiCellL1-measRTD-greaterThan-CP-r18***

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*P_{L1_sharing}*N)*T_{SSB_NBC})$ |
| DRX cycle ≤ 320 ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*P_{L1_sharing}*N)*\max(T_{DRX},T_{SSB_NBC}))$ |
| DRX cycle > 320 ms | $\text{ceil}(1.5*M*P*P_{L1_sharing}*N)*T_{DRX}$ |
| NOTE 1: $T_{SSB_NBC}$ is the periodicity of the neighbor cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: void.<br>NOTE 3: When the number of neighbor cells to be measured on intra-frequency and inter-frequency without gap is more than 1 and TCI state(s) of at least one of the neighbor cells is in the LTM candidate cell active TCI state list, the requirements apply only to the intra-frequency cells and inter-frequency neighbor cells without gap whose TCI state(s) are in the LTM candidate cell active TCI state list. | |

**Table 7.6.22.0-2: Measurement delay for inter frequency L1-RSRP measurement without measurement gaps in FR2 for UE incapable of *multiCellL1-measRTD-greaterThan-CP-r18***

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_inter_withoutGap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*P_{L1_sharing}*N)*T_{SSB_NBC})$ |
| DRX cycle ≤ 320 ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*P_{L1_sharing}*N)*\max(T_{DRX},T_{SSB_NBC}))$ |
| DRX cycle > 320 ms | $\text{ceil}(1.5*M*P*P_{L1_sharing}*N)*T_{DRX}$ |
| NOTE 1: $T_{SSB_NBC}$ is the periodicity of the neighbor cell SSB-Index configured for intra-frequency L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>NOTE 2: The requirements apply for the cells configured by LTM-CSI-ResourceConfig-r18 on which UE is required to perform L1 measurements, when the max RTD between the serving cell and the inter-frequency cell whose SSB are completely contained in the DL active BWP is not larger than CP length<br>NOTE 3: When the number of neighbor cells to be measured on intra-frequency and inter-frequency without gap is more than 1 and TCI state(s) of at least one of the neighbor cells is in the LTM candidate cell active TCI state list, the requirements only apply to intra-frequency cells and inter-frequency neighbor cells without gap whose TCI state(s) are in the LTM candidate cell active TCI state list.] | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.15.3.1, 9.15.6.1, 9.15.6.2 and 9.15.6.3.

## 7.6.22.1 NR SA FR2-FR2 SSB based L1-RSRP measurement without measurement gap

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

### 7.6.22.1.1 Test purpose

To verify the UE supporting *interFreqSSB-L1-MeasWithoutGaps-r18*makes correct reporting of inter-frequency L1-RSRP measurement without gap for LTM. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.15.6

### 7.6.22.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements without measurement gaps and reports for LTM from release 18 and forward. Test 2 is applicable only to UEs supporting *multiCellL1-measRTD-greaterThan-CP-r18,* otherwise Test 1 is applicable.

### 7.6.22.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.22.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.22.1.

### 7.6.22.1.4 Test description

#### 7.6.22.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.22.1.4.1-1

**Table 7.6.22.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 7.6.22.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.6.22.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Test environment parameters are given in Table 7.6.22.1.4.1-2.

**Table 7.6.22.1.4.1-2: Initial conditions for NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.6.14.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

1. The general test parameter settings are in Table 7.6.22.1.4.1-3.

2. There are two cells in the test, Cell 1 is the PCell on NR RF channel number 1 and Cell 2 is a neighbor cell NR RF channel number 2. The SSB of Cell 2 is contained in the DL active BWP.

**Table 7.6.22.1.4.1-3: General test parameters for NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | | Cell 1 | | |
| Neighbouring cell | | | Cell 2 | | Cell 2 is the candidate cell |
| RF Channel Number | | | 1: Cell 1<br>2: Cell 2 | | |
| A3-Offset | | dB | -15 | | |
| Hysteresis | | dB | 0 | | |
| Time To Trigger | | ms | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| maxNrofRS-IndexesToReport | | | 1 | | |
| includeBeamMeasurements | | | True | | |
| DRX | | | OFF | | DRX is not used |
| Time offset between cells | | | 0.2 μs | 2μs | The timing of Cell 2 is later than the timing of Cell 1 |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| | nrOfReportedCells | | n1 | | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | | |
| | spCellInclusion | | N/A | | |
| ltm-ConfigComplete | | | True | | Candidate cell's configuration is complete configuration |
| T1 | | s | 1.5 | | |
| T2 | | s | ≤2 | | |

### 7.6.22.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically.

There are two tests in the test case, test 1 and test 2:

- In test 1, time offset between cells is within CP length.
- In test 2, time offset between cells is larger than CP length.

UE not capable of *multiCellL1-measRTD-greaterThan-CP-r18* is only required to pass test 1. Otherwise, it is only required to pass test 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.6.22.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by Event A3 including Cell 2 measurement report with SSB index.
6. SS shall transmit an *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.
7. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 80 slots.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.22.1.5-1. T2 starts at the beginning of a frame with an even SFN.

10. The UE shall continue to send valid L1-RSRP reports. The SS shall check the following requirements:

    -R1: the UE shall start to transmit valid reports no later than 1000 ms for configuration 1 and no later than 980 slots for configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement (Table 7.6.22.1.5-2 for test configurations 1 and Table 7.6.22.1.5-3 for test configuration 2). If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

    -R2: the UE shall transmit reports every 320 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

    -R3: the L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 7.6.22.1.5-2 for test configuration 1 and in Table 7.6.22.1.5-3 for test configuration 2, or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

11. The SS waits until T2 expires.

12. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

14. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

    or:

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 2-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 7.6.22.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.6.22.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-7 with conditions INTER-FREQ, SSB Index |
| Specific message contents exceptions for Cell 1 | Table H.3.6-3 with condition SSB<br>Table H.3.6-10 |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO |

**Table 7.6.22.1.4.3-2: ReportConfigNR (a3-Offset)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | The actual value is field value * 0.5 dB | |
| } | | | |
| Hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.6.22.1.4.3-4: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-6<br>Table H.3.12-8 |
| Specific message contents exceptiosn for Test Configuration 1 | Table H.3.12-5 with condition SCS120<br>Table H.3.12-9 with conditions FR2, SSB#0 |
| Specific message contents exceptiosn for Test Configuration 2 | Table H.3.12-5 with condition SCS240<br>Table H.3.12-9 with conditions FR2, SSB#0 |

7.6.22.1.5 Test requirements

Table 7.6.22.1.4.1-3, 7.6.22.1.5-1, and Table 7.6.22.1.5-2 defines the primary level settings for all tests.

**Table 7.6.22.1.5-1: NR Cell specific test parameters for NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX**

| Parameter | Config | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 | freq2 |
| Duplex mode | 1~2 | | TDD | |
| TDD Configuration | 1~2 | | TDDConf.3.1 | |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1~2 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | kHz | 120 | |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD | N/A |
| | 2 | | SR.3.3 TDD | N/A |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | N/A |
| | 2 | | CR.3.2 TDD | N/A |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | N/A |
| | 2 | | CCR.3.7 TDD | N/A |

| | | | | |
|---|---|---|---|---|
| SSB configuration | 1 | | SSB.3 FR2 | |
| | 2 | | SSB.4 FR2 | |
| OCNG Patterns | 1~2 | | OP.4 | N/A |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | |
| SMTC configuration | 1~2 | | SMTC.1 | |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | N/A |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | N/A |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~2 | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 7.6.22.1.5-2: NR OTA Cell specific test parameters for TBD NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX TBD**

| Parameter | Config | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | 1~2 | | Setup 1 | | | |
| Beam Assumption Note 3 | 1~2 | | Rough | | Rough | |
| $\hat{E}_s / I_{ot}$ BB Note 4 | 1~2 | dB | -1.5+TT | 16.5+TT | -1.5+TT | 16.5+TT |
| SSB_RP Note2 | 1 | dBm/SSB SCS | -103+TT | -85+TT | -103+TT | -85+TT |
| | 2 | | -100+TT | -82+TT | -100+TT | -82+TT |
| Io Note2 | 1 | dBm/95.04MHz | -74+TT | -56+TT | -74+TT | -56+TT |
| | 2 | | -74+TT | -56+TT | -74+TT | -56+TT |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

The UE shall send L1-RSRP report every 320 slots in T2. No later than 960 ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the valid results for Cell 2 while meeting the accuracy requirements defined in clause 10.1.20B.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

# 7.7 Measurement performance requirements

## 7.7.1 SS-RSRP

### 7.7.1.0 Minimum conformance requirements

#### 7.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.1.

#### 7.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.2.

### 7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC1, PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC1 and PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

#### 7.7.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.1.

#### 7.7.1.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the NR FR2 neighbour cell.

##### 7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.1.4.1-1.

**Table 7.7.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.1.4.1-2.

**Table 7.7.1.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.1.1.4.1-3.
2. Message contents are defined in clause 7.7.1.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRP measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 7.7.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport* for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 7.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   - R7: The SS-RSRP value of Cell 1 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 1 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

   - R8: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a. The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

   - R11: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R11. Otherwise, R11 is passed.

   - R12: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 7.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

#### 7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.7.1.1.5 Test requirement

Table 7.7.1.1.5-1 defines the cell specific settings for all tests. Table 7.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.1.1 and relative accuracy requirements in clause 7.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R9: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R10: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R11: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R12: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

R8: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

**Table 7.7.1.1.5-1: SS-RSRP Intra-frequency general test parameters**

| Parameter[Note 5] | Unit | T1 | T2 |
|---|---|---|---|

| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
|---|---|---|---|---|---|
| Physical cell ID | | **489** | **0** | **489** | **0** |
| SSB ARFCN | | freq1 | | freq1 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | | 24 | |
| | | | | | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration | | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration | | Not applicable | - | Not applicable | - |
| TRS configuration | | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3.2 TDD | - | SR.3.2 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | µs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: All parameters apply for configuration 1 and 2
Note 6: Void

**Table 7.7.1.1.5-2: SS-RSRP Intra-frequency OTA related test parameters**

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |

| Angle of arrival configuration | | Setup 1 | | | |
|---|---|---|---|---|---|
| Assumption for UE beams Note 8 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -97.4 | | N/A | |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -88.37 | | N/A | |
| $\hat{E}_s/N_{oc}$ | dB | 6.0 | 1.4 | N/A | N/A |
| $E_s$ PC1 | dBm/SCS Note4 | | | (Table B.2.2-2 Rx Beam Peak +8.1dB) | (Table B.2.2-2 Rx Beam Peak +8.1dB) |
| $E_s$ PC3 | dBm/SCS Note4 | | | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| SSB_RP Note2 PC1 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +8.1dB) | (Table B.2.2-2 Rx Beam Peak +8.1dB) |
| SSB_RP Note2 PC3 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak +9.8dB) | (Table B.2.2-2 Rx Beam Peak +9.8dB) |
| $\hat{E}_s/I_{ot}$ BB Note6 | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.74 | | (Table B.2.2-2 Rx Beam Peak +37.40dB) | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 7: All parameters apply for configurations 1 and 2
Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 7.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 1 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 60 | n257, n258, n261 | 41 |
| | | n260 | 44 |
| | | n259 | FFS |
| Highest reported value (Cell 1) | 126 | n257, n258, n261 | 118 |
| | | n260 | 121 |
| | | n259 | FFS |

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 56 | n257, n258, n261 | 41 |
| | | n260 | 44 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 126 | n257, n258, n261 | 118 |
| | | n260 | 121 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 57+ FFS | n257, n258, n261 | 38 + FFS |
| | | n260 | 41 + FFS |
| | | n259 | FFS |
| Highest reported value (Cell 1) | 126+ FFS | n257, n258, n261 | 121 + FFS |
| | | n260 | 124 + FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | 53+ FFS | n257, n258, n261 | 38+ FFS |
| | | n260 | 41+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 126+ FFS | n257, n258, n261 | 121+ FFS |
| | | n260 | 125+ FFS |
| | | n259 | FFS |
| **UE power class 3** | | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 50 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 1) | 108 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | 46 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 103 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 47+ FFS | n257, n258, n261 | 28 + FFS |
| | | n260 | 30 + FFS |
| | | n259 | FFS |
| Highest reported value (Cell 1) | 111+ FFS | n257, n258, n261 | 91 + FFS |
| | | n260 | 93 + FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | 46+ FFS | n257, n258, n261 | 28+ FFS |
| | | n260 | 30+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 106+ FFS | n257, n258, n261 | 91+ FFS |
| | | n260 | 93+ FFS |
| | | n259 | FFS |

**Table 7.7.1.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for each cell during each time period**

| **UE power class 1** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | 16 | 16 |
| Δ(Max-Min) reported value Cell 2 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | 16 + FFS | 16+ FFS |

| | | |
|---|---|---|
| Δ(Max-Min) reported value Cell 2 | 16 + FFS | 16 + FFS |
| **UE power class 3** | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | 16 | 16 |
| Δ(Max-Min) reported value Cell 2 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | 16 + FFS | 16+ FFS |
| Δ(Max-Min) reported value Cell 2 | 16 + FFS | 16 + FFS |

**Table 7.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| **UE power class 1** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2 – Cell 1) | RSRP_x - 12 | RSRP_x - 6 |
| Highest reported value (Cell 2 – Cell 1) | RSRP_x + 2 | RSRP_x + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2 – Cell 1) | RSRP_x - 15+ FFS | RSRP_x - 9+ FFS |
| Highest reported value (Cell 2 – Cell 1) | RSRP_x + 5+ FFS | RSRP_x + 9+ FFS |
| **UE power class 3** | | |
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2 – Cell 1) | RSRP_x - 12 | RSRP_x - 6 |
| Highest reported value (Cell 2 – Cell 1) | RSRP_x + 2 | RSRP_x + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2 – Cell 1) | RSRP_x - 15+ FFS | RSRP_x - 9+ FFS |
| Highest reported value (Cell 2 – Cell 1) | RSRP_x + 5+ FFS | RSRP_x + 9+ FFS |
| RSRP_x is the reported value of Cell 1 | | |

**Table 7.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8**

| **UE power class 1** | | | |
|---|---|---|---|
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | RSRP_x - 28 | RSRP_x - 31+ FFS |
| | n260 | RSRP_x - 25 | RSRP_x - 28+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | RSRP_x - 12 | RSRP_x - 9+ FFS |
| | n260 | RSRP_x - 9 | RSRP_x - 6+ FFS |
| | n259 | FFS | FFS |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_y - 24 | RSRP_y - 27+ FFS |
| | n260 | RSRP_y - 21 | RSRP_y - 24+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_y - 8 | RSRP_y - 5+ FFS |
| | n260 | RSRP_y - 5 | RSRP_y - 2+ FFS |

| | | | |
|---|---|---|---|
| | n259 | FFS | FFS |
| **UE power class 3** | | | |
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | RSRP_x - 28 | RSRP_x - 31+ FFS |
| | n260 | RSRP_x - 26 | RSRP_x - 29+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | RSRP_x - 12 | RSRP_x - 9+ FFS |
| | n260 | RSRP_x - 10 | RSRP_x - 7+ FFS |
| | n259 | FFS | FFS |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_y - 24 | RSRP_y - 27+ FFS |
| | n260 | RSRP_y - 21 | RSRP_y - 24+ FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | RSRP_y - 8 | RSRP_y - 5+ FFS |
| | n260 | RSRP_y - 5 | RSRP_y - 2+ FFS |
| | n259 | FFS | FFS |
| RSRP_x is the reported value of Cell 1 during T1<br>RSRP_y is the reported value of Cell 2 during T1 | | | |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

### 7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

#### 7.7.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.2.

#### 7.7.1.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

##### 7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.2.4.1-1.

**Table 7.7.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.1.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| 7.7.1.2-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.2.4.1-2.

**Table 7.7.1.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.1.2.4.1-3.
2. Message contents are defined in clause 7.7.1.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRP measurements.
4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

### 7.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in clause A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.1.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport* for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

- R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R7: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R7. Otherwise, R7 is passed.

- R8: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point as defined in clause A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

- R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

- R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.2.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R10. Otherwise, R10 is passed.

#### 7.7.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-6 with condition Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.7.1.2.5 Test requirement

Table 7.7.1.2.5-1 defines the cell specific settings for all tests. Table 7.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.2.1 and relative accuracy requirements in clause 7.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R7: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R8: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R9: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R10: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

**Table 7.7.1.2.5-1: SS-RSRP Inter-frequency general test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~2 | | freq1 | freq2 | freq1 | freq2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $BW_{channel}$ | 1~2 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1 | | 24 | | 24 | |
| | 2 | | 48 | | 48 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | 1~2 | | TDD | | TDD | |
| TDD configuration | 1~2 | | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1 | | SR.3. 2 TDD | - | SR.3. 2 TDD | - |
| | 2 | | SR.3.3 TDD | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| | 2 | | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| | 2 | | CCR.3.7 TDD | | CCR.3.7 TDD | |
| SSB configuration | 1 | | SSB.3 FR2 | | SSB.3 FR2 | |
| | 2 | | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~2 | | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~2 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 1 | 1~2 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1~2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~2 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Void. | | | | | | |

**Table 7.7.1.2.5-2: SS-RSRP Inter-frequency OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | 1~2 | | Setup 4b according to clause A.9.4 | | Setup 4b according to clause A.9.4 | |
| | | | AoA1 Spherical coverage | AoA2 Rx Beam Peak | AoA1 Spherical coverage | AoA2 Rx Beam Peak |
| Assumption for UE beams Note 7 | 1~2 | | Rough | | Rough | |
| $N_{oc}$ Note1 | 1, | dBm/15kHz Note4 | -96.3 | -96.3 | (Table B.2.3-2 Rx Beam Peak Note 8 -4.63dB) | (Table B.2.3-2 Rx Beam Peak Note 8 -3.03dB) |
| | 2 | | -99.3 | -99.3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note1 | 1 | dBm/SCS Note4 | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +4.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +6.0dB) |
| | 2 | | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +7.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +9.0dB) |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 6.0 | 6.0 | 17.0 | 1.0 |
| SSB_RP Note2 | 1 | dBm/SCS | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +21.4dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +7.0dB) |
| | 2 | | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +24.4dB) | (Table B.2. 3-2 Rx Beam Peak Note 8 +10.0dB) |
| ($SSB_RP_{Cell\ 1}$ – $SSB_RP_{Cell\ 2}$) | 1~2 | dB | 0 | | 14.40 | |
| $\hat{E}_s / I_{ot}$ BB Note6 | 1 | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| | 2 | | 4. 58 | 5.87 | | |
| Io Note2 | 1 | dBm/95.04 MHz Note4 | -55.70 | -55.70 | (Table B.2.3-2 Rx Beam Peak Note 8 +46.08dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +35.13dB) |
| | 2 | | -55.7 | -55.7 | (Table B.2.3-2 Rx Beam Peak Note 8 +49.09dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +38.14dB) |
| ($Io_{freq\ 1}$ – $Io_{freq\ 2}$) | 1~2 | dB | 0 | | 11.95 | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 1}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Void

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: Void

Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.

Note 7: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Note 8: The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB_RP for $SCS_{SSB}$ = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without $\Delta MB_{P,n}$ adjustment.

**Table 7.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 33 |
| | n260 | 39 | n260 | 34 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 | | n257, n258, n261 | 101 |

| | | | | |
|---|---|---|---|---|
| | | | n260 | 104 |
| | | | n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | | n257, n258, n261 | 32 |
| | | | n260 | 34 |
| | | | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 87 |
| | | | n260 | 90 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 33 + FFS |
| | n260 | 39 + FFS | n260 | 34 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 + FFS | | n257, n258, n261 | 101 + FFS |
| | | | n260 | 104 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 + FFS | | n257, n258, n261 | 32+ FFS |
| | | | n260 | 34+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 87+ FFS |
| | | | n260 | 90+ FFS |
| | | | n259 | FFS |

**Table 7.7.1.2.5-3a: evaluation limits for the Δ(Max-Min) reported absolute values for cell 2 during each time period**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
|---|---|---|
| Δ(Max-Min) reported value Cell 2 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 2 | 16 + FFS | 16 + FFS |

**Table 7.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2**

| **UE power class 3** | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 36 |
| | n260 | 39 | n260 | 37 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 | | n257, n258, n261 | 104 |
| | | | n260 | 107 |
| | | | n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | | n257, n258, n261 | 35 |
| | | | n260 | 37 |
| | | | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | | n257, n258, n261 | 90 |
| | | | n260 | 93 |
| | | | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 + FFS | n257, n258, n261 | 36 + FFS |
| | n260 | 39 + FFS | n260 | 37 + FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 + FFS | | n257, n258, n261 | 104 + FFS |
| | | | n260 | 107 + FFS |
| | | | n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 + FFS | | n257, n258, n261 | 35+ FFS |
| | | | n260 | 37+ FFS |
| | | | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 + FFS | | n257, n258, n261 | 90+ FFS |
| | | | n260 | 93+ FFS |
| | | | n259 | FFS |

**Table 7.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | All bands: -23 | | -37 | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | +26 | n257, n258, n261 | +17 |
| | n260 | +27 | n260 | +19 |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | -23 + FFS | | -37 + FFS | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | +26 + FFS | n257, n258, n261 | +17 + FFS |
| | n260 | +27+ FFS | n260 | +19 + FFS |
| | n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.1.3 Inter-frequency measurements between FR1 and FR2

### 7.7.1.3.1 NR SA FR1-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions
- NR FR1 - FR2 OTA testability is still FFS.

#### 7.7.1.3.1.1 Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy with FR1 serving cell and FR2 target cell.

#### 7.7.1.3.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

#### 7.7.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

#### 7.7.1.3.1.4 Test description

##### 7.7.1.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.1.4.1-1.

**Table 7.7.1.3.1.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

| Config | Description of serving cell | Description of target cell |
|---|---|---|
| 7.7.1.3.1-1 | NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 7.7.1.3.1-2 | NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode | |
| 7.7.1.3.1-3 | NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.1.4.1-2.

**Table 7.7.1.3.1.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.1.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.7.1.3.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

### 7.7.1.3.1.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in clause A.9.2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.3.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport* for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in clause A.9.2 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

#### 7.7.1.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.1.3.1.4.3-1: Common Exception messages for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-6 with condition Pattern #0<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.1.3.1.4.3-2: ReportConfigNR-DEFAULT**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with Condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.7.1.3.1.5 Test requirement

Table 7.7.1.3.1.5-1 and Table 7.7.1.3.1.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.1.3.1.5-3.

**Table 7.7.1.3.1.5-1: SS-RSRP inter-frequency test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Duplex mode | 1 | | FDD | TDD | FDD | TDD |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| TDD configuration | 1 | | N/A | TDDConf. 3.1 | N/A | TDDConf. 3.1 |
| | 2 | | TDDConf. 1.1 | | TDDConf. 1.1 | |
| | 3 | | TDDConf. 2.1 | | TDDConf. 2.1 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3 | | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | 3 | | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1 | | SSB.1 FR1 | SSB.1 FR2 | SSB.1 FR1 | SSB.1 FR2 |
| | 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| | 3 | | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1~3 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~3 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~3 | | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 1 and Cell 2 | 1~3 | µs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1~3 | - | NA | AWGN | NA | AWGN |
| Antenna configuration | 1~3 | - | Link only, see TS 38.133 [6] clause A.3.7A | 1x2 | Link only, see TS 38.133 [6] clause A.3.7A | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration according to clause A.9 | | | NA | Setup 2b | NA | Setup 2b |
| Assumption for UE beams Note 4 | | | N/A | Rough | N/A | Rough |
| $N_{oc}$ | 1~6 | dBm/15 kHz | NA Link only, see clause A.3.7A of TS 38.133 [6] | -95.5 | NA Link only, see clause A.3.7A of TS 38.133 [6] | NA |
| $N_{oc}$ | 1~6 | dBm/SSB SCS | | -86.47 | | NA |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | | 5 | | NA |
| $E_s$ | 1~6 | dBm/SCS | | NA | | (Table B.2.3-2 Spherical coverage +6.5dB) |
| SSB_RP Note1 | 1~6 | dBm/SCS | | -81.47 | | (Table B.2.3-2 Spherical coverage +6.5dB) |
| $\hat{E}_s/I_{otBB}$ Note6 | 1~6 | dB | | 4.35 | | 1.69 |
| Io Note1 | 1~6 | dBm/ 95.04MHz | | -55.68 | | SSB_RP+34.48 |

Note 1: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.
Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [2] Table 6.2.1.3-4.

**Table 7.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | |
| Lowest reported value (Cell 2) | n257, n258, n261 | 46 | n257, n258, n261 | 46 |
| | n260 | 45 | n260 | 47 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | 103 | n257, n258, n261 | 101 |
| | n260 | 102 | n260 | 104 |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2** | |

| | | | | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS |
| | n259 | FFS | n259 | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 7.7.1.3.2 Void

## 7.7.2 SS-RSRQ

### 7.7.2.0 Minimum conformance requirements

#### 7.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.1.

#### 7.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.2.

### 7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 7.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

#### 7.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.1.

#### 7.7.2.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

##### 7.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.1.4.1-1.

**Table 7.7.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.1.4.1-2.

**Table 7.7.2.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.2.1.4.1-3.
2. Message contents are defined in clause 7.7.2.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 7.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7.

### 7.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

7.7.2.1.5 Test requirement

Table 7.7.2.1.5-1 defines the cell specific settings for all tests. Table 7.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 7.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.2.1.5-3.

**Table 7.7.2.1.5-1: SS-RSRQ Intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | Freq1 | | Freq1 | |
| Duplex mode | | | TDD | | TDD | |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state | | | TCI.State.0 | | TCI.State.0 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - | CR.3.1 TDD | |
| Control channel RMC | | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | | SMTC.1 | | | |
| SSB configuration | | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | | Not Applicable | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation condition | | AWGN | | AWGN | |
| Antenna Configuration | | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: Void. | | | | | |

**Table 7.7.2.1.5-2: SS-RSRQ Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 9 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -100.7 | | -96.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91.67 | | -87.67 | |
| SSB_RP Note2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| SS-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
| $\hat{E}_s/I_{ot}$ | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| $\hat{E}_s/N_{oc}$ | dB | 3 | 3 | -3 | -3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | | -55.67 | -55.67 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRQ and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>Note 6: Void.<br>Note 7: Void<br>Note 8: Void<br>Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation | | | | | |

**Table 7.7.2.1.5-3: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 (All bands) | Test 2 | |
|---|---|---|---|
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_41 | n257, n258, n261 | SS-RSRQ_35 |
| | | n260 | SS-RSRQ_34 |
| | | n259 | FFS |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | SS-RSRQ_73 | All bands | SS-RSRQ_71 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_38+ FFS | n257, n258, n261 | SS-RSRQ_34+ FFS |
| | | n260 | SS-RSRQ_33+ FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | SS-RSRQ_76+ FFS | All bands | SS-RSRQ_72+ FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

### 7.7.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.2.

### 7.7.2.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

#### 7.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.2.4.1-1.

**Table 7.7.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.2.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.2.4.1-2.

**Table 7.7.2.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |

| | | |
|---|---|---|
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.2.2.4.1-3.
2. Message contents are defined in clause 7.7.2.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.7.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.2.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport* for the following requirements:

   - R1: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

#### 7.7.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-6 with condition Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.7.2.2.5 Test requirement

Table 7.7.2.2.5-1 defines the cell specific settings for all tests. Table 7.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.2.0.2.1 and relative accuracy requirements in clause 7.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

**Table 7.7.2.2.5-1: SS-RSRQ Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 |
| SSB Configuration | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration | | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration | | Not applicable | - | Not applicable | - |
| TRS configuration | | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void | | | | | |

**Table 7.7.2.2.5-2: SS-RSRQ Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |

| AoA setup | | Setup 1 | | Setup 1 | |
|---|---|---|---|---|---|
| Assumption for UE beams[Note 8] | | Rough | | Rough | |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | -95.93 | -95.93 | -95.44 | -95.44 |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | -86.9 | -86.9 | -86.41 | -86.41 |
| $\hat{E}_s / N_{oc}$ | dB | -1.75 | -1.75 | -3 | -3 |
| SSB_RP[Note2] | dBm/SCS [Note4] | -88.65 | -88.65 | -89.41 | -89.41 |
| SS-RSRQ[Note2] | dB | -14.75 | -14.75 | -15.56 | -15.56 |
| $\hat{E}_s / I_{ot}$ | dB | -1.75 | -1.75 | -3 | -3 |
| Io[Note2] | dBm/95.04 MHz [Note4] | -55.7 | -55.7 | -55.7 | -55.7 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void
Note 7: Void
Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 7.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |

| | | |
|---|---|---|
| Lowest reported value (Cell 1) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 1) | RSRQ_73 | RSRQ_74 |
| Lowest reported value (Cell 2) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 2) | RSRQ_73 | RSRQ_74 |
| **Extreme Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Lowest reported value (Cell 1) | RSRQ_41 + FFS | RSRQ_37 + FFS |
| Highest reported value (Cell 1) | RSRQ_73 + FFS | RSRQ_74 + FFS |
| Lowest reported value (Cell 2) | RSRQ_41 + FFS | RSRQ_37 + FFS |
| Highest reported value (Cell 2) | RSRQ_73 + FFS | RSRQ_74 + FFS |

**Table 7.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | - 7 | - 9 |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 | + 9 |
| **Extreme Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | – 7 + FFS | – 9 + FFS |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.3 SS-SINR

### 7.7.3.0 Minimum conformance requirements

#### 7.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.1.

#### 7.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.2.

### 7.7.3.1 NR SA FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 7.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

#### 7.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

#### 7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.1.

#### 7.7.3.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

##### 7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.1.4.1-1.

**Table 7.7.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.1.4.1-2.

**Table 7.7.3.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.3.1.4.1-3.
2. Message contents are defined in clause 7.7.3.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-SINR measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 7.7.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.3.1.5-1 as appropriate and repeat steps 5-7.

#### 7.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 7.7.3.1.5 Test requirement

Table 7.7.3.1.5-1 defines the cell specific settings for all tests. Table 7.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 7.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.3.1.5-3.

**Table 7.7.3.1.5-1: SS-SINR Intra-frequency test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | Freq2 | | Freq2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |

| | | | | | |
|---|---|---|---|---|---|
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration | | TRS.2.1 TDD | | | |
| TCI state | | TCI.State.0 | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel | | CCR.3 .1 TDD | - | CCR.3. 1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | | | |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation condition | | AWGN | | AWGN | |
| Antenna Configuration | | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Void.<br>Note 3: Void<br>Note 4: Void | | | | | |

**Table 7.7.3.1.5-2: SS-SINR Intra-frequency OTA related test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 9 | | | Rough | | Rough | |
| $N_{oc}$ Note1 | | dBm/15kHz Note4 | -105 | | -105 | |
| $N_{oc}$ Note1 | | dBm/SCS Note3 | -96 | | -96 | |
| SSB_RP Note2 | | dBm/SCS Note4 | -91.46 | -93.34 | -98.8 | -98.8 |
| SS-SINR Note2 | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| $\hat{E}_s / I_{ot}$ | n257, 258, n261 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54 | 2.66 | -3 | -3 |
| Io Note2 | | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-SINR and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone |
| Note 5: | As observed with 0dBi gain antenna at the centre of the quiet zone |
| Note 6: | Void. |
| Note 7: | Void |
| Note 8: | Void |
| Note 9: | Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation |

**Table 7.7.3.1.5-3: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SS-SINR_22 | All bands | SS-SINR_18 |
| | n260 | SS-SINR_21 | | |
| | n259 | FFS | | |
| Highest reported value (Cell 2) | All bands | SS-SINR_58 | n257, n258, n261 | SS-SINR_55 |
| | | | n260 | SS-SINR_54 |
| | | | n259 | FFS |
| Extreme Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SS-SINR_21+ FFS | All bands | SS-SINR_17+ FFS |
| | n260 | SS-SINR_20+ FFS | | |
| | n259 | FFS | | |
| Highest reported value (Cell 2) | All bands | SS-SINR_59+ FFS | n257, n258, n261 | SS-SINR_56+ FFS |
| | | | n260 | SS-SINR_55+ FFS |
| | | | n259 | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 7.7.3.2 NR SA FR2-FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

### 7.7.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

#### 7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.2.

#### 7.7.3.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

##### 7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.2.4.1-1.

**Table 7.7.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.2.4.1-2.

**Table 7.7.3.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.3.2.4.1-3.
2. Message contents are defined in clause 7.7.3.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-SINR measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.3.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport* for the following requirements:

- R1: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

   - R4: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   And the following requirements for Test 3:

   - R7: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

   - R8: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

   - R9: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

#### 7.7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.3.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table H.3.1-5<br>Table H.3.1-6 with condition Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.7.3.2.5 Test requirement

Table 7.7.3.2.5-1 defines the cell specific settings for all tests. Table 7.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.3.0.2.1 and relative accuracy requirements in clause 7.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R8: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R9: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

**Table 7.7.3.2.5-1: SS-SINR Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | | TDD | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | | 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC. 1 | SMTC. 1 | SMTC. 1 | SMTC. 1 | SMTC. 1 | SMTC. 1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna Configuration | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void

**Table 7.7.3.2.5-2: SS-SINR Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | degrees | Setup 1 | | Setup 1 | | Setup 1 | |
| Assumption for UE beams Note 10 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | -105 | -105.1 | -105.1 | -105 | -105 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | -96 | -96.1 | -96.1 | -96 | -96 |
| $\hat{E}_s / N_{oc}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SS-RSRP[Note2] | dBm/SCS Note4 | -96.5 | -96.5 | -85.1 | -85.1 | -98.1 | -98.1 |
| SS-SINR[Note2] | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| $\hat{E}_s / I_{ot}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| Io[Note2] | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.75 | -55.75 | -64.9 | -64.9 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

**Table 7.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 1) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 1) | SINR_27 + FFS | | SINR_48 + FFS | | n257, n258, n261 | SINR_23 + FFS |
| | | | | | n260 | SINR_22 + FfS |
| | | | | | n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR_62 + FFS | n257, n258, n261 | SINR_87 + FFS | n257, n258, n261 | SINR_60 + FFS |
| | n260 | SINR_61 + FFS | n260 | SINR_86 + FFS | n260 | SINR_59 + FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lowest reported value (Cell 2) | SINR_27 + FFS | | SINR_48 + FFS | | n257, n258, n261 | SINR_23 + FFS |
| | | | | | n260 | SINR_22 + FfS |
| | | | | | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_62 + FFS | n257, n258, n261 | SINR_87 + FFS | n257, n258, n261 | SINR_60 + FFS |
| | n260 | SINR_61 + FFS | n260 | SINR_86 + FFS | n260 | SINR_59 + FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |

**Table 7.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | - 8 | - 17 | - 9 |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | + 8 | + 17 | + 9 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | – 8 + FFS | – 17 + FFS | – 9 + FFS |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | + 8 + FFS | + 17 + FFS | + 9 + FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.4 L1-RSRP

### 7.7.4.0 Minimum conformance requirements

#### 7.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.1.

#### 7.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.2.

#### 7.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.3.

#### 7.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.4.

### 7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 7.7.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 7.7.4.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 7.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.1 and 7.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

#### 7.7.4.1.4 Test description

##### 7.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.1.4.1-1.

**Table 7.7.4.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.7.4.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.7.4.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.1.4.1-2.

**Table 7.7.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.7.4.1.4.3.

2. Cell 1 is the NR FR2 cell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in Table 7.7.4.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.4.1.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall check following requirements:

   - R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3a or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.1.5-1 and repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3b or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 7.7.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.4.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |

| } | | | |
|---|---|---|---|

### 7.7.4.1.5 Test requirement

Table 7.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.1.5-3 for test configurations 1, and the corresponding absolute accuracy requirements in Table 7.7.4.1.5-4 for test configurations 2 and Table 7.7.4.1.5-3a for all configurations.

**Table 7.7.4.1.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1,2 | | freq1 | freq1 |
| Duplex mode | 1,2 | | TDD | TDD |
| TDD Configuration | 1,2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1,2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1,2 | | 66 | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD | SR.3.2 TDD |
| | 2 | | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1,2 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1,2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1,2 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1,2 | | SMTC.1 | SMTC.1 |
| reportConfigType | 1,2 | | periodic | periodic |
| reportQuantity | 1,2 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 | 2 |
| L1-RSRP reporting period | 1,2 | | slot320 | slot320 |
| Propagation condition | 1,2 | | AWGN | AWGN |
| Antenna configuration | | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.4.1.5-2: L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1,2 | dBm/15 kHz | -104.1 | | n.a. | |
| $N_{oc}$ | 1 | dBm/SSB SCS | -95.1 | | n.a. | |
| | 2 | | -92.1 | | n.a. | |
| $\hat{E}_s / I_{ot}$ | 1,2 | dB | 10 | -1.6 | n.a. | |
| SSB_RP Note1 | 1 | dBm/SCS | -85.1 | -96.9 | As in Table B.2.4-2 + 5.7 | |
| | 2 | | -78 | -90 | As in Table B.2.4-2 + 5.7 | |
| Io Note1 | 1,2 | dBm/ 95.04MHz | -55.67 | | SSB_RP+34.68 | |
| $\hat{E}_s / N_{oc}$ | 1,2 | dB | 10 | -1.6 | n.a. | |

Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (SSB#0) | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value (SSB#0) | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (SSB#0) | 39 + FFS | n257, n258, n261 | 24 + FFS |
| | | n260 | 27 + FFS |
| | | n259 | FFS |
| Highest reported value (SSB#0) | 104 + FFS | n257, n258, n261 | 86 + FFS |
| | | n260 | 89 + FFS |
| | | n259 | FFS |

**Table 7.7.4.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |

| | | |
|---|---|---|
| Δ(Max-Min) reported value SSB#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 | 18 + FFS | 18+ FFS |

**Table 7.7.4.1.5-3b: evaluation limits for the Δ(Max-Min) reported values for SSB#0 or SSB#1 for rules R3**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | 18 + FFS | 18+ FFS |

**Table 7.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 2 for the absolute accuracy rules R1, R3**

| **UE power class 3** | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value | 45 | n257, n258, n261 | 30 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value | 104 | n257, n258, n261 | 86 |
| | | n260 | 89 |
| | | n259 | FFS |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value | 42+ FFS | n257, n258, n261 | 27 + FFS |
| | | n260 | 30 + FFS |
| | | n259 | FFS |
| Highest reported value | 107+ FFS | n257, n258, n261 | 89 + FFS |
| | | n260 | 92 + FFS |
| | | n259 | FFS |

**Table 7.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 0+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | 7+ FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.7.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

### 7.7.4.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 7.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.3 and 7.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

### 7.7.4.2.4 Test description

#### 7.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.2.4.1-1.

**Table 7.7.4.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.7.4.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.2.4.1-2.

**Table 7.7.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.7.4.2.4.3.
2. Cell 1 is the NR FR2 cell and the target for CSI-RS-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.4.2.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3a or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for or CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.2.5-1 and repeat steps 3-5. In Step 4, the SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3b or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 7.7.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.4.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.4.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| csi-RS-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

7.7.4.2.5 Test requirement

Table 7.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.2.5-3 for test configurations 3 and 6 and Table 7.7.4.2.5-3a for all configurations.

**Table 7.7.4.2.5-1: L1-RSRP test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1 | | freq1 | freq1 |
| Duplex mode | 1 | | TDD | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1 | | SMTC.1 | SMTC.1 |
| CSI-RS | 1 | | CSI-RS.3.2 TDD | CSI-RS.3.2 TDD |
| reportConfigType | 1 | | periodic | periodic |
| reportQuantity | 1 | | cri-RSRP | cri-RSRP |
| Number of reported RS | 1 | | 2 | 2 |
| L1-RSRP reporting period | 1 | | slot320 | slot320 |
| Propagation condition | 1 | | AWGN | AWGN |
| Antenna configuration | 1 | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |

**Table 7.7.4.2.5-2: L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1 | dBm/15 kHz | -104.10 | | n.a. | |
| $N_{oc}$ | 1 | dBm/SSB SCS | -95.11 | | n.a.<br>n.a. | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 10 | -1.8 | n.a. | |
| CSI-RS_RP Note1 | 1 | dBm/SCS | -85.11 | -96.93 | As in Table B.2.4.2-2 + 5.7 | |
| Io Note1 | 1 | dBm/ 95.04MHz | -55.67 | | CSI-RS_RP+34.68 | |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 10 | -1.82 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

**Table 7.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (CSI-RS0) | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value (CSI-RS0) | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (CSI-RS0) | 39+ FFS | n257, n258, n261 | 25 + FFS |
| | | n260 | 27 + FFS |
| | | n259 | FFS |
| Highest reported value (CSI-RS0) | 104+ FFS | n257, n258, n261 | 86 + FFS |
| | | n260 | 89 + FFS |
| | | n259 | FFS |

**Table 7.7.4.2.5-3a: evaluation limits for the ∆(Max-Min) reported values for CSI-RS#0 for rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value CSI-RS#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value CSI-RS#0 | 18 + FFS | 18+ FFS |

**Table 7.7.4.2.5-3b: evaluation limits for the ∆(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 + FFS | 18+ FFS |

**Table 7.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 0+ FFS | 0+ FFS |
| Highest DIFF RSRP reported value | 12+ FFS | 7+ FFS |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.5 SRS-RSRP

### 7.7.5.0 Minimum conformance requirements

#### 7.7.5.0.1 Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 7.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where

- $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1
- $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 3.67us for FR2
- $N_{TA_offset}$ is defined in Table 7.1.2-2
- $T_C$ is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

**Table 7.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1**

| Accuracy | | | | | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal condition | | | Extreme condition | | | SRS Ês/Iot | Io [Note 1] range | | | | | |
| | | | | | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| dB | | | | | | dB | | dBm / $SCS_{SRS}$ | | | dBm/BW Channel | dBm/BW Channel |
| $SCS_{SRS}$ (kHz) | | | $SCS_{SRS}$ (kHz) | | | | | | | | | |
| 15 | 30 | 60 | 15 | 30 | 60 | | | $SCS_{SRS}$ = 15 kHz | $SCS_{SRS}$ = 30 kHz | $SCS_{SRS}$ = 60 kHz | | |
| ±3 | ±3.5 | ±5 | ±7.5 | ±8 | ±9.5 | ≥1 | NR_TDD_FR1_A, | -120 | -117 | -114 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_C | -119 | -116 | -113 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_D | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | | | | | NR_TDD_FR1_E | -118 | -115 | -112 | N/A | -70 |
| ±6.5 | ±7 | ±8.5 | ±9.5 | ±10 | ±11.5 | ≥1 | NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

**Table 7.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal condition | Extreme condition | SRS Ês/Iot | Io [Note 1] range |

| | | | | | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|---|
| dB | | | | dB | dBm / $SCS_{SRS}$ Note 2 | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| $SCS_{SRS}$ (kHz) | | $SCS_{SRS}$ (kHz) | | | $SCS_{SRS}$ = 60kHz | $SCS_{SRS}$ = 120kHz | | |
| 60 | 120 | 60 | 120 | | | | | |
| ±6 | ±8.5 | ±9 | ±11.5 | ≥1 | Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±9 | ±11.5 | ±11 | ±13.5 | ≥1 | N/A | | -70 | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

#### 7.7.5.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 5.7.7.0.1.2-1: SRS-RSRP measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| SRS-RSRP_0 | SRS-RSRP<-140 | dBm |
| SRS-RSRP_1 | -140≤ SRS-RSRP<-139 | dBm |
| SRS-RSRP_2 | -139≤ SRS-RSRP<-138 | dBm |
| SRS-RSRP_3 | -138≤ SRS-RSRP<-137 | dBm |
| SRS-RSRP_4 | -137≤ SRS-RSRP<-136 | dBm |
| .. | .. | … |
| SRS-RSRP_95 | -46≤ SRS-RSRP<-45 | dBm |
| SRS-RSRP_96 | -45≤ SRS-RSRP<-44 | dBm |
| SRS-RSRP_97 | -44≤ SRS-RSRP | dBm |
| SRS-RSRP_98 | Infinity | |
| Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure. | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

### 7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete
- The message content is FFS
- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.
- MU/TT analysis for UE power class other than PC3 is incomplete.
- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

#### 7.7.5.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

#### 7.7.5.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-SRS-RSRP.

#### 7.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.1.

#### 7.7.5.1.4 Test description

##### 7.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.1.4.1-1.

**Table 7.7.5.1.4.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test**

| Config | Description |
|---|---|
| 1 | 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.5.1.4.1-2.

**Table 7.7.5.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.7.5.1.4.3.
2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.1.5-1 and Table 7.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.1.5-2.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.7.5.1.4 Test description

##### 7.7.5.1.4.1 Initial conditions

##### 7.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.5.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.

<rest of the steps are FFS >

#### 7.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 7.7.5.1.5 Test requirement

Table 7.7.5.1.5-1 defines the cell specific settings for all tests. Table 7.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 7.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1 | | freq1 | freq1 |
| Duplex mode | 1 | | TDD | TDD |
| TDD configuration | 1 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns | 1 | | OP.1 | OP.1 |
| TRS configuration | 1 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | 1 | μs | 10.76 | 10.67 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1 | | AWGN | AWGN |
| Antenna configuration | 1 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 7.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PCell and Neighbour cell UE in FR2**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.9.1 | Setup 1 defined A.9.1 |
| Beam assumption Note 5 | | Fine | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note3 | -100 | N/A |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91 | N/A |
| $\hat{E}_s / N_{oc}$ | dB | 2 | N/A |
| $E_s$ | dBm/SCS Note3 | | (Table B.2.7-2 Rx Beam Peak) +5 |
| SRS_RP Note2 | dBm/SCS | -89 | (Table B.2.7-2 Rx Beam Peak) +5 |
| $\hat{E}_s / I_{ot\ BB}$ Note4 | dB | >1 | 1 |
| Io Note2 | dBm/95.04 MHz Note3 | -57.89 | (Table B.2.7-2 Rx Beam Peak +50.79dB) |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

**Table 7.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 |
| | srs-ResourceIdList | 0 |
| | resourceType | Periodic |
| | Usage | Codebook |
| SRS-Resource | SRS-ResourceId | 0 |
| | nrofSRS-Ports | Port1 |
| | transmissionComb | n2 |
| | combOffset-n2 | 0 |
| | cyclicShift-n2 | 0 |
| | resourceMapping startPosition | 0 |
| | resourceMapping nrofSymbols | n1 |
| | resourceMapping repetitionFactor | n1 |
| | freqDomainPosition | 0 |
| | freqDomainShift | 0 |
| | freqHopping c-SRS | 12 |
| | freqHopping b-SRS | 0 |
| | freqHopping | 0 |

| | | |
|---|---|---|
| | b-hop | |
| | groupOrSequenceHopping | Neither |
| | resourceType | Periodic |
| | periodicityAndOffset-p | sl160,25 |
| | sequenceId | 0 |

**Table 7.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement**

| | Test requirement Notes1,2,3 |
|---|---|
| SRS | SRS_RP -δ +$G_{min}$ ≤ Reported SRS-RSRP(dBm) ≤SRS_RP +δ +$G_{max}$ |
| Note 1: | SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test |
| Note 2: | δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test |
| Note 3: | $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class |

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 7.7.5.0. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.5.2 NR SA FR2 CLI-RSSI measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

### 7.7.5.2.1 Test purpose

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits with CLI-RSSI measurement requirements in TS 38.133 [6] clause 10.1.22.2.1.

### 7.7.5.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-RSSI.

### 7.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.2.

### 7.7.5.2.4 Test description

#### 7.7.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.2.4.1-1.

**Table 7.7.5.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test**

| Config | Description |
|---|---|
| 1 | 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

| Note: The UE is only required to be tested in one of the supported test configurations in each supported band |
|---|

Configure the test equipment and the DUT according to the parameters in Table 7.7.5.2.4.1-2.

**Table 7.7.5.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 7.7.5.2.4.3.
2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.2.5-1 and Table 7.7.5.2.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.2.5-2.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 7.7.5.2.4 Test description

#### 7.7.5.2.4.1 Initial conditions

#### 7.7.5.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.5.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.

<rest of the steps are FFS >

#### 7.7.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

### 7.7.5.2.5 Test requirement

Table 7.7.5.2.5-1 defines the cell specific settings for all tests. Table 7.7.5.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

**Table 7.7.5.2.5-1: : FR2 test parameters for CLI-RSSI accuracy**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1 | | freq1 | freq1 |
| Duplex mode | 1 | | TDD | TDD |
| TDD configuration | 1 | | TDDConf.3.1 | TDDConf.3.1 |

| | | | | |
|---|---|---|---|---|
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.3 FR2 | SSB.3 FR2 |
| OCNG Patterns Note2 | 1 | | OP.1 | OP.1 |
| TRS configuration | 1 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1 | μs | 10.67 | 10.67 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1 | | AWGN | AWGN |
| Antenna configuration | 1 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table 7.7.5.2.5-2: CLI-RSSI accuracy OTA related test parameters**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.9.1 | |
| Beam assumption Note 5 | | Fine | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/15kHz Note3 | -100+TT | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/SCS Note3 | -91 | |
| $\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource | dB | -Infinity | |
| RSRP on CLI-RSSI measurement resource Note2 | dBm/SCS | -Infinity | |
| $\hat{E}_s / I_{otBB}$ on CLI-RSSI measurement resource Note4 | dB | -Infinity | |
| Io on CLI-RSSI measurement resource Note2 | dBm/95.04 MHz Note3 | -62.01 | |

| | | |
|---|---|---|
| Io on CLI-RSSI measurement resource Note2 | dBm/1.08 MHz | -81.46 |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{OC}$ to be fulfilled.

Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

**Table 7.7.5.2.5-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| CLI-RSSI measurement resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120kHz |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl160, 25 |

**Table 7.7.5.2.5-4: CLI-RSSI absolute accuracy test requirement**

| | Test requirement Notes1,2,3 |
|---|---|
| | Io -δ +$G_{min}$ ≤ Reported CLI-RSSI(dBm) ≤Io +δ +$G_{max}$ |

Note 1: Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz

Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test

Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

## 7.7.6 L1-SINR

### 7.7.6.0 Minimum conformance requirements

#### 7.7.6.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

Dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 7.7.6.0.1-1 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS}$ < MGRP)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq$ MGRP or
- $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS}$ < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the higher layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 7.7.6.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P*N)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P*N)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320ms | ceil(M*P*N)*$T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. | |

The accuracy requirements in Table 7.7.6.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 7.7.6.0.1-3.

**Table 7.7.6.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2**

| Accuracy | Conditions |
|---|---|

| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | |
|---|---|---|---|---|---|
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz / $SCS_{CSI-RS}$ = 120kHz | | |
| ±5.5 | ±6.5 | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | N/A | -50 |

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.28.1.

### 7.7.6.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 7.7.6.0.2-1 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of $P_{CMR}$ shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

**Table 7.7.6.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$ |

| DRX cycle > 320ms | ceil(1.5*M*P*N)*$T_{DRX}$ |
|---|---|
| Note 1: | $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
| Note 2: | The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity. |

The accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3.

**Table 7.7.6.0.2-2: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2**

| **Accuracy** | | **Conditions** | | | | |
|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB CMR Ês/Iot** Note 3 | **NZP-IMR Ês/Iot** Note 3 | **Io** Note 1 **range** | | |
| | | | | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **dB** | **dBm / $SCS_{SSB}$** Note 2 | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. | | | | | | |
| NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. | | | | | | |
| NOTE 3: In the test cases, the SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

**Table 7.7.6.0.2-3: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2**

| **Accuracy** | | **Conditions** | | | |
|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB CMR Ês/Iot** Note 3 | **Io** Note 1 **range** | | |
| | | | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **dBm / $SCS_{SSB}$** Note 2 | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | |
| ±4.5 | ±5.5 | ≥-3 | Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | N/A | -50 |

| | |
|---|---|
| NOTE 1: | Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. |
| NOTE 2: | Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. |
| NOTE 3: | In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.28.2.

### 7.7.6.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 7.7.6.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the

resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between $P_{CMR}$ and $P_{IMR}$, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of $P_{CMR}$ and $P_{IMR}$ shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

**Table 7.7.6.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2**

| Configuration | $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P*N)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.<br>Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

The accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3.

**Table 7.7.6.0.3-2: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | NZP-IMR Ês/Iot Note 3 | Io Note 1 range | | |
| | | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

**Table 7.7.6.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 2 | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±4.5 | ±5.5 | ≥-3 | Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.28.3.

## 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for test frequencies > 40.8 GHz

### 7.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 7.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

#### 7.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.1.

#### 7.7.6.1.4 Test description

##### 7.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.1.4.1-1.

**Table 7.7.6.1.4.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| Config | Description |
|---|---|
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.1.4.1-2.

**Table 7.7.6.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 7.7.6.1.4.3.
2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the CSI-RS based L1-SINR measurements. The UE is configured to perform RLM and BFD measurement based on the CSI-RS.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.6.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.7.6.1.5-1.
3. After 640ms from the start of the test the SS transmits CSI-RS with a periodicity of 20 slots.
4. The SS shall check following requirements:

- R1: the L1-SINR reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. If the value for both CSI-RSs is within the limits in Table 7.7.6.1.5-2 or Table 7.7.6.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

- R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: the DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.1.5-1 as appropriate and repeat steps 3-5.

#### 7.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.6.1.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.6.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. | |
| } | | | |
| } | | | |

#### 7.7.6.1.5 Test requirement

Table 7.7.6.1.5-1 defines the primary level settings excluding test tolerances for all tests. (Refer to Sec. 7.7.3.1.5)

Each L1-SINR measurement report for each of the tests in Table 7.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 for test configuration 3.

**Table 7.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |

| | | | |
|---|---|---|---|
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| SMTC configuration | 1 | | SMTC.1 |
| CSI-RS | 1 | | CSI-RS.3.2 TDD |
| reportConfigType | 1 | | periodic |
| reportQuantity | 1 | | cri-SINR-r16 |
| nrofReportedRS | 1 | | 2 |
| L1-SINR reporting period | 1 | | slot80 |
| Propagation condition | 1 | | AWGN |
| Antenna configuration | 1 | | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |

**Table 7.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.1 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -95.1 | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 10 | -1.8 |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -85.07 | -96.87 |
| Io Note1 | 1~2 | dBm/ | -55.67 | -63.88 |

| | | | | |
|---|---|---|---|---|
| | | 95.04M Hz | | |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 10 | -1.8 |

Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 3: Void.
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 and the corresponding relative accuracy requirements in Table 7.7.6.1.5-4.

**Table 7.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values R1**

| **UE power class 3** | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 53 |
| Highest reported value (CSI-RS0) | 76 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 51 |
| Highest reported value (CSI-RS0) | 78 |

**Table 7.7.6.1.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3**

| **UE power class 3** | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest DIFF SINR reported value | 6 |
| Highest DIFF SINR reported value | 15 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest DIFF SINR reported value | 5 |
| Highest DIFF SINR reported value | 15 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 7.7.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

### 7.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.2.

### 7.7.6.2.4 Test description

#### 7.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.2.4.1-1.

**Table 7.7.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.2.4.1-2.

**Table 7.7.6.2.4.1-2: Initial conditions for SSB based L1-SINR absolute accuracy in FR2**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.6.2.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 7.7.6.2.4.3.
2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM

resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR..

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.7.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.6.2.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 7.7.6.2.5-2 and Table 7.7.6.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: the DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.2.5-1 as appropriate and repeat steps 3-5.

#### 7.7.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.6.2.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR<br>Table H.3.6A-2 with conditions SSB and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.6.2.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM | |

| | | | |
|---|---|---|---|
| | | and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

7.7.6.2.5 Test requirement

Table 7.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.6.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.2.5-3 for test configuration 3.

**Table 7.7.6.2.5-1: FR2 L1-SINR general test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| CSI-IM configuration | 1~2 | | CSI-IM 3.1 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 |
| reportConfigType | 1~2 | | periodic |
| reportQuantity-r16 | 1~2 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| L1-SINR reporting period | 1~2 | | slot640 |
| Propagation condition | 1~2 | | AWGN |
| Antenna configuration | 1~2 | | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.6.2.5-2: FR2 L1-SINR SSB specific test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | SSB0 | SSB1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams[Note 4] | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15kHz | -104.1 | |
| $N_{oc}$ | 1 | dBm/SSB SCS | -95.1 | |
| | 2 | | 92.1 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | 1.8 |
| SS-RSRP[Note1] | 1 | dBm/SCS | -85.07 | -96.87 |
| | 2 | | -82.06 | -93.86 |
| Io[Note1] | 1~2 | dBm/95.04 MHz | -55.67 | |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | -1.8 |

Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 3: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 1 shall meet the corresponding absolute accuracy of SSB#0+CSI-IM#0 and absolute accuracy of SSB#1+CSI-IM#1 in Table 7.7.6.2.5-3. The corresponding relative accuracy requirements in Table 7.7.6.2.5-4

**Table 7.7.6.2.5-3: L1-SINR absolute accuracy test requirement R1**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 55 |
| Highest reported value (CSI-RS0) | 74 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 53 |
| Highest reported value (CSI-RS0) | 76 |

**Table 7.7.6.2.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |

| | |
|---|---|
| Lowest DIFF SINR reported value | 7 |
| Highest DIFF SINR reported value | 15 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest DIFF SINR reported value | 6 |
| Highest DIFF SINR reported value | 15 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 7.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 7.7.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

### 7.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.3.

### 7.7.6.3.4 Test description

#### 7.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.3.4.1-1.

**Table 7.7.6.3.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based both CMR based IMR**

| Config | Description |
|---|---|
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.3.4.1-2.

**Table 7.7.6.3.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.6.3.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |

| | | |
|---|---|---|
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 7.7.6.3.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

#### 7.7.6.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.6.3.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 is within the limits in Table 7.7.6.3.5-2 and Table 7.7.6.3.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.3.5-1 as appropriate and repeat steps 3-5.

#### 7.7.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.6.3.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6A-1 with conditions PERIODIC and CSI-SINR<br>Table H.3.6A-2 with conditions CSI-RS and PERIODIC<br>Table H.3.6A-3 with condition PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.6.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSB. | |
| } | | | |
| } | | | |

7.7.6.3.5 Test requirement

Table 7.7.6.3.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 7.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.3.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.3.5-3 for test configuration 3.

**Table 7.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based both CMR and IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1 ULBWP.1.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| SMTC configuration | 1 | | SMTC.1 |
| CSI-RS configuration as CMR | 1 | | CSI-RS.3.2 TDD |
| CSI-RS configuration as IMR | 1 | | CSI-RS.3.3A TDD |
| reportConfigType | 1 | | periodic |
| reportQuantity-r16 | 1 | | cri-SINR-r16 |
| nrofReportedRS | 1 | | 2 |
| L1-RSRP reporting period | 1 | | slot80 |
| Propagation condition | 1 | | AWGN |
| Antenna configuration | 1 | | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |

**Table 7.7.6.3.5-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.1 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -95.1 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | 0.2 |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -85.07 | -94.87 |
| Io Note1 | 1~2 | dBm/ 95.04MHz | -55.67 | -62.97 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | 0.2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 1 shall meet the corresponding absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1 in Table 7.7.6.3.5-3. The corresponding relative accuracy of CSI-RS#0 compared with CSI-RS#1 in Table 7.7.6.3.5-4.

**Table 7.7.6.3.5-3: L1-SINR absolute accuracy test requirement R1**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 55 |
| Highest reported value (CSI-RS0) | 74 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 53 |

| | |
|---|---|
| Highest reported value (CSI-RS0) | 76 |

**Table 7.7.6.3.5-4: L1-SINR relative accuracy test requirement for the reported values R2 and R3**

| UE power class 3 | |
|---|---|
| **Normal Conditions** | **Test 1 All bands** |
| Lowest DIFF SINR reported value | 5 |
| Highest DIFF SINR reported value | 13 |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest DIFF SINR reported value | 4 |
| Highest DIFF SINR reported value | 14 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.7 CSI-RSRP

### 7.7.7.0 Minimum conformance requirements

Same as in clause 5.7.7.0.

### 7.7.7.1 Intra-frequency measurements

#### 7.7.7.1.1 NR SA FR2 CSI-RSRP measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing
- Test procedure is missing
- Cell mapping is missing
- Applicability is missing
- TT is missing

##### 7.7.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency CSI-RS based RSRP measurement accuracy for NR FR2 is within the specified limits for all bands. This test will partly verify the requirements in clauses 10.1.3.2.1 & 10.1.3.2.2 in TS 38.133 [6].

##### 7.7.7.1.1.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting CSI-RS based RSRP and RSRQ measurement.

##### 7.7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.7.7.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.7.1

##### 7.7.7.1.1.4 Test description

#### 7.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.7.1.1.4.1-1.

**Table 7.7.7.1.1.4.1-1: NR SA FR1 CSI-RSRP measurement accuracy supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.7.1.1-1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.7.1.1.1.1.4.1-2.

**Table 7.7.7.1.1.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table TBD | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.7.7.1.1.4.3.
2. There are two cells on the same frequency. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

#### 7.7.7.1.1.4.2 Test procedure

TBD

#### 7.7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.7.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

### 7.7.7.1.1.5 Test requirement

Tables 7.7.7.1.1.5-1 and 7.7.7.1.1.5-2 define the NR cell specific test parameters, not including test tolerances yet.

**Table 7.7.7.1.1.5-1: Cell specific test parameters**

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 24 | | 100: $N_{RB,c}$ = 24 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - | DLBWP.1.1 | - |

| | | | | | |
|---|---|---|---|---|---|
| Uplink initial BWP configuration | | ULB WP.0.1 | - | ULB WP.0.1 | - |
| Uplink dedicated BWP configuration | | ULB WP.1.1 | - | ULB WP.1.1 | - |
| DRX cycle configuration | | Not applicable | - | Not applicable | - |
| TRS configuration | | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.3 | OP.3 | OP.3 | OP.3 |
| SMTC configuration | | SMTC.1 | | SMTC.1 | |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | |
| Time offset with Cell 1 | µs | - | 0.58 | - | 0.58 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Propagation conditions | | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

**Table 7.7.7.1.1.5-2: CSI-RSRP Intra-frequency OTA related test parameters**

| Parameter | Unit | T1 | | T2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beams Note 7 | | Rough | | Assumption for UE beams Note 7 | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -91.6 | | N/A | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note1 | dBm/SCS Note4 | -82.6 | | N/A | |
| $\hat{E}_s / N_{oc}$ | dB | 6.0 | 1.0 | N/A | N/A |
| Es | dBm/SCS Note4 | | | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) |
| CSI-RS_RP Note2 | dBm/SCS | -76.6 | -81.6 | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2.2-2 Rx Beam Peak +2.1dB) |
| $\hat{E}_s / I_{ot}$ BB Note6 | dB | 2.44 | -5.98 | -5.98 | -5.98 |
| Io Note2 | dBm/95.04 MHz Note4 | -50.05 | | (Table B.2.2.2-2 Rx Beam Peak +29.70dB) | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-RS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Void
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: Void
Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.7.7.1.1.5-3: SS-RSRP Intra-frequency accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

## 7.7.7.2 Inter-frequency measurements

### 7.7.7.2.1 NR SA FR2-FR2 CSI-RSRP measurement accuracy

Editor's Note: This test case is incomplete. The following still is missing:

- Message content is missing
- Test procedure is missing
- Cell mapping is missing
- Applicability is missing
- TT is missing

#### 7.7.7.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency CSI-RS based RSRP measurement accuracy for NR FR2 is within the specified limits for all bands. This test will partly verify the requirements in clauses 10.1.5.2.1 and 10.1.5.2.2 in TS 38.133 [6].

#### 7.7.7.2.1.2 Test applicability

This test applies to all types of NR UE release 16 forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 7.7.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.7.7.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.7.2.

#### 7.7.7.2.1.4 Test description

In this test, there TBD.

##### 7.7.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.7.2.1.4.1-1.

**Table 7.7.7.2.1.4.1-1: NR SA FR1 CSI-RSRP measurement accuracy supported test configurations**

| Configuration | Description |
|---|---|
| 7.7.7.2.1-1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.7.2.1.1.1.4.1-2.

**Table 7.7.7.2.1.4-3: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table TBD | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | | | |

1. Message contents are defined in clause 7.7.7.2.1.4.3.
2. There are two cells on the different frequencies. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.

##### 7.7.7.2.1.4.2 Test procedure

TBD

##### 7.7.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 7.7.7.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | TBD |

7.7.7.2.1.5 Test requirement

Table 7.7.7.2.1.5-1 defines the NR cell specific test parameters, not including test tolerances yet.

**Table 7.7.7.2.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| $BW_{channel}$ | | | 100: $N_{RB,c}$ = 24 | | 100: $N_{RB,c}$ = 24 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | | | TDD | TDD | TDD | TDD |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| SSB configuration | | | SSB.3 FR2 | | SSB.3 FR2 | |
| SMTC configuration | | | SMTC.1 | | SMTC.1 | |
| OCNG Patterns | | | OP.3 | | OP.3 | |
| Initial BWP Configuration | | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | | | TCI.State.2 | | TCI.State.2 | |
| CSI-RS configuration for RRM | | | CSI-RS.RRM.FR2.1 TDD | | CSI-RS.RRM.FR2.1 TDD | |
| Time offset between Cell 2 and Cell 3 | | µs | 0.58 | | 0.58 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

**Table 7.7.7.2.1.5-2: CSI-RSRP Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 4b according to clause A.3.15.4.2 | | Setup 4b according to clause A.3.15.4.2 | |

| | | AoA1 Spherical coverage | AoA2 Rx Beam Peak | AoA1 Spherical coverage | AoA2 Rx Beam Peak |
|---|---|---|---|---|---|
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -90.6 | -90.6 | (Table B.2.3.2-2 Rx Beam Peak +1.97dB) | (Table B.2.3.2-2 Rx Beam Peak -3.03dB) |
| Assumption for UE beams Note 7 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -81.6 | -81.6 | (Table B.2.3.2-2 Rx Beam Peak +11.0dB) | (Table B.2.3.2-2 Rx Beam Peak +6.0dB) |
| $\hat{E}_s / N_{oc}$ | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| CSI-RS_RP Note2 | dBm/SCS | -75.60 | -75.60 | (Table B.2.3.2-2 Rx Beam Peak +28.0dB) | (Table B.2.3.2-2 Rx Beam Peak +5.0dB) |
| (CSI-RS_RP$_{Cell\ 1}$ – CSI-RS_RP$_{Cell\ 2}$) | dB | 0 | | 23.00 | |
| $\hat{E}_s / I_{ot\ BB}$ Note6 | dB | 5.29 | 5.96 | 8.86 | -3.92 |
| Io Note2 | dBm/95.04 MHz Note4 | -50.03 | -50.03 | (Table B.2.3.2-2 Rx Beam Peak +52.68dB) | (Table B.2.3.2-2 Rx Beam Peak +33.13dB) |
| (Io$_{freq\ 1}$ – Io $_{freq\ 2}$) | dB | 0 | | 19.55 | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: CSI-RS_RP, Es/Iot, Io, (CSI-RS_RP$_{Cell\ 2}$ – CSI-RS_RP$_{Cell\ 1}$) and (Io$_{freq\ 2}$ – Io $_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Void

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: Void

Note 6: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 7.7.7.2.1.5-3: SS-RSRP Intra-frequency accuracy requirements for the reported values for test configurations 1 and 2**

TBD

The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90% with the confidence level of 95%,

# 7.7.8 CSI-RSRQ

## 7.7.8.0 Minimum conformance requirements

### 7.7.8.0.1 Intra-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.8.2 and Clause 10.1.11]

#### 7.7.8.0.1.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in clause 9.10.2.1 in TS 38.133 [6] in FR2.

The accuracy requirements in Table 7.7.8.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 in TS 38.133 [6] for a corresponding Band for each relevant SSB.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.8.0.1.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for intra-frequency measurement is serving cell timing.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 7.7.8.0.1.1-1: CSI-RSRQ Intra-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 2] range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ [Note 1] | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±2.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.8-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-6 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 7.7.8.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 7.7.8.0.1.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|

| | | |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 7.7.8.0.2 Inter-frequency CSI-RSRQ accuracy requirements

[TS 38.133, Clause 10.1.10.2 and Clause 10.1.11]

#### 7.7.8.0.2.1 Absolute CSI-RSRQ accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply the inter-frequency measurement defined in clause 9.10.3.1 in TS 38.133 [6] in FR2.

The accuracy requirements in Table 7.7.8.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.8.0.2.1-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 7.7.8.0.2.1-1: CSI-RSRQ Inter-frequency absolute accuracy in FR2**

| **Accuracy** | | **Conditions** | | | |
|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io [Note 2] range** | | |
| | | | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **dBm / $SCS_{CSI-RS}$ [Note 1]** | | **dBm/$BW_{Channel}$** |
| | | | **$SCS_{CSI-RS}$ = 60kHz** | **$SCS_{CSI-RS}$ = 120kHz** | |
| ±2.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-4 | | | |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. | | | | | |

| | |
|---|---|
| Note 2: | Io specified at the reference point and assumed to have constant EPRE across the bandwidth. |
| Note 3: | In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

The reporting range of CSI-RSRQ measurement is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 7.7.8.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 7.7.8.0.2.1-2: CSI-RSRQ measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-RSRQ_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ_127 | 20 ≤ CSI-RSRQ | dB |

### 7.7.8.0.2.2 Relative CSI-RSRQ accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR2.

The accuracy requirements in Table 7.7.8.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 in TS 38.133 [6] for a corresponding Band for the associated SSB.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.8.0.2.2-1.
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

Note: The reference measurement timing for one layer for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

**Table 7.7.8.0.2.2-1: CSI-RSRQ Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | |
|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | |
| | | | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | $dBm/BW_{Channel}$ |

| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
|---|---|---|---|---|---|
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±4 | ±4 | ≥-4 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.
Note 4: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

## 7.7.8.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 7.7.8.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8.2.1 in TS 38.133 [6].

### 7.7.8.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA and CSI-RS based RSRP and RSRQ measurements.

### 7.7.8.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 7.7.8.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.7.7.8.1.

### 7.7.8.1.4 Test description

#### 7.7.8.1.4.1 Initial conditions

Supported test configurations are shown in Table 7.7.8.1.4.1-1.

**Table 7.7.8.1.4.1-1: CSI-RSRQ Intra-frequency CSI-RSRQ supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.8.1.4.1-2.

**Table 7.7.8.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |

| | | |
|---|---|---|
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.8.1.5-1.
2. Message contents are defined in Clause 7.7.8.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the CSI-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 7.7.8.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 7.7.8.1.5-1 and 7.7.8.1.5-2 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic *MeasurementReport*. The CSI-RSRQ value of Cell 2 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined Table 7.7.8.0.1.1-1 and Table 7.7.8.0.1.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.8.1.5-1 and 7.7.8.1.5-2 as appropriate and repeat steps 5-7.

### 7.7.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 7.7.8.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and RSRQ |

**Table 7.7.8.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |

| | | | |
|---|---|---|---|
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

7.7.8.1.5 Test Requirement

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ+2.5 dB to Nominal CSI-RSRQ-3.5 dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ+3.5 dB to Nominal CSI-RSRQ-4.5 dB according to the requirements in Clause 7.7.8.0.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal RSRQ is the value shown in Table 7.7.8.1.5-2.

**Table 7.7.8.1.5-1: CSI-RSRQ Intra-frequency test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | Freq1 | | Freq1 | |
| Duplex mode | | | TDD | | TDD | |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| TRS configuration | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| TCI state | | | TCI.State.0 | | TCI.State.0 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - | CR.3.1 TDD | |
| Control channel RMC | | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | OP.1 | OP.1 | OP.1 |
| Time offset with Cell 1 | | µs | - | 0.58 | - | 0.58 |
| SMTC configuration | | | SMTC.1 | | | |
| SSB configuration | | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| CSI-RS configuration for RRM | | | CSI-RS.RRM.FR2.1 TDD | | | |
| EPRE ratio of CSI-RS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PSS to SSS | | | | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | | | AWGN | | AWGN | |
| Antenna configuration | | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.8.1.5-2: CSI-RSRQ Intra-frequency OTA related test parameters**

| | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | | Setup 1according to Clause A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 9 | | Rough | | | |
| $N_{OC}$ Note1 | dBm/15kHz Note 4 | -100.7 | | -96.7 | |
| $N_{OC}$ Note1 | dBm/SCS Note3 | -91.7 | | -87.7 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| CSI-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
| $\hat{E}_s/N_{oc}$ for SSB | dB | 3 | 3 | -3 | -3 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | 3 | 3 | -3 | -3 |
| $\hat{E}_s/I_{ot}$ for SSB | dB | -1.83 | -1.83 | -4.81 | -4.81 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | -1.83 | -1.83 | -4.81 | -4.81 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | | -55.67 | -55.67 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.
Note 6: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 7: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 7.7.8.1.5-3: CSI-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | CSI-RSRQ_52 | n257, n258, n261 | CSI-RSRQ_46 |
| | n260 | CSI-RSRQ_51 | n260 | CSI-RSRQ_46 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands | CSI-RSRQ_62 | All bands | CSI-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 7.7.8.2 SA inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 7.7.8.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.10.2.1 and 10.1.10.2.2 in TS 38.133 [6] for inter-frequency measurement.

#### 7.7.8.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA and CSI-RS based RSRP and RSRQ measurements.

#### 7.7.8.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 7.7.8.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.7.7.8.2.

#### 7.7.8.2.4 Test description

##### 7.7.8.2.4.1 Initial conditions

Supported test configurations are shown in Table 7.7.8.2.4.1-1.

**Table 7.7.8.2.4.1-1: CSI-RSRQ Inter-frequency supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.8.2.4.1-2.

**Table 7.7.8.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.8.2.5-1.
2. Message contents are defined in Clause 7.7.8.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the CSI-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.8.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 7.7.8.2.5-1 and 7.7.8.2.5-2 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the CSI-RSRQ reported values in the periodic *MeasurementReport*. The CSI-RSRQ value of Cell 2 reported by the UE is compared to the expected CSI-RSRQ. If the value is outside the limits (determined by Table 7.7.8.0.2.1-1 and Table 7.7.8.0.2.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.8.2.5-1 and 7.7.8.2.5-2 as appropriate and repeat steps 5-7.

### 7.7.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 7.7.8.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-6 with condition gapUE and Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and RSRQ |

**Table 7.7.8.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.7.8.2.5 Test Requirement

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ+2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in Clause 7.7.8.0.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The CSI-RSRQ relative measurement accuracy shall fulfil the requirements in Clause 7.7.8.0.2.2.

**Table 7.7.8.2.5-1: CSI-RSRQ Inter-frequency general test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | Freq1 | freq2 | freq1 | Freq2 |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |

| | | | | | |
|---|---|---|---|---|---|
| Time offset with Cell 1 | µs | - | 0.58 | - | 0.58 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of CSI-RS to SSS | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.8.2.5-2: CSI-RSRQ Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup | | Setup 1 in Clause A.3.15 in TS 38.133 [6]. | | Setup 1 in Clause A.3.15 in TS 38.133 [6]. | |
| Assumption for UE beams Note 8 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -95.93 | | -95.44 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -86.90 | | -86.41 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -88.65 | -88.65 | -89.41 | -89.41 |
| CSI-RSRQ Note2 | dB | -14.80 | -14.80 | -15.59 | -15.59 |
| $\hat{E}_s/N_{oc}$ for SSB | dB | -1.75 | -1.75 | -3 | -3 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | -1.75 | -1.75 | -3 | -3 |
| $\hat{E}_s/I_{ot}$ for SSB | dB | -1.81 | -1.81 | -3.06 | -3.06 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | -1.81 | -1.81 | -3.06 | -3.06 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.69 | -55.69 | -55.66 | -55.66 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 7.7.8.2.5-3: Evaluation limits for the reported values for T1 and T2 absolute accuracy**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | RSRQ 52 | n257, n258, n261 | RSRQ_48 |
| | | n260 | RSRQ_48 |
| Highest reported value (Cell 1) | RSRQ 62 | n257, n258, n261 | RSRQ_63 |
| | | n260 | RSRQ_62 |

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | RSRQ 52 | n257, n258, n261 | RSRQ_48 |
| | | n260 | RSRQ_48 |
| Highest reported value (Cell 2) | RSRQ 62 | n257, n258, n261 | RSRQ_63 |
| | | n260 | RSRQ_62 |

**Table 7.7.8.2.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | - 7 | - 9 |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 | + 9 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 7.7.9 CSI-SINR

## 7.7.9.0 Minimum conformance requirements

### 7.7.9.0.1 Intra-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.13.2 and Clause 10.1.16]

#### 7.7.9.0.1.1 Absolute CSI-SINR accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 7.7.9.0.1.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.12 in TS 38.133 [6] for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in Clause 7.3.4 of TS 38.101-2 [3].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
  - Note: The reference measurement timing for intra-frequency measurement is serving cell timing.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.9.0.1.1-1.

**Table 7.7.9.0.1.1-1: CSI-SINR Intra-frequency absolute accuracy in FR2**

| **Accuracy** | | **Conditions** | | | |
|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io [Note 2] range** | | |
| | | | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **dBm / $SCS_{CSI-RS}$ [Note 1]** | | **$dBm/BW_{Channel}$** |
| | | | **$SCS_{CSI-RS}$ = 60kHz** | **$SCS_{CSI-RS}$ = 120kHz** | |
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.8-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±3.5 | ±4 | ≥-6 | | | |

| | |
|---|---|
| Note 1: | Values based on Refsens and EIS spherical coverage as defined in Clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. |
| Note 2: | Io specified at the reference point and assumed to have constant EPRE across the bandwidth. |
| Note 3: | In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |
| Note 4: | The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP. |

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 7.7.9.0.1.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 7.7.9.0.1.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

### 7.7.9.0.2 Inter-frequency CSI-SINR accuracy requirements

[TS 38.133, Clause 10.1.15.2 and Clause 10.1.16]

#### 7.7.9.0.2.1 Absolute CSI-SINR accuracy

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 7.7.9.0.2.1-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in Clause 7.3.4 of TS 38.101-2 [3].
- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.
    - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
    - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.9.0.2.1-1.

**Table 7.7.9.0.2.1-1: CSI-SINR Inter-frequency absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | $dBm/BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±3 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| 3.5 | ±4 | ≥-4 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in Clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
Note 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

The reporting range of CSI-SINR for reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 7.7.9.0.2.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 7.7.9.0.2.1-2: CSI-SINR measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| CSI-SINR_0 | CSI-SINR <-23 | dB |
| CSI-SINR_1 | -23≤ CSI-SINR <-22.5 | dB |
| CSI-SINR_2 | -22.5≤ CSI-SINR <-22 | dB |
| CSI-SINR_3 | -22≤ CSI-SINR <-21.5 | dB |
| CSI-SINR_4 | -21.5≤ CSI-SINR <-21 | dB |
| .. | .. | … |
| CSI-SINR_123 | 38≤ CSI-SINR <38.5 | dB |
| CSI-SINR_124 | 38.5≤ CSI-SINR <39 | dB |
| CSI-SINR_125 | 39≤ CSI-SINR <39.5 | dB |
| CSI-SINR_126 | 39.5≤ CSI-SINR <40 | dB |
| CSI-SINR_127 | 40≤ CSI-SINR | dB |

### 7.7.9.0.2.2 Relative CSI-SINR accuracy

The relative accuracy of CSI-SINR in inter-frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR2 compared to the CSI-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 7.7.9.0.2.2-1 are valid under the following conditions:

- Conditions defined in Clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.13 in TS 38.133 [6] for a corresponding Band.
- $|CSI_RP1_{dBm} - CSI_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in Clause 7.3.4 of TS 38.101-2 [3].

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is no larger than CP.

  - Note: The reference measurement timing for inter-frequency measurement is up to UE implementation and shall be based on the timing of one of the target cells.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

  - The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 7.7.9.0.2.2-1.

**Table 7.7.9.0.2.2-1: CSI-SINR Inter-frequency relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range | | |
| | | | Minimum Io | | Maximum Io |
| dB | dB | dB | dBm / $SCS_{CSI-RS}$ Note 1 | | dBm/$BW_{Channel}$ |
| | | | $SCS_{CSI-RS}$ = 60kHz | $SCS_{CSI-RS}$ = 120kHz | |
| ±3.5 | ±4 | ≥-3 | Same value as CSI_RP in Table B.2.9-2 in TS 38.133 [6], according to UE Power class, operating band and angle of arrival | | -50 |
| ±4 | ±4 | ≥-6 | | | |

Note 1: Values based on Refsens and EIS spherical coverage as defined in Clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
Note 2: Io specified at the reference point and assumed to have constant EPRE across the bandwidth.
Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
Note 4: The requirements apply for CSI-RS Ês/Iot ≤XdB. X=15 if timing offset between the reference measurement timing and the target CSI-RS is no larger than 0.5*CP, and X=4 if timing offset between the reference measurement timing and the target CSI-RS is larger than 0.5*CP but no larger than CP.

## 7.7.9.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

### 7.7.9.1.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.13.2.1 in TS 38.133 [6].

### 7.7.9.1.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA, which supports CSI-RS based SINR measurements.

### 7.7.9.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 7.7.9.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.7.7.9.1.

#### 7.7.9.1.4 Test description

##### 7.7.9.1.4.1 Initial conditions

Supported test configurations are shown in Table 7.7.9.1.4.1-1.

**Table 7.7.9.1.4.1-1: CSI-SINR Intra-frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.8.1.4.1-2.

**Table 7.7.9.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.9.1.5-1.
2. Message contents are defined in Clause 7.7.9.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the CSI-SINR measurements. The TCI status for Cell 1 is defined in Table A.3.16.2-1 in TS 38.133 [6] and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1 in TS 38.133 [6].
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

##### 7.7.9.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 7.7.9.1.5-1 and 7.7.9.1.5-2 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic *MeasurementReport*. The CSI-SINR value of Cell 2 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 7.7.9.0.1.1-1 and Table 7.7.9.0.1.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.9.1.5-1 and 7.7.9.1.5-2 as appropriate and repeat steps 5-7.

### 7.7.9.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 7.7.9.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-7 with condition CSI-RS MOBILITY and SINR |

**Table 7.7.9.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| rsType | csirs | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.7.9.1.5 Test Requirement

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+XdB to Nominal CSI-SINR –X-1dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +YdB to Nominal CSI-SINR –Y-1dB according to the requirements in Clause 7.7.9.0.1.1 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test. The relative CSI-SINR measurement accuracy shall fulfil the requirements in Clause 7.7.9.0.1.1.

Editor's note: The values of X and Y are pending on the accuracy requirement discussion.

**Table 7.7.9.1.5-1: CSI-SINR Intra-frequency test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | Freq2 | | Freq2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration | | TRS.2.1 TDD | | | |
| TCI state | | TCI.State.0 | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | |

| | | | | | |
|---|---|---|---|---|---|
| Dedicated RMSI CORESET Reference Channel | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| Time offset with Cell 1 | µs | - | 0.29 | - | 0.29 |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | | | |
| SSB configuration | | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of CSI-RS to SSS | | | | | |
| EPRE ratio of OCNG to SSS Note 1 | | | | | |
| Propagation conditions | | AWGN | | | |
| Antenna configuration | | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 7.7.9.1.5-2: CSI-SINR Intra-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 3 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | | Setup 1 according to Clause A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 9 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -91.43 | -93.31 | -98.77 | -98.77 |
| CSI-SINR Note2 | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| $\hat{E}_s / N_{oc}$ for SSB | dB | 4.54 | 2.66 | -2.8 | -2.8 |
| $\hat{E}_s / N_{oc}$ for CSI-RS | dB | 4.54 | 2.66 | -2.8 | -2.8 |
| $\hat{E}_s / I_{ot}$ for SSB | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| $\hat{E}_s / I_{ot}$ for CSI-RS | dB | -0.18 | -3.32 | -4.95 | -4.95 |
| Io Note2 | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

| | |
|---|---|
| Note 6: | NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6]. |
| Note 7: | Void |
| Note 8: | Void |
| Note 9: | Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation. |

**Table 7.7.9.1.5-3: CSI-SINR Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| Normal Conditions | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | CSI-SINR_32 | n257, n258, n261 | CSI-SINR_29 |
| | n260 | CSI-SINR_32 | n260 | CSI-SINR_28 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | All bands | CSI-SINR_48 | All bands | CSI-SINR_45 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 7.7.9.2 SA inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

### 7.7.9.2.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.15.2.1 and 10.1.15.2.2 in TS 38.133 [6] for inter-frequency measurement.

### 7.7.9.2.2 Test applicability

This test applies to all types of NR UE Rel-16 and forward supporting NR SA, which supports CSI-RS based SINR measurements.

### 7.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 7.7.9.0.2.

The normative reference for this requirement is in TS 38.133 [6] A.7.7.9.2.

### 7.7.9.2.4 Test description

#### 7.7.9.2.4.1 Initial conditions

Supported test configurations are shown in Table 7.7.9.2.4.1-1.

**Table 7.7.9.2.4.1-1: CSI-SINR Inter-frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 7.7.9.2.4.1-2.

**Table 7.7.9.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | |
| Channel bandwidth | As specified by the selected test configuration. | |

| | | |
|---|---|---|
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 7.7.9.2.5-1.
2. Message contents are defined in Clause 7.7.9.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the CSI-SINR measurements. The TCI status for Cell 1 is defined in Table A.3.16.2-1 in TS 38.133 [6] and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1 in TS 38.133 [6].
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

### 7.7.9.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] Clause 4.5.
2. Set the parameters according to Table 7.7.9.2.5-1 and 7.7.9.2.5-2 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodically *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the CSI-SINR reported values in the periodic *MeasurementReport*. The CSI-SINR value of Cell 2 reported by the UE is compared to the expected CSI-SINR. If the value is outside the limits (determined by Table 7.7.9.0.2.1-1 and Table 7.7.9.0.2.1-2) or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.9.2.5-1 and 7.7.9.2.5-2 as appropriate and repeat steps 5-7.

### 7.7.9.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] Clause 7.3 with the following exceptions.

**Table 7.7.9.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with condition CSI-RS MOBILITY<br>Table H.3.1-5<br>Table H.3.1-6 with condition gapUE and Pattern #0<br>Table H.3.1-7 with condition INTER-FREQ, CSI-RS MOBILITY and SINR |

**Table 7.7.9.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsType | csirs | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 7.7.9.2.5 Test Requirement

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR +XdB to Nominal CSI-SINR –X-1dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +YdB to Nominal CSI-SINR –Y-1dB according to the requirements in 7.7.9.0.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The CSI-SINR relative measurement accuracy shall fulfil the requirements in Clause 7.7.9.0.2.2.

Editor's note: The values of X and Y are pending on the accuracy requirement discussion.

**Table 7.7.9.2.5-1: CSI-SINR Inter-frequency general test parameters**

| **Parameter** | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|---|---|---|---|---|---|---|---|
| | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | | TDD | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Time offset with Cell 1 | µs | - | 0.29 | - | 0.29 | - | 0.29 |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG to SSS Note 1 | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| Propagation conditions | | AWGN | | | | | |
| Antenna configuration | | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 7.7.9.2.5-2: CSI-SINR Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | degrees | Setup 1 according to A.3.15.1 in TS 38.133 [6] | | Setup 1 according to A.3.15.1 in TS 38.133 [6] | | Setup 1 according to A.3.15.1 in TS 38.133 [6] | |
| Assumption for UE beams Note 10 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105.1 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96.1 | | -96 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -96.47 | -96.47 | -85.07 | -85.07 | -98.07 | -98.07 |
| CSI-SINR Note2 | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| $\hat{E}_s / N_{oc}$ for SSB | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| $\hat{E}_s / N_{oc}$ for CSI-RS | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| $\hat{E}_s / I_{ot}$ for SSB | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| $\hat{E}_s / I_{ot}$ for CSI-RS | dB | -0.98 | -0.98 | 10.51 | 10.51 | -2.58 | -2.58 |
| Io Note2 | dBm/95.04 MHz Note4 | -64.21 | | -55.75 | | -64.90 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 6: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 7.7.9.2.5-3: Evaluation limits for the reported values for T1, T2 and T3 absolute accuracy**

| UE power class 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2** | | **Test 3** | |
| Lowest reported value (Cell 1) | n257, n258, n261 | SINR_37 | n257, n258, n261 | SINR_54 | n257, n258, n261 | SINR_33 |
| | n260 | SINR_36 | n260 | SINR_54 | n260 | SINR_32 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR_52 | n257, n258, n261 | SINR_81 | n257, n258, n261 | SINR_50 |
| | n260 | SINR_52 | n260 | SINR_80 | n260 | SINR_50 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | n257, n258, n261 | SINR_37 | n257, n258, n261 | SINR_54 | n257, n258, n261 | SINR_33 |
| | n260 | SINR_36 | n260 | SINR_54 | n260 | SINR_32 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_52 | n257, n258, n261 | SINR_81 | n257, n258, n261 | SINR_50 |
| | n260 | SINR_52 | n260 | SINR_80 | n260 | SINR_50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | n259 | FFS | n259 | FFS | n259 | FFS |

**Table 7.7.9.2.5-4: Evaluation limits for the reported values for T1, T2 and T3 relative accuracy**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1** | **Test 2** | **Test 3** |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | -8 | -17 | -9 |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | 8 | 17 | 9 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 7.7.10 to 7.7.13

# 7.7.14 L1-RSRP measurement for group-based beam reporting

## 7.7.14.1 NR SA FR2 SSB based L1-RSRP measurement for group-based beam reporting

Editor's note: This test case is incomplete. The following aspects are either missing or TBD:

- TT is missing.

-Configuration of 3AoA setup and testability of the device is still FFS.

### 7.7.14.1.1 Test Purpose

The purpose of this test is to verify that the L1-RSRP measurement accuracy for group-based beam reporting is within the specified limits. This test will verify the requirements as defined in clauses 9.5.2 and 10.1.20.1 of TS 38.133[6] for SSB based L1-RSRP measurements.

### 7.7.14.1.2 Test Applicability

This test applies to all types of NR PC3 UE release 18 onwards that support *groupBasedBeamReporting-r17*.

### 7.7.14.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.7.4.0.1 and 7.7.4.0.2

The normative reference for this requirement is TS 38.133 [6] clauses A.7.7.14.1

### 7.7.14.1.4 Test description

#### 7.7.14.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.14.1.4.1-1.

**Table 7.7.14.1.4.1-1: Supported Test Configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

1. Configure the test equipment and the DUT according to the parameters in Table 7.7.4.1.4.1-2.
2. Message contents are defined in clause 7.7.14.1.4.3.

3. The test scenario comprises of 1 NR FR2 Cell. There is no measurement gap configured in the test. Before the test, UE is configured two CSI resource sets with one SSB resource in each set.

4. UE is configured with *groupBasedBeamReporting-r17* for SSB index 0 and SSB index 1.

5. UE is configured to perform RLM and BFD based on SSB 0 and UE is configured to perform group-based L1-RSRP measurement based on the SSB resources 0 and 1.

#### 7.7.14.1.4.2 Test procedure

Same as in clause 7.7.4.1.4.2 except Step 4 R1 scenario.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and SSB#1 and the relative L1-RSRP requirement for SSB1. The SS shall check for the following requirements:

   - R1: The L1-RSRP values of SSB#0 and SSB#1 are reported by the UE is compared to the expected L1-RSRP values for SSB#0 and SSB#1. If the value is outside the limits in Table 7.7.14.1.5-3 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 and SSB#1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

#### 7.7.14.1.4.3 Message contents

Message contents are same as in clause 7.7.4.1.4.3 with the following exceptions:

**Table 7.7.14.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC, SS-RSRP and groupBasedBeamReporting as enabled<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

#### 7.7.14.1.5 Test requirements

Table 7.7.14.1.5-1 and 7.7.14.1.5-2 define the primary level settings including the test tolerances for all tests.

Same as in clause 7.7.4.1.5 with below exceptions:

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 1 shall fulfil the requirements as defined in clauses 7.7.4.0.1, 7.7.4.0.2 TS 38.133 [6] 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0 and SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table 7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in TS 38.133 [6] Table 10.1.20.1.2-1.

For Test 2:

Absolute accuracy of SSB resource reported by UE in L1-RSRP report (SSB0 or SSB1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table 7.7.4.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in TS 38.133 [6] Table 10.1.20.1.2-1.

**Table 7.7.14.1.5-1: FR2 SSB based L1-RSRP general test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB ARFCN | 1, 2 | | freq1 | freq1 |
| Duplex mode | 1, 2 | | TDD | TDD |
| TDD Configuration | 1, 2 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1, 2 | MHz | 100: $N_{PRB,c}$ = 66 | 100: $N_{PRB,c}$ = 66 |
| Data PRBs allocated | 1, 2 | | 66 | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD | SR.3.2 TDD |
| | 2 | | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1, 2 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1, 2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1, 2 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1, 2 | | SMTC.1 | SMTC.1 |
| reportConfigType | 1, 2 | | periodic | periodic |
| reportQuantity | 1, 2 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1, 2 | | 2 | 2 |
| L1-RSRP reporting period | 1, 2 | | slot320 | slot320 |
| Propagation condition | 1, 2 | | AWGN | AWGN |
| Antenna configuration | 1, 2 | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.14.1.5-2: FR2 SSB based L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration | | | Setup 5 according to A.9.5 | | Setup 5 according to A.9.5 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -100+TT | | n.a. | |
| $N_{oc}$ | 1 | dBm/SSB SCS | -91+TT | | n.a. | |
| | 2 | | -88+TT | | n.a. | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10+TT | -2+TT | n.a. | |
| SSB_RP Note1 | 1 | dBm/SCS | -81+TT | -93+TT | As in Table B.2.4-2 | |

| | | | | | |
|---|---|---|---|---|---|
| | 2 | | -78+TT | -90+TT | As in Table B.2.4-2 |
| Io[Note1] | 1~2 | dBm/ 95.04M Hz | -51.57+TT | | SSB_RP+28.98 |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 10+TT | -2+TT | n.a. |
| Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: Void<br>Note 3: No additional noise is added by the test system in Test 2.<br>Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

**Table 7.7.14.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 Config1 All bands** | **Test 1 Config2 All bands** |
| Lowest reported value (SSB#0) | 59+TT | 62+TT |
| Highest reported value (SSB#0) | 102+TT | 105+TT |
| Lowest reported value (SSB#1) | 47+TT | 50+TT |
| Highest reported value (SSB#1) | 90+TT | 93+TT |
| **Extreme Conditions** | **Test 1 Config1 All bands** | **Test 1 Config1 All bands** |
| Lowest reported value (SSB#0) | 56+TT | 59+TT |
| Highest reported value (SSB#0) | 105+TT | 108+TT |
| Lowest reported value (SSB#1) | 44+TT | 47+TT |
| Highest reported value (SSB#1) | 93+TT | 96+TT |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

## 7.7.14.2 NR SA FR2 CSI-RS based L1-RSRP measurement on resource set with repetition off

Editor's note: This test case is incomplete. The following aspects are either missing or TBD:

- Test requirement shall require an update.

- TT is missing

- Configuration of 3AoA setup and testability of the device is still FFS

#### 7.7.14.2.1 Test Purpose

The purpose of this test is to verify that the L1-RSRP measurement accuracy for group-based beam reporting is within the specified limits. This test will verify the requirements as defined in clauses 9.5.3 and 10.1.20.2 of TS 38.133 [6] for L1-RSRP measurements based on CSI-RS.

#### 7.7.14.2.2 Test Applicability

This test applies to all types of NR UE from Release 17 onwards supporting *groupBasedBeamReporting-r17.*

#### 7.7.14.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.3 and 7.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3, 10.1.20.2 and A.7.7.14.2.

#### 7.7.14.2.4 Test description

##### 7.7.14.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.14.2.4.1-1.

**Table 7.7.14.2.4.1-1: Supported Test Configurations**

| Config | Description |
|---|---|
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

Same as in clause 7.7.4.2.4.1 with the following exceptions:

1. The general test parameter settings are set up according to Table 7.7.4.2.4.1-2.
2. Message contents are defined in clause 7.7.4.2.4.3.
3. The test scenario comprises of 1 NR FR2 Cell. There is no measurement gap configured in the test. Before the test, UE is configured two CSI resource sets with one CSI-RS resource in each set.
4. UE is configured with *groupBasedBeamReporting-r17* for CSI-RS0 and CSI-RS1.
5. UE is configured to perform RLM and BFD based on SSB 0 and 1 and UE is configured to perform group-based L1-RSRP measurement based on the CSI resources.
6. CSI-RS resources are not transmitted in the same OFDM symbols as SSB. The connection setup is done according to the settings in Annex C.1.1.
7. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

##### 7.7.14.2.4.2 Test procedure

Same as in clause 7.7.4.2.4.2 except Step 4 R1 scenario.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP values of CSI-RS0 and CSI-RS1 are reported by the UE is compared to the expected L1-RSRP values for CSI-RS0 and CSI-RS1. If the value is outside the limits in Table 7.7.14.2.5-3 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 and CSI-RS1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

##### 7.7.14.2.4.3 Message contents

Same as in clause 7.7.4.2.4.3 with the following exceptions:

**Table 7.7.14.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.6-2 with conditions PERIODIC, CSI-RSRP and groupBasedBeamReporting as enabled<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

### 7.7.14.2.5 Test requirements

Table 7.7.14.2.5-1 and 7.7.14.2.5-2 define the primary level settings including the test tolerances for all tests.

Same as in clause 7.7.4.2.5 with the following exceptions:

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements as defined in clauses 7.7.4.0.3, 7.7.4.0.4 and in TS 38.133[6] clause 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in TS 38.133[6] clause A.7.7.4.2.3 Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements defined in TS 38.133 [6] Table 10.1.20.2.2-1.

. For Test 2:

Absolute accuracy of CSI-RS resource reported by UE in L1-RSRP report (CSI-RS0 or CSI-RS1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in TS 38.133[6] clause A.7.7.4.2.3 Table A.7.7.4.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements defined in TS 38.133 [6] in Table 10.1.20.2.2-1.

**Table 7.7.14.2.5-1: FR2 CSI-RS based L1-RSRP general test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB ARFCN | 1 | | freq1 | freq1 |
| Duplex mode | 1 | | TDD | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{PRB,c}$ = 66 | 100: $N_{PRB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1 | | SMTC.1 | SMTC.1 |
| CSI-RS resource sets | 1 | | TBD | TBD |
| reportConfigType | 1 | | periodic | periodic |
| reportQuantity | 1 | | cri-RSRP | cri-RSRP |
| Number of reported RS | 1 | | 2 | 2 |
| L1-RSRP reporting period | 1 | | slot80 | slot80 |
| Propagation condition | 1 | | AWGN | AWGN |
| Antenna configuration | 1 | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 0 |

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |

**Table 7.7.14.2.5-2: FR2 CSI-RS based L1-RSRP OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 5 according to A.9.5 | | Setup 5 according to A.9.5 | |
| Assumption for UE beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -100+TT | | n.a. | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -91+TT | | n.a.<br>n.a. | |
| $\hat{E}_s / I_{ot}$ | 1~2 | dB | 10+TT | -2+TT | n.a. | |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -81+TT | -93+TT | As in Table B.2.4-2 | |
| Io Note1 | 1~2 | dBm/ 95.04MHz | -59.86+TT | | SS-RSRP+28.98 | |
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | -51.57+TT | -2+TT | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |
| Note 3: No additional noise is added by the test system in Test 2. | | | | | | |
| Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

**Table 7.7.14.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1 for test configuration 1**

| Normal Conditions | Test 1 All bands |
|---|---|
| Lowest reported value (CSI-RS0) | 59+TT |
| Highest reported value (CSI-RS0) | 102+TT |
| Lowest reported value (CSI-RS1) | 90+TT |
| Highest reported value (CSI-RS1) | 47+TT |
| **Extreme Conditions** | **Test 1 All bands** |
| Lowest reported value (CSI-RS0) | 105+TT |
| Highest reported value (CSI-RS0) | 56+TT |
| Lowest reported value (CSI-RS1) | 93+TT |

| | |
|---|---|
| Highest reported value (CSI-RS1) | 44+TT |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

# 7.7.15 LTM L1-RSRP measurement

## 7.7.15.0 Minimum conformance requirements

### 7.7.15.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of candidate neighbour cell(s) on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 7.7.15.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.1 for a corresponding band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 7.7.15.0.1-1: SSB based L1-RSRP absolute accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io[NOTE 1] range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / $SCS_{SSB}$[NOTE 2] | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| ±6.5 | ±9.5 | ≥-3 | Same value as SSB_RP in TS 38.133 [6] Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | N/A | | -70 | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Values based on REFSENS and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.<br>NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20B.1.1 and 10.1.6.

### 7.7.15.0.2 SSB based relative L1-RSRP measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured on one SSB configured in *LTM-CSI-ResourceConfig* on one cell on a frequency in FR2 compared to the value of L1-RSRP measured from another SSB configured in *LTM-CSI-ResourceConfig* from any other cell on another frequency in FR2.

The accuracy requirements in Table 7.7.15.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.1 for a corresponding band for each relevant SSB.
- |SSB_RP1 dBm - SSB_RP2 dBm| ≤ 27 dB
- |Channel 1_Io - Channel 2_Io| ≤ 20 dB

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

**Table 7.7.15.0.2-1: SSB based L1-RSRP relative accuracy in FR2**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io[NOTE 1] range | | |
| | | | Minimum Io | | Maximum Io |
| | | | dBm / $SCS_{SSB}$[NOTE 3] | | |
| dB | dB | dB | $SCS_{SSB}$ = 120kHz | $SCS_{SSB}$ = 240kHz | $dBm/BW_{Channel}$ |
| ±6.5 | ±9.5 | ≥-3 | Same value as SSB_RP in TS 38.133 [6] Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival | | -50 |

NOTE 1: Io specified at the Reference point and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on REFSENS and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20B.1.2 and 10.1.6

## 7.7.15.1 NR SA FR2 SSB based inter-frequency L1-RSRP measurement

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is complete for UE PC3
- TT analysis is complete for test frequencies f ≤ 40.8 GHz
- TT analysis is complete for normal conditions

### 7.7.15.1.1 Test purpose

The purpose of this test is to verify that the SSB based inter-frequency L1-RSRP absolute measurement accuracy on neighbor cell is within the limits for all bands specified in TS 38.133 [6] clause 10.1.20B.

### 7.7.15.1.2 Test applicability

This test applies to all types of NR UE supporting SSB based inter-frequency L1-RSRP measurements with measurement gaps and reports for LTM from release 18 and forward.

### 7.7.15.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.15.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.15.1.

### 7.7.15.1.4 Test description

#### 7.7.15.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.15.1.4.1-1.

**Table 7.7.15.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 7.7.15.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 7.7.15.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

Test environment parameters are given in Table 7.7.15.1.4.1-2.

**Table 7.7.15.1.4.1-2: Test environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 7.7.15.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without LTE link | | |

1. The general test parameter settings are set up according to Table 7.7.15.1.4.1-3.
2. Message contents are defined in clause 7.7.15.1.4.3.
3. There are two NR carriers and one cell on each carrier in the test. Cell 1 (PCell) is on NR RF channel 1, and is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test. Cell 2 (inter neighbour cell) is on NR RF channel 2.
4. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX beam peak direction has been obtained previously using one of the search procedures as described in Annex I.

**Table 7.7.15.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active cell | | | Cell 1 | |
| Neighbouring cell | | | Cell 2 | Cell 2 is the candidate cell |
| RF Channel Number | | | 1: Cell 1<br>2: Cell 2 | |
| a4-Threshold | | dBm | -120 | Applied to NR Cell 2 measurement object |
| offsetMO | | dB | 16 | Applied to NR Cell 2 measurement object |
| Filter coefficient | | | 0 | L3 filtering is not used |
| reportQuantityRS-Indexes | | | rsrp | |
| maxNrofRS-IndexesToReport | | | 1 | |
| includeBeamMeasurements | | | true | |
| DRX | | | OFF | DRX is not used |
| Time offset between cells | | | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| Gap Pattern Id | | | 13 | |
| Measurement gap offset | | ms | 39 | |
| LTM-CSI-ReportConfig | ltm-ResourcesForChannelMeasurement | | SSB#0 | Candidate Cell 2's SSB index for L1-RSRP measurement |
| | reportConfigType | | periodic | Periodic L1-RSRP reporting configured |
| | L1-RSRP reporting period | slot | 320 | |
| | nrOfReportedCells | | n1 | Report candidate cell's (Cell 2) L1-RSRP measurement results. |
| | nrOfReportedRS-PerCell | | n1 | |
| | spCellInclusion | | N/A | |

| | | | |
|---|---|---|---|
| ltm-ConfigComplete | | true | Candidate cell's configuration is complete configuration |

#### 7.7.15.1.4.2 Test procedure

UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically.

There are two tests in the test case, test 1 and test 2:

- In test 1, test at the highest power level below maximum Io.
- In test 2, test at the lowest power level above minimum SSB_RP.

Measurement gap pattern configuration defined in Table 7.7.15.1.4.1-3 is provided.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Test 1 in Table 7.7.15.1.5-1.
3. SS shall transmit *RRCReconfiguration* message to configure Event A4 triggered measurement report.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. The UE shall transmit *MeasurementReport* message triggered by Event A4 including Cell 2 measurement report with SSB index.
6. SS shall transmit *RRCReconfiguration* message to configure *LTM-Candidate-r18* for Cell 2. UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate Cell 2 in PUCCH format 2.
7. The UE shall transmit *RRCReconfigurationComplete* message.
8. The UE shall transmit L1-RSRP on PUCCH format 2 in Cell 1 with a periodicity of 320 slots.
9. After 10s wait from Step 6, the SS shall check the values in the periodic measurement report. The L1-RSRP value of Cell 2 reported by the UE is compared to the expected L1-RSRP value. If the reported value is outside the limits in Table 7.7.15.1.5-3 for test configuration 1 and in Table 7.7.15.1.5-4 for test configuration 2, or if the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
10. The SS shall continue checking the L1-RSRP report transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
11. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
13. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),

    OR

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

14. Set the parameters according to each test in Table 7.7.15.1.5-1 as appropriate and repeat steps 3-13.

7.7.15.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

**Table 7.7.15.1.4.3-1: Common Exception messages (step 3)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED<br>Table H.3.1-5 with condition SSB Index<br>Table H.3.1-6 with conditions gapUE and Pattern #13<br>Table H.3.1-7 with conditions INTER-FREQ and SSB Index |
| Specific message contents exceptions for Cell 2 | Table H.3.1-3 with condition INTER-FREQ MO<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 7.7.15.1.4.3-2: MeasObjectNR for Cell 2 (Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| offsetMO ::= SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| } | | | |
| } | | | |

**Table 7.7.15.1.4.3-3: ReportConfigNR (a4-threshold) (step3)**

| Derivation Path: Table H.3.1-4AA | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA4 SEQUENCE { | | | |
| a4-Threshold CHOICE { | | | |
| rsrp | 36 | The actual value is (IE value – 156) dBm | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 1 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 7.7.15.1.4.3-4: Common Exception messages (step 6)**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.12-1 with condition L1-RSRP<br>Table H.3.12-2 with condition L1-RSRP<br>Table H.3.12-3<br>Table H.3.12-4<br>Table H.3.12-5 with condition SCS120<br>Table H.3.12-6<br>Table H.3.12-8<br>Table H.3.12-9 with conditions FR2 and SSB#0 |

### 7.7.15.1.5 Test requirement

Table 7.7.15.1.5-1 and Table 7.7.15.1.5-2 define the primary level settings including test tolerances for all tests.

**Table 7.7.15.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~2 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1~2 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1~2 | | 66 | | 66 | |
| Duplex mode | 1~2 | | TDD | | TDD | |
| TDD configuration | 1~2 | | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1 | | SR.3. 2 TDD | - | SR.3. 2 TDD | - |
| | 2 | | SR.3.3 TDD | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | - | CR.3.1 TDD | - |
| | 2 | | CR.3.2 TDD | | CR.3.2 TDD | |
| Control Channel RMC | 1 | | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| | 2 | | CCR.3.7 TDD | | CCR.3.7 TDD | |
| SSB configuration | 1 | | SSB.3 FR2 | | SSB.3 FR2 | |
| | 2 | | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~2 | | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1~2 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~2 | | SMTC.1 | | SMTC.1 | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Propagation condition | 1~2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~2 | - | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 7.7.15.1.5-2: NR OTA cell specific test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | 1~2 | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams[Note 4] | 1~2 | | Rough | | Rough | |
| $N_{oc}$[Note 1] | 1~2 | dBm/15kHz[Note 4] | -104.1 | -100 | N/A | |
| $N_{oc}$[Note 1] | 1 | dBm/SCS[Note 4] | -95.07 | -90.97 | N/A | |
| | 2 | | -92.06 | -87.86 | N/A | |
| $\hat{E}s/N_{oc}$ | 1~2 | dB | 10 | -2 | N/A | |
| $\hat{E}s/Iot$[Note 2] | 1~2 | dB | 10 | -2 | N/A | |
| SSB_RP[Note 2] | 1 | dBm/SCS | -85.07 | -92.97 | (Table B.2.4.1-2 Rx Beam Peak[Note 5] + 3.65dB) | (Table B.2.4.1-2 Rx Beam Peak[Note 5] + 6.65dB) |
| | 2 | | -82.06 | -89.96 | (Table B.2.4.1-2 Rx Beam Peak[Note 5] + 3.65dB) | (Table B.2.4.1-2 Rx Beam Peak[Note 5] + 6.65dB) |
| Io[Note 2] | 1 | dBm/95.04MHz[Note 3] | -55.67 | -59.86 | (Table B.2.4.1-2 Rx Beam Peak[Note 5] +32.64dB) | (Table B.2.4.1-2 Rx Beam Peak[Note 5] +35.64dB) |
| | 2 | | -55.67 | -59.86 | (Table B.2.4.1-2 Rx Beam Peak[Note 5] +29.63dB) | (Table B.2.4.1-2 Rx Beam Peak[Note 5] +32.63dB) |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot, Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: The value in Table B.2.4.1-2 of TS 38.133 [6] is the minimum SSB_RP, selected according to $SCS_{SSB}$, operating band and UE power class, without $\Delta MB_{P,n}$ adjustment.

Each L1-RSRP measurement report of Cell 2 in each test shall meet the corresponding absolute accuracy requirements in Table 7.7.15.1.5-3 for test configuration 1, and the corresponding absolute accuracy requirements in Table 7.7.15.1.5-4 for test configuration 2.

**Table 7.7.15.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1**

| UE power class 3 | | | |
|---|---|---|---|
| Normal Conditions | Test 1 All bands | Test 2 | |
| Lowest reported value (Cell 2) | 39 | n257, n258, n261 | 32 |
| | | n259 | 36 |

| | | | |
|---|---|---|---|
| | | n260 | 35 |
| | | n262 | FFS |
| Highest reported value (Cell 2) | 98 | n257, n258, n261 | 88 |
| | | n259 | 92 |
| | | n260 | 91 |
| | | n262 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n259 | FFS |
| | | n260 | FFS |
| | | n262 | FFS |
| Highest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n259 | FFS |
| | | n260 | FFS |
| | | n262 | FFS |

**Table 7.7.15.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2**

| **UE power class 3** | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 42 | n257, n258, n261 | 35 |
| | | n259 | 39 |
| | | n260 | 38 |
| | | n262 | FFS |
| Highest reported value (Cell 2) | 101 | n257, n258, n261 | 91 |
| | | n259 | 95 |
| | | n260 | 94 |
| | | n262 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n259 | FFS |
| | | n260 | FFS |
| | | n262 | FFS |
| Highest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n259 | FFS |
| | | n260 | FFS |
| | | n262 | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 8 E-UTRA - NR inter-RAT with E-UTRA serving cell

## 8.0 General

This clause contains test scenarios for E-UTRA - NR inter-RAT with the serving cell in E-UTRA. The NR cells can be in FR1, FR2 or both.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

## 8.1 Void

## 8.2 RRC_IDLE state mobility

### 8.2.1 Inter-RAT cell re-selection

#### 8.2.1.0 Minimum conformance requirements

##### 8.2.1.0.1 Minimum conformance requirements for E-UTRA-NR FR1 inter-RAT cell re-selection

[TS 36.133 [23], clause 4.2.1]

When the UE is in either *Camped Normally* state or *Camped on Any Cell* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. UE measurement activity is also controlled by measurement rules defined in TS 36.304 [1], allowing the UE to limit its measurement activity.

[TS 36.133 [23], clause 4.2.2]

The UE shall search every layer of higher priority at least every $T_{higher_priority_search}$ = (60 * $N_{layers}$) seconds when the UE is not configured with eDRX_IDLE cycle, and at least every $T_{higher_priority_search}$ = MAX(60 * $N_{layers}$, one eDRX_IDLE cycle) when UE is configured with eDRX_IDLE cycle, where $N_{layers}$ is the total number of configured higher priority E-UTRA, UTRA FDD, UTRA TDD, CDMA2000 1x, HRPD and NR carrier frequencies and is additionally increased by one if one or more groups of GSM frequencies is configured as a higher priority.

[TS 36.133 [23], clause 4.2.2.5.6]

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT NR layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 36.133 [23] clause 4.2.2.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT NR layers of higher, lower priority in preparation for possible re-selection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT NR layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT NR measurements. When the measurement rules indicate that inter-RAT NR cells are to be measured, the UE shall measure SS-RSRP and SS-RSRQ of detected NR cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, a carrier is indicated to meet high speed requirement if *highSpeedInterRAT-NR-r16* is configured and the carrier to be measured is configured with *highSpeedCarrierNR-r16*. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, the UE is required to meet non high speed requirements no matter whether *highSpeedInterRAT-NR-r16* or *highSpeedCarrierNR-r16* is configured or not. The parameter $N_{NR_carrier}$ is the number of configured NR carriers indicated to meet non high speed requirement in the neighbour frequency list. $N_{NR_carrier_HST}$ is the number of configured carriers for re-selection indicated to meet high speed requirements. The parameter $N_{NR_carrier}$ for a UE configured with idle mode DC measurements (while T331 is running) is the combined

number of configured NR carriers indicated to meet non high speed requirement in the neighbour frequency list, and NR carriers configured for idle mode DC measurements.

NOTE: Combined total number means that if a carrier is indicated in the neighbour frequency list and additionally a carrier configured for idle mode DC measurements, it only counts as one carrier.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured NR cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period.

The UE shall be able to evaluate whether a newly detectable inter-RAT NR cell meets the re-selection criteria defined in TS 36.304 [1] within $N_{NR_carrier_HST} * T_{detect, NR_HST} + N_{NR_carrier} * T_{detect, NR}$

when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ when Treselection = 0 provided that the re-selection criteria is met by a margin of at least 5 dB in FR1 or 6.5 dB in FR2 for re-selections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP re-selections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ re-selections based on absolute priorities.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR}$. If, after detecting a cell in a higher priority search, it is determined that re-selection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of re-selection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT NR cell in cell re-selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

Cells which have been detected shall be measured at least every $N_{NR_carrier_HST} * T_{measure, NR_HST} + N_{NR_carrier} * T_{measure, NR}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT NR cell has met re-selection criterion defined in TS 36.304 [1] within $N_{NR_carrier_HST} * T_{evaluate, NR_HST} + N_{NR_carrier} * T_{evaluate, NR}$ when Treselection = 0 as specified in Table 8.2.1.0.1-1 and table 8.2.1.0.1-2 provided that the re-selection criteria is met by a margin of at least 5dB in FR1 or 6.5 dB in FR2 for re-selections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP re-selections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ re-selections based on absolute priorities.

If Treselection timer has a non-zero value and the inter-RAT NR cell is satisfied with the re-selection criteria which are defined in TS 36.304 [1], the UE shall evaluate this NR cell for the Treselection time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

**Table 8.2.1.0.1-1: $T_{detect,NR}$, $T_{measureNR,}$ and $T_{evaluate,NR}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR}$ [s] (number of DRX cycles) | $T_{measure,NR}$ [s] (number of DRX cycles) | $T_{evaluate,NR}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x 1.5 x N1 (36 x 1.5 x N1) | 1.28 x 1.5 x N1 (4 x 1.5 x N1) | 5.12 x 1.5 x N1 (16 x 1.5 x N1) |
| 0.64 | | 5 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| NOTE: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. | | | | | |

**Table 8.2.1.0.1-2: $T_{detect,NR_HST}$, $T_{measureNR_HST}$, and $T_{evaluate,NR_HST}$ for UE configured with highSpeedInterRAT-NR-r16**

| DRX cycle length [s] | $T_{detect,NR_HST}$ [s] (number of DRX cycles) | $T_{measure,NR_HST}$ [s] (number of DRX cycles) | $T_{evaluate,NR_HST}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 4.16 x M2 (13 x M2) Note 2 | 0.64 x M3 (2 x M3) Note 2 | 0.96 x M4 (3 x M4) Note 2 |
| 0.64 | 7.68 (12)) | 1.28 (2) | 1.92 (3) |
| 1.28 | 12.8(10) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| NOTE 1: FR2 high speed requirements are not specified.<br>NOTE 2: M2=1.5, M3=2 and M4=2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M2=1. | | | |

The normative reference for this requirement is TS 36.133 [23] clause 4.2.1, 4.2.2, 4.2.2.5.6.

## 8.2.1.1 E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

### 8.2.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT cell re-selection requirements specified in TS 36.133 [23] clause 4.2.2.5.6.

### 8.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

### 8.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.1.1.

### 8.2.1.1.4 Test description

There are two cells configured in this test, the E-UTRA Cell 1 and NR Cell 2. NR Cell 2 is the PCell and E-UTRA Cell 1 is the neighbour cell. This test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA Cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than Cell 1.

#### 8.2.1.1.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.1.1.4.1-1.

**Table 8.2.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.2.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.2.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.2.1.1.4.1-2.

**Table 8.2.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.2.1.1.4.1-3.

2. Message contents are defined in clause 8.2.1.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. NR Cell 2 is the PCell and E-UTRA Cell 1 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 8.2.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell 2 | The UE camps on Cell 2 in the initial phase |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6 | Cell 1 | |
| T1 end condition | Active cell | | | Cell 1 | During T1 period the UE reselects to Cell 1 |
| | Neighbour cell | | | Cell 2 | |
| T3 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell 2 | The UE shall perform re-selection to Cell 2 during T3 |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3, 4, 5, 6 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 5 | 3 µs | Synchronous cells |
| | | | 3, 6 | 3 µs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | >7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3, 4, 5, 6 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 8.2.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one NR PCell (NR Cell 2) and a E-UTRA neighbour cell (E-UTRA Cell 1). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA Cell 1 is already identified by the UE prior to the start of the test. NR Cell 2 is of higher priority than E-UTRA Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure.

1. The SS shall send a *RRCRelease* message on NR Cell 2 to ensure the UE is in State RRC_IDLE with generic procedure parameters connectivity = *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. The SS shall set the parameters according to T1 in Table 8.2.1.1.5-1 and 8.2.1.1.5-2 at the same time instance *RRCRelease* message is sent on NR Cell 2, T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, E-UTRA Cell 1.

4. If the UE responds on lower priority cell, E-UTRA Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1".

5. If the UE has re-selected E-UTRA Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 8.2.1.1.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE, T2 starts.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 8.2.1.1.5-1, T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, NR Cell 2.

9. If the UE responds on higher priority cell, NR Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 11.

10a. The SS shall send an *RRCRelease* message on NR Cell 2 to ensure that the UE is in state RRC_IDLE with generic procedure parameters connectivity = NR with Test Mode On according to TS 38.508-1 [14] clause 4.5 on Cell 2.

11. The SS shall set the parameters according to T1 in Table 8.2.1.1.5-1 and 8.2.1.1.5-2 at the same time instance *RRCRelease* message is sent on NR Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 8.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.2.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br>Table H.2.3-2 with condition lower priority<br>Table H.2.3-3 with condition lower priority |
| Default RRC messages and information elements contents exceptions | |

**Table 8.2.1.1.4.3-2: *SystemInformationBlockType3***

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearch | 25 | Actual value = 50 dB | |
| threshServingLow | 22 | Actual value = 44 dB | |
| } | | | |
| } | | | |

**Table 8.2.1.1.4.3-3: SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25], Table 4.4.3.3-20 with Condition FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| measTimingConfig-r15[1] SEQUENCE { | | | |
| periodicityAndOffset-r15 CHOICE { | | | |
| sf20-r15 | 0 | | |
| } | | | |
| ssb-Duration-r15 | sf5 | Asynchronous cells | Configuration 1,4 |
| | sf2 | Synchronous cells | Configuration 2,3,5,6 |
| } | | | |
| subcarrierSpacingSSB-r15[1] | kHz15 | | Configuration 1,2,4,5 |
| | kHz30 | | Configuration 3,6 |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| q-RxLevMin-r15[1] | -70 | Actual value = -140 dBm | Configuration 1,2,4,5 |
| | -69 | Actual value = -137 dBm, Round down | Configuration 3,6 |
| } | | | |
| } | | | |

**Table 8.2.1.1.4.3-4: Void**

**Table 8.2.1.1.4.3-5: Void**

8.2.1.1.5 Test requirement

Tables 8.2.1.1.4.1-3, 8.2.1.1.5-1 and 8.2.1.1.5-2 define the primary level settings including test tolerances for higher priority NR cell re-selection test case.

**Table 8.2.1.1.5-1: NR Cell specific test parameters for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell**

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | | 1, 4 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1, 4 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.2 FR1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| | | 3, 6 | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Cell_selection_and_re-selection_quality_measurement | | 1, 2, 3, 4, 5, 6 | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | -3.65 | -infinity | 13.55 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -99.90 | -98 | -98 |
| | | 2, 5 | -99.90 | -98 | -98 |
| | | 3, 6 | -96.90 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -99.90 | -98 | -98 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | -3.65 | -infinity | 13.55 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -103.55 | -infinity | -84.45 |
| | | 2, 5 | -103.55 | -infinity | -84.45 |
| | | 3, 6 | -100.54 | -infinity | -81.44 |
| Io | dBm/9.36 MHz | 1, 4 | -70.39 | -70.05 | -56.31 |
| | dBm/9.36 MHz | 2, 5 | -70.39 | -70.05 | -56.31 |
| | dBm/38.16 MHz | 3, 6 | -64.29 | -63.94 | -50.21 |
| Treselection | s | 1, 2, 3, 4, 5, 6 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| $Thresh_{x,highP}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | | |
| $Thresh_{serving,lowP}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | | |
| $Thresh_{x,lowP}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

**Table 8.2.1.1.5-2: E-UTRA Cell specific test parameters for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell**

| Parameter | Unit | Cell 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 kHz | -84 | -84 | -82.45 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 | 15.55 |
| $\hat{E}_s/N_{oc}$ | dB | 14 | 14 | 15.55 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | 50 | | |
| $Thresh_{x, highP}$ | dB | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP}$ | dB | 50 | | |
| Propagation Condition | | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

The cell re-selection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell re-selections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR} + T_{SI-NR,}$ and to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{higher_priority_search}$ is the higher priority search period, $T_{higher_priority_search}$ = 60 s according to TS 36.133 [23], clause 4.2.2;

$T_{evaluate, NR}$ is the evaluation time for NR Cell, $T_{evaluate, NR}$ = 6400 ms according TS 36.133 [23], Table 4.2.2.5.6-1;

$T_{SI-NR}$ is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; $T_{SI-NR}$ = 1280 ms is assumed in this test case.

$T_{evaluate, E-UTRAN}$ is the evaluation time for E-UTRAN Cell, $T_{evaluate, E-UTRAN}$ = 6400 ms according TS 38.133 [6], Table 4.2.2.5-1;

$T_{SI-E-UTRA}$ is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; $T_{SI-E-UTRA}$ = 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## 8.2.1.2 E-UTRA - NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

### 8.2.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT cell re-selection requirements specified in TS 36.133 [23] clause 4.2.2.5.6.

### 8.2.1.2.2 Test applicability

This test applies to all types of NR UE configured with highSpeedInterRAT-NR-r16 from Release 15 onwards.

### 8.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.1.2.

### 8.2.1.2.4 Test description

#### 8.2.1.2.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.1.2.4.1-1.

**Table 8.2.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.2.1.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.1.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.1.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.2.1.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.1.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.1.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.2.1.2.4.1-2.

**Table 8.2.1.2.4.1-2: Initial conditions for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell in FR1 for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 8.2.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.2.1.2.4.1-3.
2. Message contents are defined in clause 8.2.1.2.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.
4. In SIB of the E-UTRA cell, highSpeedInterRAT-NR-r16 is configured and the carrier of NR cell is configured with highSpeedCarrierNR-r16.

**Table 8.2.1.2.4.1-3: General test parameters for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell in FR1 for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell 1 | The UE camps on Cell 1 in the initial phase |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell 2 | The UE shall perform re-selection to Cell 2 during T1 |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6 | Cell 1 | The UE shall perform re-selection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4, 5, 6 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 5 | 3 µs | Synchronous cells |
| | | | 3, 6 | 3 µs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6 | 0.32 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| T1 | | s | 1, 2, 3, 4, 5, 6 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 8.2.1.2.4.2 Test procedure

Two cells are deployed in the test, which are one E-UTRA Cell 1 and NR Cell 2. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cells are already identified by the UE prior to the start of the test. NR Cell 2 is of lower priority than E-UTRA Cell 1. UE is camped on E-UTRA Cell 1 during the initial phase of the test.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure.

1. Ensure the UE is in State RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T2 in Table 8.2.1.2.5-1 and 8.2.1.2.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 8.2.1.2.5-1 and 8.2.1.2.5-2, T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority NR Cell 2.

5. If the UE responds on lower priority cell, NR Cell 2 during time duration T1 within 3 seconds from the beginning of time period T1, then count a success for the event "Re-select lowe priority Cell 2". Otherwise count a fail for the event "Re-select lower priority Cell 2".

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, skip to step 10.

7. The SS shall switch the power setting from T1 to T2 as specified in Table Table 8.2.1.2.5-1 and 8.2.1.2.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority E-UTRA Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, skip to step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

11. Repeat step 3-9 the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 8.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.2.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-3 with Condition HighSpeedMeas<br>Table H.2.3-1<br>Table H.2.3-2 with condition higher priority<br>Table H.2.3-3 with condition higher priority |
| Default RRC messages and information elements contents exceptions | |

**Table 8.2.1.2.4.3-2: SystemInformationBlockType3**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearch | 25 | Actual value = 50 dB | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 5 | | higher priority E-UTRA |
| } | | | |
| } | | | |

**Table 8.2.1.2.4.3-3: highSpeedCarrierNR-r16 in SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25], Table 4.4.3.3-20 with Condition FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| measTimingConfig-r15[*n*] SEQUENCE { | | | |
| periodicityAndOffset-r15 CHOICE { | | | |
| sf20 | 0 | | |
| } | | | |
| ssb-Duration-r15 | sf5 | Asynchronous cells | Configuration 1,4 |
| | sf2 | Synchronous cells | Configuration 2,3,5,6 |
| } | | | |
| subcarrierSpacingSSB-r15[1] | kHz15 | | Configuration 1,2,4,5 |
| | kHz30 | | Configuration 3,6 |
| cellReselectionPriority-r15[*n*] | 4 | | higher priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| q-RxLevMin-r15[1] | -70 | Actual value = -140 dBm | Configuration 1,2,4,5 |
| | -69 | Actual value = -137 dBm, Round down | Configuration 3,6 |
| } | | | |
| carrierFreqListNR-v1610 ::= SEQUENCE {(SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| highSpeedCarrierNR-r16 | TRUE | | |
| } | | | |

**Table 8.2.1.2.4.3-4: highSpeedInterRAT-NR-r16 configuration**

| Derivation Path: TS 36.508 [25] Table 4.6.3-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSIB::= SEQUENCE { | | | |
| highSpeedInterRAT-NR-r16 | TRUE | | |
| } | | | |

**Table 8.2.1.2.4.3-5: *SIB2***

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| } | | | |
| } | | | |

**Table 8.2.1.2.4.3-6: SIB5**

| Derivation Path: Table H.2.3-3 with Condition higher priority | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB5 ::= SEQUENCE { | | | |
| carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 { | 1 entry | carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA contain same number of entries. And the entries are listed in the same order | |
| CarrierFreqEUTRA-v1610[1] SEQUENCE { | | entry 1 | |

| | | | |
|---|---|---|---|
| highSpeedEUTRACarrier-r16 | true | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.2.5 Test requirement

Tables 8.2.1.2.4.1-3, 8.2.1.2.5-1 and 8.2.1.2.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

**Table 8.2.1.2.5-1: NR Cell specific test parameters for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH Reference measurement channel | | 1, 4 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1, 4 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| RMC CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6 | SMTC.1 | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.2 FR1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | |
| | | 3, 6 | -137 | |
| Pcompensation | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| Cell_selection_and_re-selection_quality_measurement | | 1, 2, 3, 4, 5, 6 | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 17.45 | 14 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -99.9 | |
| | | 2, 5 | -99.9 | |
| | | 3, 6 | -96.9 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -99.9 | |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 17.45 | 14 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -82.45 | -85.90 |
| | | 2, 5 | -82.45 | -85.90 |
| | | 3, 6 | -79.45 | -82.90 |

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Io | dBm/9.36 MHz | 1, 4 | -54.42 | -57.78 |
| | dBm/9.36 MHz | 2, 5 | -54.42 | -57.78 |
| | dBm/38.16 MHz | 3, 6 | -48.32 | -51.68 |
| Treselection | s | 1, 2, 3, 4, 5, 6 | 0 | |
| Snonintrasearch | dB | 1, 2, 3, 4, 5, 6 | Not sent | |
| $Thresh_{x, high}$ | dB | 1, 2, 3, 4, 5, 6 | 48 | |
| $Thresh_{serving, low}$ | dB | 1, 2, 3, 4, 5, 6 | 44 | |
| $Thresh_{x, low}$ | dB | 1, 2, 3, 4, 5, 6 | 50 | |
| Propagation Condition | | 1, 2, 4, 56 | AWGN 1944 Note 4 | |
| | | 3, 6 | AWGN 3334 Note 5 | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.<br>NOTE 5: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz. | | | | |

**Table 8.2.1.2.5-2: E-UTRA Cell specific test parameters for for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Cell 1 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA Note 1 | dB | | |
| OCNG_RB Note 1 | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -99.9 | |
| RSRP Note 3 | dBm/15 kHz | -103.55 | -84.45 |
| $\hat{E}_s/I_{ot}$ | dB | -3.65 | 15.45 |
| $\hat{E}_s/N_{oc}$ | dB | -3.65 | 15.45 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| Snonintrasearch | dB | 50 | |
| $Thresh_{x, high}$ | dB | 48 | |
| $Thresh_{serving, low}$ | dB | 44 | |
| $Thresh_{x, low}$ | dB | 50 | |
| Propagation Condition | | AWGN | |

| Parameter | Unit | Cell 1 | |
|---|---|---|---|
| | | T1 | T2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: Void | | | |

The cell re-selection delay to a lower priority NR cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a registration procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

The rate of correct cell re-selections observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, NR_HST} + T_{SI-NR,}$

Where:

$T_{evaluate, NR_HST}$ See Table 4.2.2.5.6-2 in clause 4.2.2.5.6 in TS 36.133 [23]

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority NR cell.

## 8.2.2 E-UTRA - NR Inter-RAT Early Measurement Reporting

### 8.2.2.0 Minimum conformance requirements

A UE supporting *ca-IdleModeMeasurements* shall perform the idle mode measurement on the inter-frequency CA candidate frequencies/cells indicated by higher layers and meet the requirement specified in this clause. A UE supporting *nr-IdleInactiveMeasFR1-r16* and/or *nr-IdleInactiveMeasFR2-r16* shall perform the idle mode measurement on the NR inter-RAT EN-DC candidate frequencies/cells indicated by higher layers and meet the requirement specified in this section.

Additionally, a UE supporting *ca-IdleModeMeasurements* or *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall perform the idle mode measurement on serving cell and meet the requirement specified in this section.

A UE only supporting *ca-IdleModeMeasurements* shall fulfil the requirements defined for a UE supporting *ca-IdleModeMeasurements* as defined in this section.

A UE only supporting *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall fulfil the requirements defined for a UE supporting *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* as defined in this section.

A UE supporting both *ca-IdleModeMeasurements* and *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall fulfil the requirements for a UE supporting *ca-IdleModeMeasurements* and *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* as defined in this section.

The requirements in clause 4.9 apply provided that the UE is provided with a valid timer T331 by dedicated RRC signalling and T331 is running.

For a UE which supports *ca-IdleModeMeasurements* the UE shall support the idle mode CA measurements on the serving cell, overlapping and non-overlapping carriers.

For inter-frequency idle mode measurements, an overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements. A non-overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.

This clause defines the requirements for the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an E-UTRAN carrier aggregation or EN-DC capable UE which has been configured with one or more downlink SCells or NR PSCell and one or more downlink NR SCells during the Connected mode and which supports *ca-IdleModeMeasurements* or *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16*. The requirements are applicable for E-UTRAN FDD and TDD SCell(s), and NR PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
  - The UE is provided with a valid timer T331 by dedicated RRC signalling, and
  - For inter-frequency carrier, the detected cell remains detectable until UE reconnects to the network and transmits the early measurement report, or for NR inter-RAT carrier, the detected cell and SSBs of the detected cell remains detectable until UE reconnects to the network and transmits the early measurement report.
  - The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-frequency cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-RAT NR cell is considered detectable according to the conditions in B.1.3 of [50] for a corresponding band. An SSB of an inter-RAT NR cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in Annex B.1.3 of [50] for a corresponding Band.

In the absence or expiration of T331, it is up to UE implementation to apply the requirements on the detected cell status in this subclause.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in section 4.2.2.1 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in clauses 9.1.2B.2 and 9.1.5B.2, respectively.

While T331 is running, the UE shall perform measurement on the configured NR inter-RAT carriers for idle mode measurement reporting.

In addition to the requirements defined in section 4.2.2.9 and 4.2.2.9a, a UE which supports *nr-IdleInactiveMeasFR1-r16 or nr-IdleInactiveMeasFR2-r16* shall be able to support idle mode DC measurements of.

- at least 8 inter-RAT NR carriers which are also configured for inter-RAT mobility measurements, and
- at least 2 inter-RAT NR carrier which are not configured for inter-RAT mobility measurements.

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 8 inter-RAT NR carriers for idle mode DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For idle mode DC measurements on NR inter-RAT carriers, if Srxlev $\leq S_{nonIntraSearchP}$ and Squal $\leq S_{nonIntraSearchQ}$, the NR inter-RAT measurement requirements defined in clause 4.2.2.5.6 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, the UE shall search for NR inter-RAT layers configured for idle mode DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2, where UE shall search for and measure NR inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting.

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* on one or more carriers for idle mode DC measurement, the UE, on each carrier, shall be able to

- detect a newly detectable inter-RAT NR cell and perform RSRP/RSRQ measurement in preparation for reporting, and
- detect and acquire the SSB index for a newly detectable inter-RAT NR cell if *beamMeasConfigIdle-r16* is configured on this carrier and perform RSRP/RSRQ measurement in preparation for reporting,

within the requirements defined in clause 4.2.2.5.6 plus k*$T_{SSB_index,NR}$, where k is the number of carriers configured for idle mode DC measurement with *beamMeasConfigIdle-r16*, and $T_{SSB_index,NR}$ is the additional time period used to acquire the index of the SSB being measured as defined in Table 4.9.2.4-1.

**Table 4.9.2.4-1: $T_{SSB_index,NR}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{SSB_index,NR}$ [s] (number of DRX cycles) |
|---|---|---|---|
| | FR1 | FR2[Note1] | |
| 0.32 | 1 | 8 | N2 x 1.28 x 1.5 x N1 (N2 x 4 x 1.5 x N1) |
| 0.64 | | 5 | N2 x 1.28 x N1 (N2 x 2 x N1) |
| 1.28 | | 4 | N2 x 1.28 x N1 (N2 x 1 x N1) |
| 2.56 | | 3 | N2 x 2.56 x N1 (N2 x 1 x N1) |
| NOTE 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.<br>NOTE 2: N2 = 3 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR1, and N2= 5 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR2. | | | |

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode DC measurement, the UE shall be capable of performing SS-RSRP, SS-RSRQ for at least

- 7 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR1,
- 10 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR2.

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode DC measurement.

The UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements to higher layers, with measurement accuracy as specified in sub-clauses 9.11.1A and 9.11.2A, respectively. The UE shall be able to report idle mode DC measurements when idle mode DC measurement reporting is requested by the network.

## 8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting

### 8.2.2.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 4.9.2.4 and verify to the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 9.11.1A and 9.11.2A.

### 8.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE from Release 16 onwards, capable of NR measurements and supporting eNB-configured SSB-based RRM measurements of NR FR1 carrier(s) in RRC_IDLE and in RRC_INACTIVE.

#### 8.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.2.1.

#### 8.2.2.1.4 Test description

##### 8.2.2.1.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.2.1.4.1-1.

**Table 8.2.2.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 Inter-RAT Early Measurement Reporting**

| Test Case ID | Description |
|---|---|
| 8.2.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.2.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.2.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.2.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test requirement and the DUT according to the parameters in Table 8.2.2.1.4.1-2.

**Table 8.2.2.1.4.1-2: Initial conditions for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1. 6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.2.2.1.4.1-3.
2. Message contents are defined in clause 8.2.2.1.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is the PCell and Cell 2 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 8.2.1.1.4.1-3: General test parameters for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRAN Cell 1 | |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | Cell 2 is of higher priority. |
| RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1: Cell 1<br>2: Cell 2 | |
| DRX cycle length | s | 1, 2, 3, 4, 5, 6 | 1.28 | |
| Time offset between Cell 1 and Cell 2 | | 1, 2, 3, 4, 5, 6 | 3 μs | |
| T1 | s | 1, 2, 3, 4, 5, 6 | 0.5 | |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2, 3, 4, 5, 6 | 71 | |
| T3 | s | 1, 2, 3, 4, 5, 6 | 2 | |
| T331 | s | 1, 2, 3, 4, 5, 6 | 300 | |

#### 8.2.2.1.4.2 Test procedure

In this test there are two cells, E-UTRA PCell (Cell 1) and neighbour NR Cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Prior to the start of the test the UE shall be connected to Cell 1. During T1, NR Cell 2 shall be powered off.

At the end of T1, the RRC connection to Cell 1 is released and UE is configured Idle mode DC measurement on the carrier frequency of Cell 2.

1. Ensure the UE is in State RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters for T1 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T1 starts.

3. After T1 expires, the SS shall send the RRCConnectionRelease with configuration of Idle mode DC measurement on the carrier frequency of Cell 2.

4. The SS shall set the parameters for T2 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T2 starts.

5. During the time period T2 the UE is in Idle mode configured to perform inter-RAT idle mode CA/DC measurements on Cell 2. The UE shall not perform re-selection.

6. After T2 expires, the SS shall set the parameters for T3 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T3 starts.

7. The SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity). During the connection setup the UE is reports idleMeasAvailable-r15 in the *RRCConnectionSetupComplete* message.

8. The SS shall send the *UEInformationRequest* message, requesting UE to report idle mode CA/DC measurements.

9. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 8.2.2.1.5-3 for configuration 1, 2, 4 and 5 and Table 8.2.2.1.5-4 for configuration 3 and 6 and SS-RSRQ values within the limits in Table 8.2.2.1.5-5 for configuration 1, 2, 3, 4, 5 and 6 the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.

10. If paging in step 7 succeeds, go to step 12, otherwise switch off the UE.

11. Switch on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-12 until a test verdict has been achieved.

#### 8.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 8.2.2.1.4.3-2: *SystemInformationBlockType2***

| Derivation Path: 36.508 [25] Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| idleModeMeasurementsNR-r16 | true | | |
| } | | | |

**Table 8.2.2.1.4.3-2: *RRCConnectionRelease***

| Derivation Path: 36.508 [25] Table 4.6.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionRelease ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier-DL | | |
| criticalExtensions CHOICE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| measIdleConfig-r15 SEQUENCE { | | | |
| measIdleCarrierListNR-r16 ::= SEQUENCE { | | | |
| carrierFreqNR-r16 | ARFCN of Cell 2 | | |
| subcarrierSpacingSSB-r16 | kHz15 | 8.2.2.1-1<br>8.2.2.1-2<br>8.2.2.1-4<br>8.2.2.1-5 | |
| subcarrierSpacingSSB-r16 | kHz30 | 8.2.2.1-3<br>8.2.2.1-6 | |
| reportQuantitiesNR-r16 | both | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.1.4.3-2: *RRCConnectionSetupComplete***

| Derivation Path: 36.508 [25] Table 4.6.1-18 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionSetupComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| idleMeasAvailable-r15 | true | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.1.4.3-3: *UEInformationRequest***

| Derivation Path: 36.508 [25] Table 4.6.1-23A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationRequest-r9 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| idleModeMeasurementReq-r15 | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 4.6.1-23B: *UEInformationResponse***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UEInformationResponse-r9 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| measResultListIdleNR-r16 SEQUENCE { | | | |
| carrierFreqNR-r16 | ARFCN of Cell 2 | | |
| measResultsPerCellListIdleNR-r16 SEQUENCE { | | | |
| physCellIdNR-r16 | Cell ID of Cell 2 | | |
| rsrpResultNR-r16 | INTEGER (0..127) | | |

| | | | |
|---|---|---|---|
| rsrqResultNR-r16 | INTEGER (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.1.5 Test requirement

Tables 8.2.2.1.5-1 and 8.2.2.1.5-2 define the primary level settings including test tolerances for and tables 8.2.2.1.5-3, 8.2.2.1.5-4, 8.2.2.1.5-5 and 8.2.2.1.5-6 define accuracy requirements E-UTRA - NR FR1 Early Measurement Reporting test case.

**Table 8.2.2.1.5-1: Cell specific test parameters for NR Cell 2 for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | | 1, 4 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1, 4 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.2 FR1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5 | -140 | | |
| | | 3, 6 | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Qhysts | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Qoffsets, n | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| Cell_selection_and_re-selection_quality_measurement | | 1, 2, 3, 4, 5, 6 | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4 | -infinity | -4 | 4 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | |
| | | 2, 5 | -98 | | |
| | | 3, 6 | -95 | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | |
| | | 2, 5 | | | |
| | | 3, 6 | | | |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | dB | 1, 4 | -infinity | -3.7 | -3.7 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -infinity | -101.7 | -101.7 |
| | | 2, 5 | -infinity | -101.7 | -101.7 |
| | | 3, 6 | -infinity | -98.7 | -98.7 |
| SS-RSRQ Note3 | dB | 1, 4 | -infinity | -16.03 | -16.03 |
| | | 2, 5 | -infinity | -16.03 | -16.03 |
| | | 3, 6 | -infinity | -16.03 | -16.03 |
| Io | dBm/9.36 MHz | 1, 4 | -70.05 | -68. 51 | -68. 51 |
| | dBm/9.36 MHz | 2, 5 | -70.05 | -68. 51 | -68. 51 |
| | dBm/38.16 MHz | 3, 6 | -63.94 | -62.40 | -62.40 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.2.2.1.5-2: Cell specific test parameters for E-UTRA Cell 1 for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Cell 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 kHz | -84 | -84 | -84 |
| RSRQ Note 3 | dB | -10.96 | -10.96 | -10.96 |
| $\hat{E}_s / I_{ot}$ | dB | 14 | 14 | 14 |
| $\hat{E}_s / N_{oc}$ | dB | 14 | 14 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | 50 | | |
| $Thresh_{x, highP}$ | dB | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP}$ | dB | 50 | | |
| beamMeasConfigIdle | | True | | |
| Propagation Condition | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.2.2.1.5-3: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values for test configurations 1 and 2**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 2) | 44 |
| Highest reported value (Cell 2) | 66 |

**Table 8.2.2.1.5-4: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values for test configurations 3**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 2) | 47 |
| Highest reported value (Cell 2) | 69 |

**Table 8.2.2.1.5-5: Absolute accuracy requirements for the Cell 2 SS-RSRQ reported values for test configurations 1, 2 and 3**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 2) | 44 |
| Highest reported value (Cell 2) | 65 |

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform re-selection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [23]. UE shall be able to detect, acquire the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [23] and Section 9.1.3B, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

## 8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions
- E-UTRA - FR2 OTA testability is still FFS.

### 8.2.2.2.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 4.9.2.4 and verify to the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 9.11.1A and 9.11.2A.

#### 8.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, capable of NR measurements and supporting eNB-configured SSB-based RRM measurements of NR FR2 carrier(s) in RRC_IDLE and in RRC_INACTIVE.

#### 8.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.2.2.

#### 8.2.2.2.4 Test description

##### 8.2.2.2.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.2.2.4.1-1.

**Table 8.2.2.2.4.1-1: Supported test configurations for E-UTRA - NR FR2 Inter-RAT Early Measurement Reporting**

| Test ID | Description |
|---|---|
| 8.2.2.2-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.2.2.2-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test requirement and the DUT according to the parameters in Table 8.2.2.2.4.1-2.

**Table 8.2.2.2.4.1-2: Initial conditions for E-UTRA - NR FR2 Inter-RAT Early Measurement Reporting**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.2.2.2.4.1-3.
2. Message contents are defined in clause 8.2.2.2.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is the PCell and Cell 2 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and Cell 2 is configured according to clauses C.1.1 and C.1.2.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I. Ensure that the UE is receiving NR Cell 2 from the Rx Beam Peak direction.

**Table 8.2.2.2.4.1-3: General test parameters for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | E-UTRAN Cell 1 | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2. |
| Neighbour cell | | 1, 2 | NR Cell 2 | |
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |

| | | | | |
|---|---|---|---|---|
| NR RF Channel Number | | 1, 2 | 1 | One FR2 NR carrier frequency is used. |
| DRX cycle length | s | 1, 2 | 1.28 | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | |
| T1 | s | 1, 2 | 0.5 | |
| T2 | s | 1, 2 | 128 | |
| T3 | s | 1, 2 | 2 | |
| T331 | s | 1, 2 | 300 | |

#### 8.2.2.2.4.2 Test procedure

Same test procedure as in 8.2.2.1.4.2.

#### 8.2.2.2.4.3 Message contents

Same message content as in 8.2.2.1.4.3.

### 8.2.2.2.5 Test requirement

Table8.2.2.2.5-1 define the primary level settings including test tolerances and tables 8.2.2.2.5-2, 8.2.2.2.5-3 define accuracy requirements for E-UTRA - NR FR2 Early Measurement Reporting test case.

**Table 8.2.2.2.5-1: Cell specific test parameters for NR Cell 2 for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | |
| PDSCH Reference measurement channel | | 1, 2 | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | | 1, 2 | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | | 1, 2 | CCR.3.1 TDD | | |
| OCNG Patterns | | 1, 2 | OP.1 | | |
| BWchannel | MHz | 1, 2 | 100 | | |
| Data RBs allocated | | 1, 2 | 66 | | |
| SMTC configuration | | 1, 2 | SMTC.1 | | |
| SSB configuration | | 1, 2 | SSB.1 FR2 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | |
| RLM-RS | | | SSB | | |
| Qrxlevmin | | | -140 | | |
| Pcompensation | | | 0 | | |
| Qhysts | | | 0 | | |
| Qoffsets, n | | | 0 | | |
| Cell_selection_and_re-selection_quality_measurement | | | SS-RSRP | | |
| AoA setup | | | Setup 1 defined in A.9.1 | | |
| Beam assumption Note 4 | | | Rough | | |
| $\hat{E}_s/I_{ot}$ UE baseband | dB | 1, 4 | -infinity | -3.66 | -3.66 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -107 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | -infinity | -2.4 | -2.4 |
| SSbRP Note3 | dBm/SCS | 1, 4 | -infinity | -100.4 | -100.4 |
| SS-RSRQ Note3 | dB | 1, 4 | -infinity | -16.01 | -16.01 |
| Io | dBm/95.04MHz | 1, 4 | -68.98 | -67.01 | -67.01 |

| | | | |
|---|---|---|---|
| Propagation Condition | | 1, 2 | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled.
Note 3: SSB_RP, SS-RSRQ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4.

**Table 8.2.2.2.5-2: Cell specific test parameters for E-UTRA Cell 1 for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting**

| Parameter | Unit | Cell 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{\mathrm{oc}}$ Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 kHz | -84 | -84 | -84 |
| RSRQ Note 3 | dB | -10.96 | -10.96 | -10.96 |
| $\widehat{E}_{\mathrm{s}}/I_{\mathrm{ot}}$ | dB | 14 | 14 | 14 |
| $\widehat{E}_{\mathrm{s}}/N_{\mathrm{oc}}$ | dB | 14 | 14 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | N/A | | |
| $Thresh_{x, highP}$ | dB | 51 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP}$ | dB | 50 | | |
| beamMeasConfigIdle | | False | | |
| Propagation Condition | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\mathrm{oc}}$ to be fulfilled.
Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.2.2.2.5-3: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 2) | 28 |
| Highest reported value (Cell 2) | 86 |

**Table 8.2.2.2.5-4: Absolute accuracy requirements for the Cell 2 SS-RSRQ reported values**

| Normal Conditions | T3 |
|---|---|
| Lowest reported value (Cell 2) | 44 |
| Highest reported value (Cell 2) | 65 |

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform re-selection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [23]. UE shall be able to detect, acqure the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [23] and Section 9.1.3B, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

# 8.3 RRC_CONNECTED state mobility

## 8.3.1 Inter-RAT cell handover

### 8.3.1.0 Minimum conformance requirements

#### 8.3.1.0.1 Minimum conformance requirements for E-UTRA - NR FR1 handover

[TS 36.133 [23], clause 5.3.4.2]

When the UE receives a RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within $D_{handover}$ seconds from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay which is [50] ms.

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding $T_{RRC_procedure_delay}$. $T_{interruption}$ is defined in TS 36.133 clause 5.3.4.3.

[TS 36.133 [23], clause 5.3.4.3]

When inter-RAT handover to NR is commanded, the interruption time shall be less than $T_{interruption}$

$$T_{interruption} = T_{search} + T_{IU} + T_{rs} + 20 \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknowncell and target cell Es/Iot $\geq$ [-2] dB, then $T_{search} = 3 \cdot T_{rs} + 2$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

NOTE: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

$T_{rs}$ is the SMTC period of the target NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise $T_{rs}$ is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in clauses 8.1.2.4.21 and 8.1.2.4.22.

The normative reference for this requirement is TS 38.133 [6] clause 5.3.4.2 and 5.3.4.3.

## 8.3.1.1 E-UTRA - NR FR1 handover with known target cell

### 8.3.1.1.1 Test purpose

The purpose of this test is to verify the E-UTRAN to NR FR1 handover requirements as specified in TS 36.133 [23] clause 5.3.4.

### 8.3.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

### 8.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.3.1.1.

### 8.3.1.1.4 Test description

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN PCell and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [23] is configured before T2 begins to enable inter-RAT frequency monitoring.

#### 8.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.3.1.1.4.1-1.

**Table 8.3.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 handover with known target cell**

| Configuration | Description |
|---|---|
| 8.3.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.3.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.3.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.3.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.3.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.3.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.3.1.1.4.1-2.

**Table 8.3.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 handover with known target cell**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.3.1.1.4.1-3.
2. Message contents are defined in clause 8.3.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

**Table 8.3.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 handover with known target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | E-UTRAN cell |
| | Neighbouring cell | | Cell 2 | NR cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| b2-Threshold1 | | dBm | -83 | Absolute E-UTRAN RSRP threshold for event B2 |
| b2-Threshold2NR | | dBm | As specified in Table 8.3.1.1.5-2 | Absolute NR SS-RSRP threshold for event B2 |
| Hysteresis | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in Table 8.1.2.1-1 started before T2 starts [23] |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 8.3.1.1.4.2 Test procedure

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.3.1.1.4.1-3, 8.3.1.1.5-1 and 8.3.1.1.5-2, respectively.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [23] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2.
7. SS shall transmit a *MobilityFromEUTRACommand* message implying handover to Cell 2.
8. The start of T3 is the instant when the last TTI containing the *MobilityFromEUTRACommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 112 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. The UE shall transmit an *RRCReconfigurationComplete* message on Cell 2.
11. After T3 expires,
    - The SS could switch the parameters setting from T3 to T1 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively.
    - If the UE handover back to E-UTRA Cell 1, then T1 starts, skip to step 3. Otherwise, switch off and on the UE. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.
    - Or, switch off and on the UE Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.
12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved

#### 8.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.3.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 handover with known target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.3-2;<br>Table H.3.4-1a<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 and gapUE<br>Table H.3.4-5 with Condition Pattern #0 |
| Specific message contents exceptions for Test Configuration 8.3.1.1-1, 8.3.1.1-2, 8.3.1.1-4 and 8.3.1.1-5 | Table H.3.4-6 with Condition SSB.1 FR1, SMTC.1 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.3.1.1-3 and 8.3.1.1-6 | Table H.3.4-6 with Condition SSB.2 FR1, SMTC.1 and Asynchronous cells |

### 8.3.1.1.5 Test requirement

Table 8.3.1.1.4.1-3, 8.3.1.1.5-1 and 8.3.1.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 handover with known target cell.

**Table 8.3.1.1.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 handover with known target cell**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode | | 1, 2, 3 | FDD | | |
| | | 4, 5, 6 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PRACH Configuration[Note2] | | 1, 2, 3 | 4 | | |
| | | 4, 5, 6 | 53 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note4] | | | | | |
| OCNG_RB[Note4] | | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 7 | 5.45 | 5.45 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6 | 7 | 5.45 | 5.45 |
| RSRP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91 | -92.55 | -92.55 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -91 | -92.55 | -92.55 |
| Io[Note6] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -62.43 | -63.68 | -63.68 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix[Note7] | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
NOTE 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.3.1.1.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 handover with known target cell**

| Parameter | | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | | | 1, 4 | FDD | | |
| | | | 2, 3, 5, 6 | TDD | | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | | |
| | | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1, 4 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3, 6 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.2 FR1 | | |
| b2-Threshold2NR | | dBm | 1, 2, 4, 5 | -106 | | |
| | | | 3, 6 | -103 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -98 | | |
| | | | 3, 6 | -95 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | -infinity | 1.55 | 1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | -infinity | 1.55 | 1.55 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -infinity | -96.45 | -96.45 |
| | | | 3, 6 | -infinity | -93.44 | -93.44 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -70.05 | -66.19 | -66.19 |
| | | dBm/38.16 MHz | 3, 6 | -63.94 | -60.09 | -60.09 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3.

The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 50 ms and is specified in TS 36.133 [23].
- $T_{interrupt}$ = 62 ms in the test; $T_{interrupt}$ is defined in TS 36.133 [23] clause 5.3.4.3.

This gives a total of 112 ms.

The rate of correct handovers observed during repeated tests shall be at least 90%.

# 8.4 Measurement procedures

## 8.4.1 SFTD measurement delay

### 8.4.1.0 Minimum conformance requirements

#### 8.4.1.0.1 Minimum conformance requirements for E-UTRA - NR FR1 SFTD measurement delay

[TS 36.133 [23], clause 8.1.2.4.25.1]

The UE shall perform inter-RAT SFTD measurement and report SFTD result with/without SS-RSRP after the network requests with *reportSFTD-Meas* set to *neighborCells*. The overall delay includes RRC procedure delay to be defined in clause 11.2 in TS 36.331 and SFTD measurement reporting delay in TS 36.133 [23] clause 8.1.2.4.25.3.

[TS 36.133 [23], clause 8.1.2.4.25.2]

The requirements on SFTD measurement delay defined in this clause are applicable under the side condition SCH $\hat{E}s/Iot \geq$ -3 dB for the NR cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest NR cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more NR cells. The UE may or may not be configured with *cellsForWhichToReportSFTD*. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the NR cell regardless of its SSB position in the SMTC period. The SFTD measurement shall be conducted with sustained connection to the E-UTRA PCell and activated SCell(s), however, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in TS 36.133 [23] clause 7.35.

When measurement gaps are provided, the UE shall be capable of finding the NR cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no MCG DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of $T_{measure_SFTD1}$ as follows:

- For SFTD measurements without measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1}$ = 14 SMTC periods
- For SFTD measurements in measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1} = N_{freq} \times 8 \times \max(\text{MGRP, SMTC period})$
- For SFTD measurements without measurement gaps, and with additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1}$ = 19 SMTC periods
- For SFTD measurements in measurement gaps, and with additional SS-RSRP reporting:

- For NR carrier in FR1: $T_{measure_SFTD1} = N_{freq} \times 13 \times \max(\text{MGRP, SMTC period})$

Where $N_{freq}$ is the number of carriers monitored in measurement gaps.

When MCG DRX is used, the same $T_{measure_SFTD1}$ as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case an NR PSCell is added, the UE shall terminate the inter-RAT SFTD measurement.

In case PCell is changed due to handover, the UE shall terminate the inter-RAT SFTD measurement.

[TS 36.133, clause 8.1.2.4.25.3]

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier-based switching, an additional delay can be expected.

The SFTD measurement reporting delay shall be less than $T_{measure_SFTD1}$ defined in TS 36.133 [23], clause 8.1.2.4.25.2.

## 8.4.1.1 E-UTRA - NR FR1 SFTD measurement delay in non-DRX

### 8.4.1.1.1 Test purpose

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [23] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

### 8.4.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of inter-RAT SFTD measurements.

### 8.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.1.1.

### 8.4.1.1.4 Test description

Two carriers are used in this test: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

This test consists of a single time period of duration T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report. No measurement gaps are provided and no DRX is configured in this test.

#### 8.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.1.1.4.1-1.

**Table 8.4.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Config | Description |
|---|---|
| 8.4.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 8.4.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.1.1.4.1-2.

**Table 8.4.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.1.1.4.1-3.
2. Message contents are defined in clause 8.4.1.1.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup for this test. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1.

**Table 8.4.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One NR FR1 carrier frequencies is used. |
| Active cell | | Config 1,2,3,4,5,6 | Cell 1 | | Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | Cell 2 | | Cell 2 is on NR RF channel number 1. |
| SSB configuration | | Config 1,4 | SSB.1 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| | | Config 2,5 | SSB.1 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| | | Config 3,6 | SSB.2 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| CP length | | Config 1,2,3,4,5,6 | Normal | | Applicable to both cells. |
| DRX | | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Frame time offset between serving and neighbour cells | ms | Config 1,2,4,5 | 3 | 7 | Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1. |
| | µs | Config 3,6 | 3 | | Synchronous cells. |
| SFN offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 0 | 1 | SFN of Cell 2 relative to SFN of Cell 1. |
| T1 | s | Config 1,2,3,4,5,6 | 1 | | |

#### 8.4.1.1.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general test parameters are given in Table 8.4.1.1.4.1-3. The test has two subtests with different frame time offset and SFN offset. Cell specific test parameters for the E-UTRA PCell and neighbour cell are given in Table 8.4.1.1.5-1 and 8.4.1.1.5-2, respectively.

In the measurement control information, it is indicated to the UE that inter-RAT SFTD measurement on Cell 2 is used. This test consists of single time period with time duration of T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only.

Configure the frame time offset and SFN offset according to Test 1 in Table 8.4.1.1.4.1-3.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 2 according to T1 in Table 8.4.1.1.5-2, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. UE shall transmit a *MeasurementReport* message triggered by SFTD measurement reporting. If the overall delays measured from the beginning of time period T1 is less than 297 ms then the number of successful tests is increased by one. If the UE fails to report within the overall delays measured requirement then the number of failure tests is increased by one.
6. After the SS receive the *MeasurementReport* message in step 6) or when T1 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
7. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.
10 Set the frame time offset and SFN offset for Test 2 according to Table 8.4.1.1.4.1-3 and repeat steps 1 to 9.

#### 8.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and SFTD;<br>Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS |
| Specific message contents exceptions for Test Configuration 8.4.1.1-1 8.4.1.1-2, 8.4.1.1-4 and 8.4.1.1-5 | Table H.3.4-6 with Condition SSB.1 FR1 andSMTC.1 |
| Specific message contents exceptions for Test Configuration 8.4.1.1-3 and 8.4.1.1-6 | Table H.3.4-6 with Condition SSB.2 FR1 andSMTC.1 |

8.4.1.1.5 Test requirement

Table 8.4.1.1.4.1-3, 8.4.1.1.5-1 and 8.4.1.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement delay in non-DRX.

**Table 8.4.1.1.5-1: E-UTRA Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Parameter | Unit | E-UTRAN Cell 1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP [Note5] | dBm/15 kHz | -87 |
| SCH_RP [Note5] | dBm/15 kHz | -87 |
| Io [Note5] | dBm/Ch BW | -59.13+10log($N_{RB,c}$ /50) |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.4.1.1.5-2: NR Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 |
|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 |
| Duplex mode | | Config 1,4 | FDD |
| | | Config 2,3,5,6 | TDD |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 |
| TDD configuration | | Config 2,5 | TDDConf.1.1 |
| | | Config 3,6 | TDDConf.2.1 |
| OCNG Pattern defined in A.3.2.1.1 | | Config 1,2,3,4,5,6 | OP.1 |
| SMTC configuration | | Config 1,2,3,4,5,6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 |
| | | Config 3,6 | 30 |
| EPRE ratio of PSS to SSS | dB | Config 1,2,3,4,5,6 | 0 |
| EPRE ratio of PBCH DMRS to SSS | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | dB | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | dB | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 |
| | | Config 3,6 | -95 |
| SS-RSRP Note 3, 4 | dBm/SCS | Config 1,2,4,5 | -94 |
| | | Config 3,6 | -91 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 |
| Io Note 3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 |
| | dBm/38.16MHz | Config 3,6 | -58.49 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The overall delays measured is defined as the time from the beginning of time period T1, to the moment the UE send one SFTD measurement triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

- Overall delays measured = measurement reporting delay + TTI insertion uncertainty
- Measurement reporting delay = $T_{RRC_procedure_delay}$ + $T_{measure_SFTD1}$

  $T_{RRC_procedure_delay}$ = 15 ms, is the RRC procedure delay for RRC reconfiguration, which is defined in TS 36.331 [29] Clause 11.2

  $T_{measure_SFTD1}$ = 280 ms, is the SFTD measurement report delay defined in TS 36.133 [23] clause 8.1.2.4.25 and 8.1.2.4.26 for FDD and TDD E-UTRA Cell 1, respectively.
- TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 297 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 8.4.1.2 E-UTRA - NR FR1 SFTD measurement delay in DRX

### 8.4.1.2.1 Test purpose

The purpose of this test is:

- To partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [23] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

### 8.4.1.2.2 Test applicability

This test applies to all types of E-UTRA UE Release 15 and forward supporting inter-RAT SFTD measurements and long DRX cycle.

### 8.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.1.2.

### 8.4.1.2.4 Test description

Two carriers are used in this test: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

This test consists of a single time period of duration T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report. No measurement gaps are provided and DRX is configured in this test.

#### 8.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.1.2.4.1-1.

**Table 8.4.1.2.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Config | Description |
|---|---|
| 8.4.1.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.1.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.1.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.1.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.1.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.1.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.1.2.4.1-2.

**Table 8.4.1.2.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.1.2.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.1.2.4.1-3.
2. Message contents are defined in clause 8.4.1.2.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup for this test. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1.

**Table 8.4.1.2.4.1-3: General test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One NR FR1 carrier frequencies is used. |
| Active cell | | Config 1,2,3,4,5,6 | Cell 1 | | Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | Config 1,2,3,4,5,6 | Cell 2 | | Cell 2 is on NR RF channel number 1. |
| SSB Configuration | | Config 1,4 | SSB.1 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| | | Config 2,5 | SSB.1 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| | | Config 3,6 | SSB.2 FR1 | | As specified in TS 38.133 [6] clause A.3.10.1 |
| CP length | | Config 1,2,3,4,5,6 | Normal | | Applicable to both cells. |
| DRX | | Config 1,2,3,4,5,6 | DRX.4 | | DRX configuration as specified in TS 38.133 [6] clause A.3.3.4 |
| Frame time offset between serving and neighbour cells | ms | Config 1,2,4,5 | 3 | 7 | Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1. |
| | µs | Config 3,6 | 3 | | Synchronous cells. |
| SFN offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 0 | 1 | SFN of Cell 2 relative to SFN of Cell 1. |
| T1 | s | Config 1,2,3,4,5,6 | 1 | | |

### 8.4.1.2.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general test parameters are given in Table 8.4.1.2.4.1-3. The test has two subtests with different frame time offset and SFN offset. Cell specific test parameters for the E-UTRA PCell and neighbour cell are given in Table 8.4.1.2.5-1 and 8.4.1.2.5-2, respectively.

In the measurement control information, it is indicated to the UE that inter-RAT SFTD measurement on Cell 2 is used. This test consists of single time period with time duration of T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only.

Configure the frame time offset and SFN offset according to Test 1 in Table 8.4.1.2.4.1-3.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 2 according to T1 in Table 8.4.1.2.5-2, T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. UE shall transmit a *MeasurementReport* message triggered by SFTD measurement reporting. . If the overall delays measured from the beginning of time period T1 is less than 455 ms then the number of successful tests is increased by one, otherwise the number of failure tests is increased by one.

6. After the SS receive the *MeasurementReport* message in step 6) or when T1 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod1008) for next iteration of the test procedure loop.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

10 Set the frame time offset and SFN offset for Test 2 according to Table 8.4.1.2.4.1-3 and repeat steps 1 to 9.

#### 8.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

**Table 8.4.1.2.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and SFTD;<br>Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS<br>Table H.3.7-2 with Condition DRX.4 |
| Specific message contents exceptions for Test Configuration 8.4.1.1-1, 8.4.1.1-2, 8.4.1.1-4 and 8.4.1.1-5 | Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 and |
| Specific message contents exceptions for Test Configuration 8.4.1.1-3 and 8.4.1.1-6 | Table H.3.4-6 with Condition SSB.2 FR1 and SMTC.1 |

#### 8.4.1.2.5 Test requirement

Table 8.4.1.2.4.1-3, 8.4.1.2.5-1 and 8.4.1.2.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement delay in DRX.

**Table 8.4.1.2.5-1: E-UTRA Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Parameter | Unit | E-UTRAN Cell 1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |

| | | |
|---|---|---|
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP [Note5] | dBm/15 kHz | -87 |
| SCH_RP [Note5] | dBm/15 kHz | -87 |
| Io [Note5] | dBm/Ch BW | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.4.1.2.5-2: NR Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX**

| Parameter | Unit | Test configuration | Cell 2 |
|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 |
| Duplex mode | | Config 1,4 | FDD |
| | | Config 2,3,5,6 | TDD |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 |
| TDD configuration | | Config 2,5 | TDDConf.1.1 |
| | | Config 3,6 | TDDConf.2.1 |
| OCNG Pattern defined in A.3.2.1.1 | | Config 1,2,3,4,5,6 | OP.1 |
| SMTC configuration | | Config 1,2,3,4,5,6 | SMTC.1 |
| | kHz | Config 1,2,4,5 | 15 |

| | | | |
|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | Config 3,6 | 30 |
| EPRE ratio of PSS to SSS | dB | Config 1,2,3,4,5,6 | 0 |
| EPRE ratio of PBCH DMRS to SSS | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | dB | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | dB | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2,4,5 | -98 |
| | | Config 3,6 | -95 |
| SS-RSRP Note 3, 4 | dBm/SCS | Config 1,2,4,5 | -94 |
| | | Config 3,6 | -91 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 |
| Io Note 3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 |
| | dBm/38.16MHz | Config 3,6 | -58.49 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The overall delays measured is defined as the time from the beginning of time period T1, to the moment the UE send one SFTD measurement triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

- Overall delays measured = measurement reporting delay + TTI insertion uncertainty
- Measurement reporting delay = $T_{RRC_procedure_delay} + T_{measure_SFTD1} + T_{DRX_transmission}$

  $T_{RRC_procedure_delay}$ = 15 ms, is the RRC procedure delay for RRC reconfiguration, which is defined in TS 36.331 [29] Clause 11.2

  $T_{measure_SFTD1}$ = 280 ms, is the SFTD measurement report delay defined in TS 36.133 [23] clause 8.1.2.4.25 and 8.1.2.4.26 for FDD and TDD E-UTRA Cell 1, respectively. When DRX is used, the same $T_{measure_SFTD1}$ as for non-DRX applies.

  $T_{DRX_transmission}$ = 158 ms, it is the time until the next transmission in the worst case that the last PDDCH is missed at 280ms from the beginning of T1.
- TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 455 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 8.4.2 Inter-RAT measurements

### 8.4.2.0 Minimum conformance requirements

#### 8.4.2.0.1 Minimum conformance requirements for E-UTRA - NR event-triggered measurement

The UE shall be able to identify new inter-RAT E-UTRAN – NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

When measurement gaps are scheduled, the UE shall be able to identify a new detectable cell within $T_{identify_irat_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT frequency cell within $T_{identify_irat_with_index}$. The UE shall be able to identify a new detectable inter-RAT SS block of an already detected cell within $T_{identify_irat_without_index}$.

$$T_{identify_irat_without_index} = (T_{PSS/SSS_sync_irat} + T_{SSB_measurement_period_irat}) \text{ ms}$$

$$T_{identify_irat_with_index} = (T_{PSS/SSS_sync_irat} + T_{SSB_measurement_period_irat} + T_{SSB_time_index_irat}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_irat}$: it is the time period used in PSS/SSS detection given in table 8.4.2.0.1-1 and table 8.4.2.0.1-2.

$T_{SSB_time_index_irat}$: it is the time period used to acquire the index of the SSB being measured given in table 8.4.2.0.1-3 and table 8.4.2.0.1-4.

$T_{SSB_measurement_period_irat}$: equal to a measurement period of SSB based measurement given in table 8.4.2.0.1-5 and table 8.4.2.0.1-6.

$M_{pss/sss_sync_irat}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_ira}$=64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), $M_{pss/sss_sync_irat}$=40 samples. For a UE supporting FR2 power class 3 (handheld), $M_{pss/sss_sync_irat}$=40 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_syn_iratc}$=40 samples.

$M_{SSB_index_irat}$: For a UE supporting power class 1, $M_{SSB_index_irat}$ =40 samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), $M_{pss/sss_sync_irat}$=24 samples.For a UE supporting power class 3 (handheld), $M_{SSB_index_irat}$ =24 samples. For a UE supporting power class 4, $M_{meas_period_irat}$ =24 samples.

$M_{meas_period_irat}$: For a UE supporting FR2 power class 1, $M_{meas_period_irat}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), $M_{pss/sss_sync_irat}$=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas_period_irat}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_irat}$ =40 samples.

$N_{freq}$ is defined in TS 36.133 [23] clause 8.1.2.1.1.

For per-FR measurement gap capable UE, when serving cells are in E-UTRA and measurement objects are only in FR2:

- UE can perform such measurements without gap; and
- UE fulfils the requirements for FR2 measurement objects based on effective MGRP = 20 ms.

**Table 8.4.2.0.1-1: Time period for PSS/SSS detection, (Frequency range 1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_irat}$ |
|---|---|
| No DRX | max[600ms, 8 x max(MGRP, SMTC period)] x $N_{freq}$ |
| DRX cycle ≤ 320ms | max[600ms, ceil(8x1.5) x max(MGRP, SMTC period, DRX cycle)] x $N_{freq}$ |
| DRX cycle > 320ms | 8 x DRX cycle x $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 8.4.2.0.1-1A: Time period for PSS/SSS detection for UE configured with *highSpeedInterRAT-r16* (Frequency range 1)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_irat}$ |
|---|---|
| No DRX | $Max(600ms, 8 \times Max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle < 320ms | $Max(600ms, ceil(8 \times M) \times max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle ≥ 320ms | $8 \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [6]. | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [6] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms. | |

**Table 8.4.2.0.1-2: Time period for PSS/SSS detection, (Frequency range 2)**

| Condition NOTE1,2 | $T_{PSS/SSS_sync_irat}$ |
|---|---|
| No DRX | $Max(600ms, M_{pss/sss_sync_irat} \times max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle ≤ 320ms | $Max(600ms, (1.5 \times M_{pss/sss_sync_irat}) \times max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle > 320ms | $M_{pss/sss_sync_irat} \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 8.4.2.0.1-3: Time period for time index detection (Frequency range 1)**

| Condition NOTE1,2 | $T_{SSB_time_index_irat}$ |
|---|---|
| No DRX | $Max(120ms, 3 \times max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle ≤ 320ms | $Max(120ms, ceil(3 \times 1.5) \times max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle > 320ms | $3 \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 8.4.2.0.1-3A: Time period for time index detection for UE configured with *highSpeedInterRAT-r16* (Frequency range 1)**

| Condition NOTE1,2 | $T_{SSB_time_index_irat}$ |
|---|---|
| No DRX | $Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle < 320ms | $Max(120ms, Ceil(3 \times M) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle ≥ 320ms | $3 \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [6]. | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [6] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms. | |

**Table 8.4.2.0.1-4: Time period for time index detection (Frequency range 2)**

| Condition NOTE1,2 | $T_{SSB_time_index_irat}$ |
|---|---|

| | |
|---|---|
| No DRX | Max(200ms, $M_{SSB_index_irat}$ x max(MGRP, SMTC period)) x $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(200ms, (1.5 x $M_{SSB_index_irat}$) x max(MGRP, SMTC period, DRX cycle)) x $N_{freq}$ |
| DRX cycle > 320ms | $M_{SSB_index_irat}$ x DRX cycle x $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

In the requirements, an NR cell is considered to be detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in clause 9.11.1 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6],
- NR SS-RSRQ related conditions in the accuracy requirements in clause 9.11.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6],
- NR SS-SINR related conditions in the accuracy requirements in clause 9.11.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6].

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ, and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 36.133 [23] clause 9.11, with measurement period as shown in table 8.4.2.0.1-5 and table 8.4.2.0.1-6:

**Table 8.4.2.0.1-5: Measurement period for inter-RAT frequency measurements (Frequency range 1)**

| **Condition** NOTE1,2 | **$T_{SSB_measurement_period_irat}$** |
|---|---|
| No DRX | Max(200ms, 8 x max(MGRP, SMTC period)) x $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(200ms, ceil(8 x 1.5) x max(MGRP, SMTC period, DRX cycle)) x $N_{freq}$ |
| DRX cycle > 320ms | 8 x DRX cycle x $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

**Table 8.4.2.0.1-5A: Measurement period for inter-RAT measurements for UE configured with *highSpeedInterRAT-r16* (Frequency range 1)**

| **Condition** NOTE1,2 | **$T_{SSB_measurement_period_irat}$** |
|---|---|
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period) ) × $N_{freq}$ |
| DRX cycle < 320ms | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×$N_{freq}$ |
| DRX cycle ≥ 320ms | 4× M × DRX cycle ×$N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [6].<br>NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [6] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.<br>NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms. | |

**Table 8.4.2.0.1-6: Measurement period for inter-RAT frequency measurements (Frequency range 2)**

| **Condition** NOTE1,2 | **$T_{SSB_measurement_period_irat}$** |
|---|---|
| No DRX | Max(400ms, $M_{meas_period_irat}$ x max(MGRP, SMTC period)) x $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(400ms, (1.5 x $M_{meas_period_irat}$) x max(MGRP, SMTC period, DRX cycle)) x $N_{freq}$ |
| DRX cycle > 320ms | $M_{meas_period_irat}$ x DRX cycle x $N_{freq}$ |

| | |
|---|---|
| NOTE 1: | DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1. |
| NOTE 2: | In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. |

The UE shall be capable of performing NR SS-RSRP, SS-RSRQ, and SS-SINR for up to 7 NR carrier frequencies.

For each RAT E-UTRAN - NR layer on FR1 or FR2, the UE shall be capable of monitoring at least 4 cells.

For each RAT E-UTRAN - NR layer on FR1, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB index and/or PCI on the RAT E-UTRA -NR.

For each RAT E-UTRA - NR layer on FR2, during each layer 1 measurement period, the UE shall be capable of monitoring at least 10 SSBs with different SSB index and/or PCI on the RAT E-UTRAN - NR layer. The UE shall be capable of monitoring at least one SSB per cell.

The NR SS-RSRP measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.1.
The NR SS-RSRQ measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.2.
The NR SS-SINR measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.3.

Reported measurements in event triggered measurement reports shall meet the requirements in TS 36.133 [23] clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any events that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_without_index}$ or $T_{identify_irat_with_index}$ for the minimum requirements. When L3 filtering is used or IDC autonomous denial or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_irat_without_index}$ or $T_{identify_irat_with_index}$ for the minimum requirements and then triggers the measurement report as per TS 36.331 [29], the event triggered measurement reporting delay shall be less than $T_{measurement_NR_FDD}$ provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21 and 8.1.2.4.22.

#### 8.4.2.0.2 Void

### 8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX

#### 8.4.2.1.1 Test purpose

The purpose of this test isto verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

#### 8.4.2.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

#### 8.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.1.

#### 8.4.2.1.4 Test description

The test consists of two sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. The UE is not required to report SSB time index.

##### 8.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.1.4.1-1.

**Table 8.4.2.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Configuration | Description |
|---|---|
| 8.4.2.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.1-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.2.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.1-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.1.4.1-2.

**Table 8.4.2.1.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.1.4.1-3.
2. Message contents are defined in clause 8.4.2.1.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.1.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

**Table 8.4.2.1.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Numbers | | 1, 2, 3, 4, 5, 6 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1, 2, 3, 4, 5, 6 | 1 | One FR1 NR carrier frequency is used. |

| | | | | |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | E-UTRA RSRP threshold for E-UTRA RSRP measurement on Cell 1 for event B2 [29] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B2 [29] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3, 4, 5, 6 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3µs | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 1 | |
| NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.1.5-1.<br>NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.1.5-2. | | | | |

#### 8.4.2.1.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.1.4.1-3, 8.4.2.1.5-1 and 8.4.2.1.5-2, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.1.5-1 and Table 8.4.2.1.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.1.5-1 and Table 8.4.2.1.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or

- switch off the UE.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

- switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

**Table 8.4.2.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0 |
| Specific message contents exceptions for Test Configuration 8.4.2.1-1 and 8.4.2.1-4 | Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.1-2 and 8.4.2.1-5 | Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.1-3 and 8.4.2.1-6 | Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells |

**Table 8.4.2.1.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.1-1/2/3 |
| | 22 | | Config 8.4.2.1-4/5/6 |
| } | | | |
| } | | | |

#### 8.4.2.1.5 Test requirement

Table 8.4.2.1.4.1-3, 8.4.2.1.5-1 and 8.4.2.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX.

**Table 8.4.2.1.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD | |

| | | | | |
|---|---|---|---|---|
| | | | 20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH_RA<br>PBCH_RB<br>PSS_RA<br>SSS_RA<br>PCFICH_RB<br>PHICH_RA<br>PHICH_RB<br>PDCCH_RA<br>PDCCH_RB<br>PDSCH_RA<br>PDSCH_RB<br>OCNG_RA[Note3]<br>OCNG_RB[Note3] | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -56.12 | -56.12 |
| Propagation Condition [Note6] | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.4.2.1.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |
| TDD configuration | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | |
| | | 3, 6 | 40: $N_{RB,c}$ = 106 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| | | 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| | | 3, 6 | -98 | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| | | 3, 6 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| | dBm/38.16MHz | 3, 6 | -63.94 | -56.15 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 [6] plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

### 8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX

#### 8.4.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements given in clause 8.1.2.4.21 of TS 36.133 [23] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [23] for E-UTRAN TDD-NR measurements.

#### 8.4.2.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR measurements.

#### 8.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.2.

#### 8.4.2.2.4 Test description

The test consists of two sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the two sub-tests is the DRX configuration parameters. Each sub-test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In all sub-tests the UE is not required to report SSB time index.

##### 8.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.2.4.1-1.

**Table 8.4.2.2.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Configuration | Description |
|---|---|
| 8.4.2.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.2.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.2.4.1-2.

**Table 8.4.2.2.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.2.4.1-3.
2. Message contents are defined in clause 8.4.2.2.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.2.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

**Table 8.4.2.2.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 1. |

| | | | | | |
|---|---|---|---|---|---|
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on Cell 1 for event B2 [29] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B2 [29] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX | | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | 11 | |
| NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.2.5-1.<br>NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.2.5-2. | | | | | |

### 8.4.2.2.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.2.4.1-3, 8.4.2.2.5-1 and 8.4.2.2.5-2, respectively.

DRX cycle = 40 ms is used in sub-test 1, DRX cycle = 640 ms is used in sub-test 2. The UE is allocated with PUSCH resource at every DRX cycle.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.2.5-1 and Table 8.4.2.2.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.2.5-1 and Table 8.4.2.2.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one. Where X is,
   - 1082 for sub-test 1,
   - 10242 for sub-test 2.
7. .After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.2.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0;Table H.3.7-2 with Condition DRX.9 and Gap for Test 1<br>Table H.3.7-2 with Condition DRX.12 and Gap for Test 2 |
| Specific message contents exceptions for Test Configuration 8.4.2.2-1 and 8.4.2.2-4 | Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.2-2 and 8.4.2.2-5 | Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.2-3 and 8.4.2.2-6 | Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells |

**Table 8.4.2.2.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.2-1/2/3 |
| | 22 | | Config 8.4.2.2-4/5/6 |
| } | | | |
| } | | | |

#### 8.4.2.2.5 Test requirement

Table 8.4.2.2.4.1-3, 8.4.2.2.5-1 and 8.4.2.2.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX.

**Table 8.4.2.2.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |

| | | | | |
|---|---|---|---|---|
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -56.12 | -56.12 |
| Propagation Condition [Note6] | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.4.2.2.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |
| TDD configuration | | 2, 5 | TDDConf.1.1 | |

| | | | | |
|---|---|---|---|---|
| | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | |
| | | 3, 6 | 40: $N_{RB,c}$ = 106 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| | | 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| | | 3, 6 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| | | 3, 6 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| | dBm/38.16MHz | 3, 6 | -63.95 | -56.15 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1082 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10242 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is not required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 [2] plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

## 8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX

### 8.4.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

### 8.4.2.3.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

### 8.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.3.

### 8.4.2.3.4 Test description

The test consists of two cells configured, the E-UTRA PCell and NR neighbour cell. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell.

#### 8.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.3.4.1-1.

**Table 8.4.2.3.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Configuration | Description |
|---|---|
| 8.4.2.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.3-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.2.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.3-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.3.4.1-2.

**Table 8.4.2.3.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.3.4.1-3.

2. Message contents are defined in clause 8.4.2.3.4.3.

3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.3.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

**Table 8.4.2.3.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| E-UTRA RF Channel Numbers | | 1, 2, 3, 4, 5, 6 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | One FR1 NR carrier frequency is used. |
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | E-UTRA RSRP threshold for E-UTRA RSRP measurement on Cell 1 for event B2 [29] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B2 [29] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3, 4, 5, 6 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3μs | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | |
| NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.3.5-1.<br>NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.3.5-2. | | | | |

### 8.4.2.3.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.3.4.1-3, 8.4.2.3.5-1 and 8.4.2.3.5-2, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.3.5-1 and Table 8.4.2.3.5-2 respectively, T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.3.5-1 and Table 8.4.2.3.5-2 respectively. T2 Starts.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 1042 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or

   - switch off the UE.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.3.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

**Table 8.4.2.3.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-8 with Condition SSB-Index |
| Specific message contents exceptions for Test Configuration 8.4.2.3-1 and 8.4.2.3-4 | Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.3-2 and 8.4.2.3-5 | Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.3-3 and 8.4.2.3-6 | Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells |

**Table 8.4.2.3.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.3-1/2/3 |
| | 22 | | Config 8.4.2.3-4/5/6 |
| } | | | |
| } | | | |

8.4.2.3.5 Test requirement

Table 8.4.2.3.4.1-3, 8.4.2.3.5-1 and 8.4.2.3.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX.

**Table 8.4.2.3.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -56.12 | -56.12 |
| Propagation Condition [Note6] | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27]. | | | | |

**Table 8.4.2.3.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |
| TDD configuration | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | |
| | | 3, 6 | 40: $N_{RB,c}$ = 106 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| | | 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| | | 3, 6 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| | | 3, 6 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| | dBm/38.16MHz | 3, 6 | -63.95 | -56.15 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1042 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 [6] plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

## 8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX

### 8.4.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

### 8.4.2.4.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR measurements.

### 8.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.4.

### 8.4.2.4.4 Test description

The test consists of two sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the two sub-tests is the DRX configuration. Each subtest consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In measurements configuration UE shall be indicated to report the SSB index of the identified NR cell.

#### 8.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.4.4.1-1.

**Table 8.4.2.4.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Configuration | Description |
|---|---|
| 8.4.2.4-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.4-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.4-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.2.4-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.4-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.4-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.4.4.1-2.

**Table 8.4.2.4.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.4.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.4.4.1-3.
2. Message contents are defined in clause 8.4.2.4.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.4.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

**Table 8.4.2.4.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | | E-UTRA RSRP threshold for E-UTRA RSRP measurement on Cell 1 for event B2 [29] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B2 [29] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX | | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3μs | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 2 | 13 | |
| NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.4.5-1.<br>NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.4.5-2. | | | | | |

### 8.4.2.4.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.4.4.1-3, 8.4.2.4.5-1 and 8.4.2.4.5-2, respectively.

DRX cycle = 40 ms is used in sub-test 1 and sub-test 3, DRX cycle = 640 ms is used in sub-test 2 and sub-test 4. The UE is allocated with PUSCH resource at every DRX cycle.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.4.5-1 and Table 8.4.2.4.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.4.5-1 and Table 8.4.2.4.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one. Where X is,
   - 1282 for sub-test 1,
   - 12162 for sub-test 2.
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.4.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.4.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-8 with Condition SSB-Index<br>Table H.3.7-2 with Condition DRX.9 and Gap for Test 1<br>Table H.3.7-2 with Condition DRX.12 and Gap for Test 2 |
| Specific message contents exceptions for Test Configuration 8.4.2.4-1 and 8.4.2.4-4 | Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 8.4.2.4-2 and 8.4.2.4-5 | Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.4-3 and 8.4.2.4-6 | Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells |

**Table 8.4.2.4.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.4-1/2/3 |
| | 22 | | Config 8.4.2.4-4/5/6 |
| } | | | |
| } | | | |

8.4.2.4.5 Test requirement

Table 8.4.2.4.4.1-3, 8.4.2.4.5-1 and 8.4.2.4.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX.

**Table 8.4.2.4.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -56.12 | -56.12 |
| Propagation Condition Note6 | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2, 3, 4, 5, 6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.4.2.4.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |
| TDD configuration | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | |
| | | 3, 6 | 40: $N_{RB,c}$ = 106 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| | | 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| | | 3, 6 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| | | 3, 6 | -Infinity | -88 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Io[Note3] | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| | dBm/38.16MHz | 3, 6 | -63.95 | -56.15 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1282 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12162 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 [6] plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

### 8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX

*Editor's Note: This test case is incomplete:*

- *EUTRA – NR FR2 testability issue is not cleared*
- *The TT analysis is complete for test frequency f ≤ 40.8 GHz*
- *The TT analysis is complete for UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

#### 8.4.2.5.1 Test purpose

To verify the UE's ability to make a correct reporting of an event without SSB time index detection in non-DRX within E-UTRA - NR FR2 cell search requirements.

#### 8.4.2.5.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

#### 8.4.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.5.

8.4.2.5.4 Test description

8.4.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.5.4.1-1.

**Table 8.4.2.5.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX**

| Configuration | Description |
|---|---|
| 8.4.2.5-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.4.2.5-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.5.4.1-2.

**Table 8.4.2.5.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.5.4.1-3.
2. Message contents are defined in clause 8.4.2.5.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

**Table 8.4.2.5.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2 | 1 | One FR2 NR carrier frequency is used. |
| Active cell | | 1, 2 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2. |
| Neighbour cell | | 1, 2 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | For UEs supporting per-FR gap (*independentGapConfig*) |
| Measurement gap offset | | 1, 2 | 39 | As specified in TS 36.331 [29]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | For UEs supporting per-FR gap (*independentGapConfig*) |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B1 [29]. |

| | | | | |
|---|---|---|---|---|
| Hysteresis | dB | 1, 2 | 0 | |
| CP length | | 1, 2 | Normal | |
| TimeToTrigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used. |
| DRX | | 1, 2 | OFF | DRX is not used. |
| Time offset between serving and neighbour cells | | 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3μs | Synchronous cells. |
| T1 | s | 1, 2 | 10 | |
| T2 | s | 1, 2 | 6 | |
| NOTE 1: The value of b1-ThresholdNR is defined in Table 8.4.2.5.5-1. | | | | |

### 8.4.2.5.4.2 Test procedure

Measurement gap pattern configuration # 0 as defined in Table 8.4.2.5.4.1-3 is provided for UE that does not support per-FR gap and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.5.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.5.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 3202 for UEs supporting per-FR gap (*independentGapConfig*),
   - 1602 for UEs supporting per-FR gap (*independentGapConfig*).
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.5.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.5.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with condition INTER-RAT and EVENT B1;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for UEs not supporting per-FR gap;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for UEs supporting per-FR gap;<br>Table H.3.4-5 with Condition Pattern #0 for UEs not supporting per-FR gap; |
| Specific message contents exceptions for Test Configuration 8.4.2.5-1 | Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.5-2 | Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells |

**Table 8.4.2.5.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.5-1/2/3 |
| | 22 | | Config 8.4.2.5-4/5/6 |
| } | | | |
| } | | | |

8.4.2.5.5 Test requirement

Tables 8.4.2.5.4.1-3 and 8.4.2.5.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX.

**Table 8.4.2.5.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup defined in A.9.2.1 | | 1, 2 | Setup 2a | |
| Assumption for UE beams[Note 5] | | 1, 2 | Rough | |
| NR RF Channel Number | | 1, 2 | 1 | |
| Duplex mode | | 1, 2 | TDD | |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 24 | |
| OCNG patterns defined in A.3.2.1.1 | | 1, 2 | OP. 3 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | |
| b1-ThresholdNR UE power class 3 | dBm/SCS | 1, 2 | -118 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $\hat{E}_s$ | dBm/SCS | 1, 2 | - Infinity | -80.6 |
| SSB_RP Note 3 | dBm/SCS | 1, 2 | -Infinity | -80.6 |
| $\hat{E}_s / I_{ot}$ BB Note 6 | dB | 1, 2 | -Infinity | 8.3 |
| Io Note3 | dBm/95.04MHz | 1, 2 | -Infinity | -56.0 |
| Propagation Condition | | 1, 2 | AWGN | |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

**Table 8.4.2.5.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Test case | Measurement reporting delay (ms) | |
|---|---|---|
| | D1 ms | D2 ms |
| UE power class 3 | 3202 | 1602 |

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays specified in 36.133 [23] because of TTI insertion uncertainty of the measurement report in DCCH.

The UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms and D2 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

## 8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX

*Editor's Note: This test case is incomplete:*

- *EUTRA – NR FR2 testability issue is not cleared*
- *The TT analysis is complete for test frequency f ≤ 40.8 GHz*
- *The TT analysis is complete for UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

#### 8.4.2.6.1 Test purpose

To verify the UE's ability to make a correct reporting of an event without SSB time index detection in DRX within E-UTRA - NR FR2 cell search requirements.

#### 8.4.2.6.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR FR2 measurements.

#### 8.4.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.6.

#### 8.4.2.6.4 Test description

##### 8.4.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.6.4.1-1.

**Table 8.4.2.6.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX**

| Configuration | Description |
|---|---|
| 8.4.2.6-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.4.2.6-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.6.4.1-2.

**Table 8.4.2.6.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.6.4.1-3.
2. Message contents are defined in clause 8.4.2.6.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

**Table 8.4.2.6.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |

| | | | | | |
|---|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2 | 1 | | One FR2 NR carrier frequency is used. |
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | | For UEs supporting per-FR gap (*independentGapConfig*) |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | | As specified in TS 36.331 [29]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | | For UEs supporting per-FR gap (*independentGapConfig*) |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B1 [29]. |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used. |
| DRX | | 1, 2, 3, 4, 5, 6 | DRX.9 | DRX.12 | As specified in clause A.3.3. |
| Time offset between serving and neighbour cells | | 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3µs | | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 6 | s83 | |
| NOTE: The value of b1-ThresholdNR is defined in Table 8.4.2.6.5-1. | | | | | |

### 8.4.2.6.4.2 Test procedure

Measurement gap pattern configuration # 0 as defined in Table 8.4.2.6.4.1-3 is provided for UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR Cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.6.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.6.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,

- 4802 for sub-test 1,
- 51202 for sub-test 2.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or

   - switch off the UE

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.6.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.6.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with condition INTER-RAT and EVENT B1;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for UEs not supporting per-FR gap;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for UEs supporting per-FR gap;<br>Table H.3.4-5 with Condition Pattern #0 for UEs not supporting per-FR gap;<br>Table H.3.7-2 with Condition DRX.9 for Test 1<br>Table H.3.7-2 with Condition DRX.12 for Test 2 |
| Specific message contents exceptions for Test Configuration 8.4.2.6-1 | Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.6-2 | Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells |

**Table 8.4.2.6.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.6-1/2/3 |
| | 22 | | Config 8.4.2.6-4/5/6 |
| } | | | |
| } | | | |

#### 8.4.2.6.5 Test requirement

Tables 8.4.2.6.4.1-3 and 8.4.2.6.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX.

**Table 8.4.2.6.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup defined in A.9.1 | | 1, 2 | Setup 1 | |
| Assumption for UE beams Note 5 | | 1, 2 | Rough | |
| NR RF Channel Number | | 1, 2 | 1 | |
| Duplex mode | | 1, 2 | TDD | |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns defined in A.3.2.1.1 (OP.1) | | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | |
| b1-ThresholdNR UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $\hat{N}_{oc}$ Note2 | dBm/15kHz | 1, 2 | -104.7 | |
| $\hat{N}_{oc}$ Note2 | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2 | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 8 |
| Io Note3 | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | | 1, 2 | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $\hat{N}_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation

**Table 8.4.2.6.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Test case | Measurement reporting delay (ms) | | | |
|---|---|---|---|---|
| | D1 ms | D2 ms | D3 ms | D4 ms |
| UE power class 3 | 4802 | 51202 | 4802 | 51202 |

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays specified in 36.133 [23] because of TTI insertion uncertainty of the measurement report in DCCH.

In test 1, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms and D3 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms and D4 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is not required to report SSB time index.

### 8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX

*Editor's Note: This test case is incomplete:*

- *EUTRA – NR FR2 testability issue is not cleared*
- *The TT analysis is complete for test frequency f ≤ 40.8 GHz*
- *The TT analysis is complete for UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

#### 8.4.2.7.1 Test purpose

To verify the UE's ability to make a correct reporting of an event with SSB time index detection in non-DRX within E-UTRA - NR FR2 cell search requirements.

#### 8.4.2.7.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

#### 8.4.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.7.

#### 8.4.2.7.4 Test description

##### 8.4.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.7.4.1-1.

**Table 8.4.2.7.4.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX**

| Configuration | Description |
|---|---|
| 8.4.2.7-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.4.2.7-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.7.4.1-2.

**Table 8.4.2.7.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.7.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.7.4.1-3.
2. Message contents are defined in clause 8.4.2.7.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

**Table 8.4.2.7.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| E-UTRA RF Channel Numbers | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Numbers | | 1, 2 | 1 | One FR2 NR carrier frequency is used. |
| Active cell | | 1, 2 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2. |
| Neighbour cell | | 1, 2 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | For UEs supporting per-FR gap (*independentGapConfig*) |
| Measurement gap offset | | 1, 2 | 39 | As specified in TS 36.331 [29]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | For UEs supporting per-FR gap (*independentGapConfig*) |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B1 [29] |
| Hysteresis | dB | 1, 2 | 0 | |
| CP length | | 1, 2 | Normal | |
| TimeToTrigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used. |
| DRX | | 1, 2 | OFF | DRX is not used. |
| Time offset between serving and neighbour cells | | 1 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3µs | Synchronous cells. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |
| NOTE: The value of b1-ThresholdNR is defined in Table A.8.4.2.7.5-1. | | | | |

### 8.4.2.7.4.2 Test procedure

Measurement gap pattern configuration # 0 as defined in Table 8.4.2.7.4.1-3 is provided for UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.7.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.7.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 4162 for UEs supporting per-FR gap (*independentGapConfig*),
   - 2082 for UEs not supporting per-FR gap (*independentGapConfig*).
7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.7.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.7.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with condition INTER-RAT and EVENT B1;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for UEs not supporting per-FR gap;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for UEs supporting per-FR gap;<br>Table H.3.4-5 with Condition Pattern #0 for UEs not supporting per-FR gap; |
| Specific message contents exceptions for Test Configuration 8.4.2.7-1 | Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.7-2 | Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells |

**Table 8.4.2.7.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.7-1/2/3 |
| | 22 | | Config 8.4.2.7-4/5/6 |
| } | | | |
| } | | | |

**Table 8.4.2.7.4.3-3: ReportConfigInterRAT**

| Derivation Path: 36.508 [25] Table 4.6.6-7BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |
| event SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1-NR-r15 SEQUENCE{ | | | |
| b1-Threshold2NR-r15 CHOICE{ | | | |
| nr-RSRP-r15 | 50 | Actual value = 50 -156 = -106dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| maxReportRS-Index-r15 | 2 | | |
| reportQuantityRS-IndexNR-r15 SEQUENCE { | | | |
| ss-rsrp | TRUE | | |
| ss-rsrq | FALSE | | |
| ss-sinr | FALSE | | |
| } | | | |
| } | | | |

### 8.4.2.7.5 Test requirement

Tables 8.4.2.7.4.1-3 and 8.4.2.7.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX.

**Table 8.4.2.7.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup defined in A.9.1 | | 1, 2 | Setup 1 | |
| Assumption for UE beams[Note 5] | | 1, 2 | Rough | |
| NR RF Channel Number | | 1, 2 | 1 | |
| Duplex mode | | 1, 2 | TDD | |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns defined in A.3.2.1.1 | | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | |
| b1-ThresholdNR UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2 | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 8 |
| Io Note3 | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | | 1, 2 | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation

**Table 8.4.2.7.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Test case | Measurement reporting delay (ms) | |
|---|---|---|
| | D1 ms | D2 ms |
| UE power class 3 | 4162 | 2082 |

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays specified in 36.133 [23] because of TTI insertion uncertainty of the measurement report in DCCH.

The UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms and D2 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

## 8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX

*Editor's Note: This test case is incomplete:*

- *EUTRA – NR FR2 testability issue is not cleared*
- *The TT analysis is complete for test frequency f ≤ 40.8 GHz*
- *The TT analysis is complete for UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

#### 8.4.2.8.1 Test purpose

To verify the UE's ability to make a correct reporting of an event with SSB time index detection in DRX within E-UTRA - NR FR2 cell search requirements.

#### 8.4.2.8.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR FR2 measurements.

#### 8.4.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.8.

#### 8.4.2.8.4 Test description

##### 8.4.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.8.4.1-1.

**Table 8.4.2.8.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX**

| Configuration | Description |
|---|---|
| 8.4.2.8-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.4.2.8-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.8.4.1-2.

**Table 8.4.2.8.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.2.8.4.1-3.
2. Message contents are defined in clause 8.4.2.8.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

**Table 8.4.2.8.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |

| | | | | | |
|---|---|---|---|---|---|
| E-UTRA RF Channel Numbers | | 1, 2 | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Numbers | | 1, 2 | 1 | | One FR2 NR carrier frequency is used. |
| Active cell | | 1, 2 | E-UTRA Cell 1 (PCell) | | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2. |
| Neighbour cell | | 1, 2 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | | For UEs supporting per-FR gap (*independentGapConfig*) |
| Measurement gap offset | | 1, 2 | 39 | | As specified in TS 36.331 [29]. For UEs not supporting per-FR gap (*independentGapConfig*) |
| | | | N/A | | For UEs supporting per-FR gap (*independentGapConfig*) |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B1 [29]. |
| Hysteresis | dB | 1, 2 | 0 | | |
| CP length | | 1, 2 | Normal | | |
| TimeToTrigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used. |
| DRX | | | DRX.9 | DRX.12 | As specified in clause A.3.3. |
| Time offset between serving and neighbour cells | | 1 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3µs | | Synchronous cells. |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 7 | 70 | |
| NOTE: The value of b1-ThresholdNR is defined in Table 8.4.2.8.5-1 | | | | | |

### 8.4.2.8.4.2 Test procedure

Measurement gap pattern configuration # 0 as defined in Table 8.4.2.8.4.1-3 is provided for UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.8.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.8.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 6242 for sub-test 1,

- 66562 for sub-test 2.

7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or

   - switch off the UE.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.8.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.8.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with condition INTER-RAT and EVENT B1;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for UEs not supporting per-FR gap;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for UEs supporting per-FR gap;<br>Table H.3.4-5 with Condition Pattern #0 for UEs not supporting per-FR gap;<br>Table H.3.7-2 with Condition DRX.9 for Test 1;<br>Table H.3.7-2 with Condition DRX.12 for Test 2 |
| Specific message contents exceptions for Test Configuration 8.4.2.8-1 | Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells |
| Specific message contents exceptions for Test Configuration 8.4.2.8-2 | Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells |

**Table 8.4.2.8.4.3-2: SchedulingRequest-Config-DEFAULT**

| Derivation Path: 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 8.4.2.8-1/2/3 |
| | 22 | | Config 8.4.2.8-4/5/6 |
| } | | | |
| } | | | |

**Table 8.4.2.8.4.3-3: ReportConfigInterRAT**

| Derivation Path: 36.508 [25] Table 4.6.6-7BA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |

| | | | |
|---|---|---|---|
| event SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1-NR-r15 SEQUENCE{ | | | |
| b1-Threshold2NR-r15 CHOICE{ | | | |
| nr-RSRP-r15 | 50 | Actual value = 50 -156 = -106dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| maxReportRS-Index-r15 | 2 | | |
| reportQuantityRS-IndexNR-r15 SEQUENCE { | | | |
| ss-rsrp | TRUE | | |
| ss-rsrq | FALSE | | |
| ss-sinr | FALSE | | |
| } | | | |
| } | | | |

8.4.2.8.5 Test requirement

Tables 8.4.2.8.4.1-3 and 8.4.2.8.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX.

**Table 8.4.2.8.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup defined in A.9.1 | | 1, 2 | Setup 1 | |
| Assumption for UE beams Note 5 | | 1, 2 | Rough | |
| NR RF Channel Number | | 1, 2 | 1 | |
| Duplex mode | | 1, 2 | TDD | |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns defined in A.3.2.1.1 | | 1, 2 | OP.1 | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | |
| b1-ThresholdNR UE power class 3 | dBm/SCS | 1, 2 | -106 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95.7 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2 | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 8 |
| Io Note3 | dBm/95.04MHz | 1, 2 | -66.7 | -58.0 |
| Propagation Condition | | 1, 2 | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation |

**Table 8.4.2.8.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX**

| Test case | Measurement reporting delay (ms) | | | |
|---|---|---|---|---|
| | D1 ms | D2 ms | D3 ms | D4 ms |
| UE power class 3 | 6242 | 66562 | 6242 | 66562 |

In test 1, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms and D3 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms and D4 ms from the beginning of time period T2 for a UE incapable of per-FR gap and for a UE capable of per-FR gap, respectively. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays specified in 36.133 [23] because of TTI insertion uncertainty of the measurement report in DCCH.

## 8.4.2.9 E-UTRA event triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16

### 8.4.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22 when UE is configured with *highSpeedInterRAT-NR-r16*.

### 8.4.2.9.2 Test applicability

This test applies to all E-UTRA UEs capable of NR measurements and configured with highSpeedInterRAT-NR-r16 from release 15 onwards.

### 8.4.2.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.9.

### 8.4.2.9.4 Test description

#### 8.4.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.9.4.1-1.

**Table 8.4.2.9.4.1-1: Supported test configurations for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Configuration | Description |
|---|---|
| 8.4.2.9-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.9-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.9-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.2.9-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.2.9-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.2.9-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.9.4.1-2.

**Table 8.4.2.9.4.1-2: Initial conditions for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 8.4.2.9.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | One FR1 NR carrier frequency is used. |
| Active cell | | 1, 2, 3, 4, 5, 6 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2, 3, 4, 5, 6 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2, 3, 4, 5, 6 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2, 3, 4, 5, 6 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | Note 1 | E-UTRA RSRP threshold for E-UTRA RSRP measurement on Cell 1 for event B2 [29] |
| b2-Threshold2NR | dBm | 1, 2, 3, 4, 5, 6 | Note 2 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B2 [29] |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| CP length | | 1, 2, 3, 4, 5, 6 | Normal | |
| TimeToTrigger | s | 1, 2, 3, 4, 5, 6 | 0 | |
| Filter coefficient | | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3, 4, 5, 6 | DRX.5 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | 1, 4 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2, 3, 5, 6 | 3μs | Synchronous cells. |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 | |

NOTE 1: The value of b2-Threshold1 is defined in Table A.8.4.2.9.1-3.
NOTE 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.9.1-4.

#### 8.4.2.9.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.9.4.1-3, 8.4.2.9.5-1 and 8.4.2.9.5-2, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2. UE is configured with *highSpeedInterRAT-NR-r16*.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.9.5-1 and Table 8.4.2.9.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.9.5-1 and Table 8.4.2.9.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 4.8s ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3),

   or

   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 8.4.2.9.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.4.2.9.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks on condition of HighSpeedMeas with exceptions | Table H.2.1-3 with Condition HighSpeedMeas |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR and EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-8 with Condition SSB-Index<br>Table H.3.7-2 with Condition DRX.5 and Gap |

**Table 8.4.2.9.4.3-2: highSpeedCarrierNR-r16 in SystemInformationBlockType24**

| Derivation Path: TS 36.508 [25], Table 4.4.3.3-20 with Condition FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| CarrierFreqNR-v1610 ::= SEQUENCE {(SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| highSpeedCarrierNR-r16 | TRUE | | |
| } | | | |

**Table 8.4.2.9.4.3-3: highSpeedInterRAT-NR-r16 configuration**

| Derivation Path: 36.508 [25] Table 4.6.3-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSIB::= SEQUENCE { | | | |
| highSpeedInterRAT-NR-r16 | TRUE | | |
| } | | | |

8.4.2.9.5 Test requirement

Tables 8.4.2.9.4.1-3, 8.4.2.9.5-1 and 8.4.2.9.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16.

**Table 8.4.2.9.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting with NR neighbour cell in FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 2, 3 | FDD | |
| | | 4, 5, 6 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| b2-Threshold1 | dBm | 1, 2, 3, 4, 5, 6 | -77 | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2, 3, 4, 5, 6 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2, 3, 4, 5, 6 | -59.13+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition Note6 | | 1, 2, 3, 4, 5, 6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.4.2.9.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3, 4, 5, 6 | 1 | |
| Duplex mode | | 1, 4 | FDD | |
| | | 2, 3, 5, 6 | TDD | |
| TDD configuration | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | |
| | | 3, 6 | 40: $N_{RB,c}$ = 106 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3, 5, 6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2, 4, 5 | 15 | |
| | | 3, 6 | 30 | |
| b2-Threshold2NR | dBm/SCS | 1, 2, 4, 5 | -101 | |
| | | 3, 6 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2, 3, 4, 5, 6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2, 3, 4, 5, 6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5 | -98 | |
| | | 3, 6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4, 5 | -Infinity | -91 |
| | | 3, 6 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | 1, 2, 4, 5 | -70.05 | -62.26 |
| | dBm/38.16MHz | 3, 6 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2, 4, 5 | AWGN1944 | |
| | | 3,6 | AWGN3334 | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 Low | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 4.8s from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 8.4.3 Inter-RAT measurements without gaps

### 8.4.3.0 Minimum conformance requirements

#### 8.4.3.0.1 Minimum conformance requirements for inter-RAT event-triggered reporting without gap

Requirements in this clause shall apply for UE capable of performing inter-RAT NR measurement without measurement gap as indicated via *interRAT-NeedForIntrNR*, when UE is not configured with EN-DC.

When measurement gap is not configured, requirements in this clause apply.

The UE shall be able to identify new inter-RAT E-UTRAN FDD - NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

UE shall be able to identify a new detectable cell within $T_{identify_irat_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured).

$$T_{identify_irat_without_index} = (T_{PSS/SSS_sync_irat} + T_{SSB_measurement_period_irat}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_irat}$: it is the time period used in PSS/SSS detection given in Table 8.4.3.0.1-1 and Table 8.4.3.0.1-2.

$T_{SSB_measurement_period_irat}$: equal to a measurement period of SSB based measurement given in Table 8.4.3.0.1-3 and Table 8.4.3.0.1-4.

$M_{pss/sss_sync_irat}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_irat}$ = 64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), $M_{pss/sss_sync_irat}$ = 40 samples. For a UE supporting FR2 power class 3 (handheld), $M_{pss/sss_sync_irat}$ = 40 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_irat}$ = 40 samples.

$M_{meas_period_irat}$: For a UE supporting FR2 power class 1 or 5, $M_{meas_period_irat}$ = 64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), $M_{meas_period_irat}$ = 40 samples. For a UE supporting FR2 power class 3 (handheld), $M_{meas_period_irat}$ = 40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_irat}$ = 40 samples.

$T_{LB}$: $T_{LB}$ = 0 if UE indicates *nogap-nointerruption* for the band which the NR measurement object belongs to, and $T_{LB}$ = 80ms if UE indicates *nogap-interruption* for the band which the NR measurement object belongs to.

$N_{freq}$ is defined in TS 36.133 [23] clause 8.1.2.1.1.

$K_p$ is a scaling factor calculated as follows:

- When the SMTC of the inter-RAT NR carrier is fully non-overlapping with measurement gaps, $K_p$ =1;
- When the SMTC of the inter-RAT NR carrier is partially overlapping with measurement gaps, $K_p$ = 1/(1-(SMTC period /MGRP)), where SMTC period < MGRP.

**Table 8.4.3.0.1-1: Time period for PSS/SSS detection (Frequency range FR1)**

| Condition NOTE1 | $T_{PSS/SSS_sync_irat}$ |
|---|---|
| No DRX | $\max(600ms, ceil(8 \times K_p) \times \max(T_{LB}, SMTC\ period)) \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |

**Table 8.4.3.0.1-2: Time period for PSS/SSS detection (Frequency range FR2)**

| Condition NOTE1 | $T_{PSS/SSS_sync_irat}$ |
|---|---|
| No DRX | $\max(600ms, ceil(M_{pss/sss_sync_irat} \times K_p) \times \max(T_{LB}, SMTC\ period)) \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |

In the requirements, an NR cell is considered detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in TS 36.133 [23] clause 9.11.1 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [6],
- NR SS-RSRQ related conditions in the accuracy requirements in TS 36.133 [23] clause 9.11.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [6],
- NR SS-SINR related conditions in the accuracy requirements in TS 36.133 [23] clause 9.11.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [6].

UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 36.133 [23] clause 9.11, with measurement period as shown in Table 8.4.3.0.1-3 and Table 8.4.3.0.1-4:

**Table 8.4.3.0.1-3: Measurement period for inter-RAT measurements (Frequency range FR1)**

| Condition NOTE1 | $T_{SSB_measurement_period_irat}$ |
|---|---|
| No DRX | $\max(200ms, ceil(8 \times K_p) \times \max(T_{LB}, SMTC\ period)) \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |

**Table 8.4.3.0.1-4: Measurement period for inter-RAT measurements (Frequency range FR2)**

| Condition NOTE1 | $T_{SSB_measurement_period_irat}$ |
|---|---|
| No DRX | $\max(400ms, ceil(M_{meas_period_irat} \times K_p) \times \max(T_{LB}, SMTC\ period)) \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |

The UE shall be capable of performing NR SS-RSRP, SS-RSRQ and SS-SINR for up to 7 NR carrier frequencies.

For each inter-RAT NR carrier frequency on FR1 or FR2, the UE shall be capable of monitoring at least 4 cells.

For each inter-RAT NR carrier frequency on FR1, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB index and/or PCI.

For each inter-RAT NR carrier frequency on FR2, during each layer 1 measurement period, the UE shall be capable of monitoring at least 10 SSBs with different SSB index and/or PCI. The UE shall be capable of monitoring at least one SSB per cell.

The NR SS-RSRP measurement accuracy for all measured NR cells shall be as specified in TS 36.133 [23] clause 9.11.1. The NR SS-RSRQ measurement accuracy for all measured NR cells shall be as specified in TS 36.133 [23] clause 9.11.2. The NR SS-SINR measurement accuracy for all measured NR cells shall be as specified in TS 36.133 [23] clause 9.11.3.

Reported measurements in event triggered measurement reports shall meet the requirements in TS 36.133 [23] clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_without_index}$ for the minimum requirements.

If an NR cell which has been detectable at least for the time period $T_{identify_irat_without_index}$ for the minimum requirements and then triggers the measurement report as per TS 36.331 [29], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_irat}$ defined in TS 36.133 [23] clause 8.1.2.4.29.1.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used.

Normative reference for this requirement are TS 36.133 [23] clause 8.1.2.4.29.

## 8.4.3.1 E-UTRAN - NR SA FR2 event-triggered reporting without gap with interruption

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test applicability is missing in 38.522
- Message contents are FFS
- Test procedure is missing
- Minimum conformance requirement is FFS

### 8.4.3.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event without gap. The test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.29 of TS 36.133 [23] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.30 of TS 36.133 [23] for E-UTRAN TDD-NR measurements, as well as the interruption requirements in clause 7.8.2.22 of TS 38.133 [6].

### 8.4.3.1.2 Test applicability

This test applies to all types of NR UE from release 18 onwards supporting inter-RAT measurements without gaps.

#### 8.4.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.3.1.

#### 8.4.3.1.4 Test description

##### 8.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.3.1.4.1-1

**Table 8.4.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.4.3.1-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 8.4.3.1-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations. | |

Test environment parameters are given in Table 8.4.3.1.4.1-2.

**Table 8.4.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.3.1.4.1-3.
2. Message contents are defined in clause 8.4.3.1.4.3.
3. Two cells are deployed in the TBD.

**Table 8.4.3.1.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without MG nor DRX**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | 1, 2 | 1 | One FR2 NR carrier frequency is used. |
| Active cell | | 1, 2 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1 as defined in TS 38.133 [6] clause A.3.7.2.2. |
| Neighbour cell | | 1, 2 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |
| b1-ThresholdNR | dBm | 1, 2 | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell 2 for event B1 [29] |
| SMTC configuration | | 1, 2 | SMTC.3 | As defined in A.4 |
| Hysteresis | dB | 1, 2 | 0 | |
| CP length | | 1, 2 | Normal | |
| TimeToTrigger | s | 1, 2 | 0 | |

| | | | | |
|---|---|---|---|---|
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1, 2 | 3μs | Synchronous cells. |
| T1 | s | 1, 2 | 10 | |
| T2 | s | 1, 2 | | |
| NOTE 1: The value of b1-ThresholdNR is defined in table 8.4.3.1.5-1 | | | | |

#### 8.4.3.1.4.2 Test procedure

TBD

#### 8.4.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

### 8.4.3.1.5 Test requirements

Table 8.4.3.1.4.1-3 and 8.4.3.1.5-1 define the primary level settings for all tests.

**Table 8.4.3.1.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter | | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| AoA setup defined in A.3.15.2.1 | | | 1, 2 | Setup 2a | |
| Assumption for UE beams Note 5 | | | 1, 2 | Rough | |
| NR RF Channel Number | | | 1, 2 | 1 | |
| Duplex mode | | | 1, 2 | TDD | |
| TDD configuration | | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 1, 2 | 100: $N_{PRB,c}$ = 24 | |
| OCNG patterns defined in A.3.2.1.1 | | | 1, 2 | OP. 3 | |
| SSB configuration | | | 1, 2 | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | 1, 2 | -112 | |
| EPRE ratio of PSS to SSS | | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $\hat{E}_s$ | | dBm/SCS | 1, 2 | - Infinity | -80.6+TT |
| SSB_RP Note 3 | | dBm/SCS | 1, 2 | -Infinity | -80.6+TT |
| $\hat{E}_s / I_{ot\ BB}$ Note 6 | | dB | 1, 2 | -Infinity | 8.3+TT |
| Io Note3 | | dBm/95.04 MHz | 1, 2 | -Infinity | -56.0+TT |
| Propagation Condition | | | 1, 2 | AWGN | |

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Void<br>NOTE 3: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: Void<br>NOTE 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation<br>NOTE 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. | | | | |

In the test, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2, where D1 = 12.8 s for UE power class 3.

During the test, the interruption ratio (number of interrupted subframes over the number of total subframes) in LTE PCell shall be less than 1.25 %, and each interruption shall not exceed 1 subframe.

The UE shall not send event triggered measurement reports, if the reporting criteria are not fulfilled.

In the test, the UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 8.4.3.2 E-UTRAN - NR SA FR1 event-triggered reporting without gap

Editor's Notes: This test case is incomplete in following aspects:

- Test procedure is TBD;
- Message contents are TBD;
- TT analysis is still missing

### 8.4.3.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event when performing inter-RAT NR measurements without gaps and with or without interruptions. This test will partly verify the NR inter-RAT cell search requirements in TS 36.133 [23] clause 8.1.2.4.29 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.1.2.4.30 for E-UTRAN TDD-NR measurements.

The purpose of this test is also to verify that the interruption ratio does not exceed the limits for the LTE PCell during the inter-RAT NR measurement without gaps and with interruptions. This test will verify the interruption ratio for LTE PCell in standalone LTE specified in TS 36.133 [23] clause 7.8.2.22.

### 8.4.3.2.2 Test applicability

This test applies to all E-UTRA UE release 18 and forward supporting *interRAT-NeedForInterruptionNR-r18*.

### 8.4.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.3.2.

#### 8.4.3.2.4 Test description

In this test two cells are configured, the E-UTRA PCell and NR neighbour cell. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. The UE is not required to report SSB time index.

The serving frequency should be selected for this test case should be one in which the UE reports UE capabilities *interRAT-NeedForGapsNR-r16 = false* and *interRAT-NeedForInterruptionNR-r18 = nogap-interruption* or *nogap-nointerruption*.

No measurement gap is configured for the test. UE is continuously scheduled in DL in LTE PCell during the test.

##### 8.4.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.3.2.4.1-1.

**Table 8.4.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.4.3.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.3.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.3.2-3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8.4.3.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 8.4.3.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 8.4.3.2-6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 8.4.3.2.4.1-2.

**Table 8.4.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.4.3.2.4.1-3.
2. Message contents are defined in clause 8.4.3.2.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.3.2.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

**Table 8.4.3.2.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1,2,3,4,5,6 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1,2,3,4,5,6 | 1 | One FR1 NR carrier frequency is used. |
| Active cell | | 1,2,3,4,5,6 | E-UTRA Cell 1 (PCell) | E-UTRA Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1,2,3,4,5,6 | NR Cell 2 | NR Cell 2 is on NR RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| *b1-ThresholdNR* | dBm | 1,2,3,4,5,6 | Note 1 | SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [29] |
| Hysteresis | dB | 1,2,3,4,5,6 | 0 | |
| CP length | | 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1,4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2,3,5,6 | 3μs | Synchronous cells. |
| T1 | s | 1,2,3,4,5,6 | 5 | |
| T2 | s | 1,2,3,4,5,6 | 2 | |
| NOTE 1: The value of *b1-ThresholdNR* is defined in Table 8.4.3.2.5-2 | | | | |

8.4.3.2.4.2 Test procedure

TBD

8.4.3.2.4.3 Message contents

TBD

8.4.3.2.5 Test requirement

Table 8.4.3.2.4.1-3, Table 8.4.3.2.5-1 and Table 8.4.3.2.5-2 define the primary level settings including test tolerances for the test.

**Table 8.4.3.2.5-1: E-UTRAN PCell specific test parameters (Cell 1)**

| Parameter | Unit | Test Config. | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1,2,3,4,5,6 | 1 | |
| Duplex mode | | 1,2,3 | FDD | |
| | | 4,5,6 | TDD | |
| TDD special subframe configuration[Note1] | | 4,5,6 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4,5,6 | 1 | |
| $BW_{channel}$ | MHz | 1,2,3,4,5,6 | 5 MHz: $N_{PRB,c}$ = 25<br>10 MHz: $N_{PRB,c}$ = 50<br>20 MHz: $N_{PRB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1,2,3 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4,5,6 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL RMCl[Note2] | | 1,2,3 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4,5,6 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1,2,3 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4,5,6 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| *b2-Threshold1* | dBm | 1,2,3,4,5,6 | -77 | |
| PBCH_RA | dB | 1,2,3,4,5,6 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |

| Parameter | Unit | Test Config. | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1,2,3,4,5,6 | -104 +TT | |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3,4,5,6 | 17 +TT | 17 +TT |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1,2,3,4,5,6 | 17 +TT | 17 +TT |
| RSRP Note5 | dBm/15kHz | 1,2,3,4,5,6 | -87 +TT | -87 +TT |
| SCH_RP Note5 | dBm/15kHz | 1,2,3,4,5,6 | -87 +TT | -87 +TT |
| Io Note5 | dBm/9 MHz | 1,2,3,4,5,6 | -59.13+10log ($N_{PRB,c}$ /50) +TT | -59.13+10log ($N_{PRB,c}$ /50) +TT |
| Propagation Condition Note6 | | 1,2,3,4,5,6 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1,2,3,4,5,6 | 1x2 | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in TS 36.211 [24] Table 4.2-1.
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 8.4.3.2.5-2: NR Cell specific test parameters (Cell 2)**

| Parameter | Unit | Test Config. | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1,2,3,4,5,6 | 1 | |
| Duplex mode | | 1,4 | FDD | |
| | | 2,3,5,6 | TDD | |
| TDD configuration | | 2,5 | TDDConf.1.1 | |
| | | 3,6 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1,2,4,5 | 10: $N_{PRB,c}$ = 52 | |
| | | 3,6 | 40: $N_{PRB,c}$ = 106 | |
| OCNG Patterns | | 1,2,3,4,5,6 | OP.1 | |
| SMTC configuration | | 1,4 | SMTC.2 | |
| | | 2,3,5,6 | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2,4,5 | 15 | |
| | | 3,6 | 30 | |
| *b1-ThresholdNR* | dBm/SCS | 1,2,4,5 | -101 | |
| | | 3,6 | -98 | |
| EPRE ratio of PSS to SSS | | 1,2,3,4,5,6 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1,2,3,4,5,6 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -98 | |
| | | 3,6 | -95 | |
| SS-RSRP Note 3 | dBm/SCS | 1,2,4,5 | -Infinity | -91 |
| | | 3,6 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | 1,2,3,4,5,6 | -Infinity | 7 |

| Parameter | Unit | Test Config. | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| $\hat{E}_s / N_{oc}$ | dB | 1,2,3,4,5,6 | -Infinity | 7 |
| Io[Note3] | dBm/9.36 MHz | 1,2,4,5 | -70.05 | -62.26 |
| | dBm/38.16 MHz | 3,6 | -63.95 | -56.16 |
| Propagation Condition | | 1,2,3,4,5,6 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1,2,3,4,5,6 | 1x2 | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

The UE shall be continuously scheduled on PCell during the entire length of T1 and T2. During both time durations the interruption ratio should not exceed 2.5 %.

In the test, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2.

- D1 = 1282 for a UE that supports *interRAT-NeedForInterruptionNR-r18 = nogap-interruption*
- D1 = 802 for a UE that supports *interRAT-NeedForInterruptionNR-r18 = nogap-nointerruption*

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90 %.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 8.5 Measurement performance requirements

## 8.5.1 SFTD measurement accuracy

### 8.5.1.0 Minimum conformance requirements

#### 8.5.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The SFN and frame timing difference (SFTD) is measured between PCell and NR cell for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 8.5.1.0.1-3 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to TS 36.133 [23] Annex B.3.5 for a corresponding Band.
- Io range defined in Table 8.5.1.0.1-1.

**Table 8.5.1.0.1-1: PCell Io range conditions for SFTD measurement accuracy**

| Parameter | Io Note 1 range | | |
|---|---|---|---|
| | E-UTRA operating band groups Note 4, 5 | Minimum Io | Maximum Io |
| | | dBm/15kHz Note 2, 3 | dBm/$BW_{Channel}$ |
| Conditions | FDD_A, TDD_A | -121 | -50 |
| | FDD_C, TDD_C | -120 | -50 |
| | FDD_D | -119.5 | -50 |
| | FDD_E, TDD_E | -119 | -50 |
| | FDD_F | -118.5 | -50 |
| | FDD_G | -118 | -50 |
| | FDD_H | -117.5 | -50 |
| | FDD_N | -114.5 | -50 |

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by $\Delta$>0, when applicable, as described in clause B.4.2 and B.4.3.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: E-UTRA operating band groups are as defined in clause 3.5.
NOTE 5: Only E-UTRA bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Io range defined in Table 8.5.1.0.1-2.

**Table 8.5.1.0.1-2: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy in FR1**

| Parameter | Io Note 1 range | | | |
|---|---|---|---|---|
| | NR operating band groups Note 4, 5 | Minimum Io Note 2, 3 | | Maximum Io |
| | | dBm/ $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dBm/$BW_{Channel}$ |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A | -121 | -118 | -50 |
| | NR_FDD_FR1_B | -120.5 | -117.5 | -50 |
| | NR_TDD_FR1_C | -120 | -117 | -50 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -50 |
| | NR_FDD_FR1_G | -118 | -115 | -50 |
| | NR_FDD_FR1_H | -117.5 | -114.5 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA - NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3.5.
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

**Table 8.5.1.0.1-3: SFTD measurement accuracy**

| Accuracy | Conditions | |
|---|---|---|
| | Ês/Iot | Frequency range |
| Ts Note 1 | dB | |
| 40 | ≥ -3 dB | FR1 |

NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

## 8.5.1.1 E-UTRA - NR FR1 SFTD measurement accuracy

### 8.5.1.1.1 Test purpose

The purpose of this test is to verify that the SFTD measurement accuracy is within the specified limits and to verify the requirements as specified in clause 9.1.27 in TS 36.133 [23] for inter-RAT FR1 SFTD measurements.

### 8.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and support inter-RAT NR SFTD measurements.

### 8.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.1.1.

### 8.5.1.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

#### 8.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.1.1.4.1-1.

**Table 8.5.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement accuracy**

| Configuration | Description |
|---|---|
| 8.5.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 8.5.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.1.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.1.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 8.5.1.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 8.5.1.1-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.1.1.4.1-2.

**Table 8.5.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 8.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.5.1.1.4.1-3.
2. Message contents are defined in clause 8.5.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

4. The SFTD between PCell and NR neighbour cell shall be set to one of the conditions in Table 8.5.1.1.5-3. For negative Frame boundary offset, it can be achieved delaying NR neighbour cell in regards to PCell OR advancing PCell in regards to NR neighbour cell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to NR neighbour cell OR advancing NR neighbour cell in regards to PCell.

#### 8.5.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.1.1.5-1 and Table 8.5.1.1.5-3 as appropriate. (Condition = 3)
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by SFTD measurement.
6. The SS shall check the reported values of SFN offset and frame boundary offset in the *MeasurementReport*. The SFN offset value and frame boundary offset value between E-UTRA Cell 1 and Cell 2 reported by the UE is compared to the expected SFN offset value and frame boundary offset, respectively. The number of failed iterations is increased by one, if

   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult*is outside the range given in Table 8.5.1.1.5-5, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
8. Repeat steps 1-7 until the confidence level according to Table G.2.3-1 in Annex G is achieved.

#### 8.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement accuracy**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and SFTDTable H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS |
| Specific message contents exceptions for Test Configuration 8.5.1.1-1 and 8.5.1.1-4 | Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 |
| Specific message contents exceptions for Test Configuration 8.5.1.1-2 and 8.5.1.1-5 | Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 |
| Specific message contents exceptions for Test Configuration 8.5.1.1-3 and 8.5.1.1-6 | Table H.3.4-6 with Condition SSB.2 FR1 and SMTC.1 |

#### 8.5.1.1.5 Test requirement

Table 8.5.1.1.5-1 and 8.5.1.1.5-2 defines the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement accuracy.

The SFN offset and frame boundary offset between E-UTRA PCell and the inter-RAT neighbour cell shall be set to one of the configurations in Table 8.5.1.1.5-3. The reported SFTD accuracy shall fulfil the accuracy requirements in Table 8.5.1.1.5-4. The SFN offset in reported SFTD shall match the values in Table 8.5.1.1.5-3 and the frame boundary offset in reported SFTD shall be within the range given in Table 8.5.1.1.5-5.

**Table 8.5.1.1.5-1: E-UTRA cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy**

| Parameter | Unit | Test 1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | -2.2 |
| $\hat{E}_s/I_{ot}$ | dB | -2.2 |
| RSRP [Note5] | dBm/15 kHz | -106.2 |
| SCH_RP [Note5] | dBm/15 kHz | -106.2 |
| Io [Note5] | dBm/Ch BW | -74.17<br>+10log<br>($N_{RB,c}$ /50) |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 8.5.1.1.5-2: NR cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy**

| Parameter | | Config | Unit | Test 1 |
|---|---|---|---|---|
| SSB GSCN | | 1~6 | | freq1 |
| Duplex mode | | 1,4 | | FDD |
| | | 2,5 | | TDD |
| | | 3,6 | | TDD |
| TDD Configuration | | 1,4 | | N/A |
| | | 2,5 | | TDDConf.1.1 |
| | | 3,6 | | TDDConf.2.1 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,4 | | SR.1.1 FDD |
| | | 2,5 | | SR.1.1 TDD |
| | | 3,6 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 | | CR.1.1 FDD |
| | | 2,5 | | CR.1.1 TDD |
| | | 3,6 | | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 | | CCR.1.1 FDD |
| | | 2,5 | | CCR.1.1 TDD |
| | | 3,6 | | CCR.2.1 TDD |
| SSB configuration | | 1,4 | | SSB.1 FR1 |
| | | 2,5 | | SSB.1 FR1 |
| | | 3,6 | | SSB.2 FR1 |
| SMTC configuration | | 1~6 | | SMTC.1 |
| DL BWP configuration | | 1~6 | | DLBWP.1.1 |
| UL BWP configuration | | 1~6 | | ULBWP.1.1 |
| OCNG Patterns | | 1~6 | | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | |
| $N_{oc}$[Note2] | NR_FDD_FR1_A, NR_TDD_FR1_A | 1~6 | dBm/15kHz | -104 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| $N_{oc}$[Note2] | NR_FDD_FR1_A, NR_TDD_FR1_A | 1,2,4,5 | dBm/SSB SCS | -104 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| | NR_FDD_FR1_A, NR_TDD_FR1_A | 3,6 | | -101 |
| | NR_FDD_FR1_B | | | |

| Parameter | | Config | Unit | Test 1 |
|---|---|---|---|---|
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| $\widehat{E}_s/I_{ot}$ | | 1~6 | dB | -2.7 |
| $\widehat{E}_s/N_{oc}$ | | 1~6 | dB | -2.7 |
| SS-RSRP Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A | 1,2,4,5 | dBm/SCS | -106.7 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| | NR_FDD_FR1_A, NR_TDD_FR1_A | 3,6 | | -103.7 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| Io Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A | 1,2,4,5 | dBm/9.36 MHz | -74.18 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| | NR_FDD_FR1_A, NR_TDD_FR1_A | 3,6 | dBm/38.16 MHz | -68.08 |
| | NR_FDD_FR1_B | | | |
| | NR_TDD_FR1_C | | | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | NR_FDD_FR1_G | | | |
| | NR_FDD_FR1_H | | | |
| Propagation condition | | 1~6 | | AWGN |
| Antenna configuration | | 1~6 | | 1x2 |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 8.5.1.1.5-3: Timing offsets for E-UTRA - NR FR1 SFTD measurement accuracy**

| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
|---|---|---|
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

**Table 8.5.1.1.5-4: SFTD measurement accuracy**

| Accuracy | Conditions | |
|---|---|---|
| | Ês/Iot | Frequency range |
| Ts Note 1 | dB | |
| 40 | ≥ -3 dB | FR1 |
| NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].<br>NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies. | | |

**Table 8.5.1.1.5-5: E-UTRA - NR FR1 SFTD measurement accuracy requirements for the value of frameBoundaryOffsetResult in reported SFTD**

| Normal and Extreme Conditions | frameBoundaryOffsetResult | | | | |
|---|---|---|---|---|---|
| | Condition 1 | Condition 2 | Condition 3 | Condition 4 | Condition 5 |
| Lowest reported value | -24408 | -12116 | 192 | 12500 | 24792 |
| Highest reported value | -24392 | -12100 | 208 | 12516 | 24808 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 8.5.2 Inter-RAT measurement accuracy

### 8.5.2.1 SS-RSRP

#### 8.5.2.1.0 Minimum conformance requirements

The measurement period of NR SS-RSRP measurements in RRC_CONNECTED state is specified in TS 36.133 [23] Clause 8.1.2.4.21 for UE with FDD PCell not configured with E-UTRA-NR Dual Connectivity operation. The measurement period of NR SS-RSRP measurements in RRC_CONNECTED state is specified in TS 36.133 [23] Clause 8.1.2.4.22 for UE with TDD PCell not configured with E-UTRA-NR Dual Connectivity operation.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.1.

##### 8.5.2.1.0.1 Inter-RAT E-UTRA - NR FR1 SS-RSRP measurement accuracy requirements

The accuracy requirements of NR SS-RSRP measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 4.7.1.0.3.

##### 8.5.2.1.0.2 Inter-RAT E-UTRA - NR FR2 SS-RSRP minimum conformance requirements

The accuracy requirements of NR SS-RSRP measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 5.7.1.0.2.

### 8.5.2.1.1 SS-RSRP with NR FR1 target cell

#### 8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell

##### 8.5.2.1.1.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRP absolute measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

##### 8.5.2.1.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

##### 8.5.2.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.1.1.1.

##### 8.5.2.1.1.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

###### 8.5.2.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.1.1.1.4.1-1.

**Table 8.5.2.1.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.1.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 8.5.2.1.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.1.1.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.1.1.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 8.5.2.1.1.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 8.5.2.1.1.1-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.1.1.1.4.1-2.

**Table 8.5.2.1.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the selected test configuration. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | Without faders | | |

1. The general test parameter settings are set up according to Table 8.5.2.1.1.1.4.1-3.
2. Message contents are defined in clause 8.5.2.1.1.1.4.3.

3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

#### 8.5.2.1.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.1.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in clause 8.5.2.1.1.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.1.1.1.5-1 as appropriate and repeat steps 5-7.

#### 8.5.2.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.1.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.1.1.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| ss-rsrp | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.5.2.1.1.1.5 Test requirement

Table 8.5.2.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 8.5.2.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.1.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 8.5.2.1.1.1.5-3 for test configurations 3 and 6.

**Table 8.5.2.1.1.1.5-1: SS-RSRP inter-RAT test parameters**

| Parameter | | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 2 |
| SSB ARFCN | | | | freq1 | freq1 |
| Duplex mode | | Config 1,4 | | FDD | |
| | | Config 2,3,5,6 | | TDD | |
| TDD configuration | | Config 1,4 | | Not Applicable | |
| | | Config 2,5 | | TDDConf.1.1 | |
| | | Config 3,6 | | TDDConf.2.1 | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1,4 | | - | - |
| | | Config 2,5 | | | |
| | | Config 3,6 | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | | - | - |
| | | Config 2,5 | | | |
| | | Config 3,6 | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | | - | - |
| | | Config 2,5 | | | |
| | | Config 3,6 | | | |
| OCNG Patterns | | | | OP.1 | |
| SS-RSSI-Measurement | | | | Not Applicable | |
| SMTC configuration | | | | SMTC.1 | |
| SSB configuration | | Config 1,2,4,5 | | SSB.1 FR1 | |
| | | Config 3,6 | | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | |
| | | Config 3,6 | | 30 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -94.65 | | -117 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/15kHz | -96.00 | | -117 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -94.65 | | Same as Noc for 15kHz | |
| | Config 3,6 | Depending on band group | | -93.00 | | -114 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 10 | | -3.2 | |
| $\hat{E}_s/N_{oc}$ | | | dB | 10 | | -3.2 | |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -84.65 | | -120.2 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | -83.00 | | -117.2 + $\Delta_{BG_offset}$ | |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/9.36MHz | -56.28 | | -87.35 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/38.16MHz | -51.53 | | -81.25 + $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| | | Cell 2 | Cell 2 |
| NOTE 5: NR operating band groups are as defined in clause 3.5.2.<br>NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | |

**Table 8.5.2.1.1.1.5-2: SS-RSRP Inter RAT absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 30 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 31 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 32 |
| | | Bands NR_FDD_FR1_F | 33 |
| | | Bands NR_FDD_FR1_G | 33 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 2) | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 43 |
| | | Bands NR_FDD_FR1_B | 43 |
| | | Bands NR_TDD_FR1_C | 44 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 44 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 45 |
| | | Bands NR_FDD_FR1_F | 45 |
| | | Bands NR_FDD_FR1_G | 46 |
| | | Bands NR_FDD_FR1_H | 46 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 26 |
| | | Bands NR_FDD_FR1_B | 26 |
| | | Bands NR_TDD_FR1_C | 27 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 27 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 28 |
| | | Bands NR_FDD_FR1_F | 28 |
| | | Bands NR_FDD_FR1_G | 29 |
| | | Bands NR_FDD_FR1_H | 29 |
| Highest reported value (Cell 2) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 47 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 48 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, NR_TDD_FR1_E | 49 |
| | | Bands NR_FDD_FR1_F | 50 |
| | | Bands NR_FDD_FR1_G | 50 |
| | | Bands NR_FDD_FR1_H | 51 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 8.5.2.1.1.1.5-3: SS-RSRP Inter RAT absolute accuracy requirements for the reported values for test configurations 3 and 6**

| Normal Conditions | Test 1 All bands | Test 2 |
|---|---|---|

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 64 | Bands NR_TDD_FR1_A | 33 |
| | | Bands NR_TDD_FR1_C | 34 |
| | | Bands NR_TDD_FR1_D | 35 |
| | | Bands NR_TDD_FR1_E | 35 |
| Highest reported value (Cell 2) | 83 | Bands NR_TDD_FR1_A | 46 |
| | | Bands NR_TDD_FR1_C | 47 |
| | | Bands NR_TDD_FR1_D | 47 |
| | | Bands NR_TDD_FR1_E | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 61 | Bands NR_TDD_FR1_A | 29 |
| | | Bands NR_TDD_FR1_C | 30 |
| | | Bands NR_TDD_FR1_D | 30 |
| | | Bands NR_TDD_FR1_E | 31 |
| Highest reported value (Cell 2) | 86 | Bands NR_TDD_FR1_A | 50 |
| | | Bands NR_TDD_FR1_C | 51 |
| | | Bands NR_TDD_FR1_D | 52 |
| | | Bands NR_TDD_FR1_E | 52 |
| NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

#### 8.5.2.1.1.2 Void

### 8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 8.5.2.1.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRP measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

#### 8.5.2.1.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

#### 8.5.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.1.2.

#### 8.5.2.1.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

#### 8.5.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.1.2.4.1-1.

**Table 8.5.2.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.1.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.1.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.1.2.4.1-2.

**Table 8.5.2.1.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | UE Part: A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 8.5.2.1.2.4.1-3.
2. Message contents are defined in clause 8.5.2.1.2.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 8.5.2.1.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.1.2.5-1 and Table 8.5.2.1.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in clause 8.5.2.1.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Tables 8.5.2.1.2.5-1 and 8.5.2.1.2.5-2 as appropriate and repeat steps 5-7.

#### 8.5.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.1.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| rsrp | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.5.2.1.2.5 Test requirement

Table 8.5.2.1.2.5-1 defines the general test parameters and Table 8.5.2.1.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 8.5.2.1.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.1.2.5-3

**Table 8.5.2.1.2.5-1: SS-RSRP Inter-RAT general test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| | | Cell 2 | Cell 2 |
| SSB ARFCN | | Freq1 | freq1 |
| Duplex mode | | TDD | TDD |
| TDD configuration | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Downlink initial BWP configuration | | DLBWP.0.1 | |
| Uplink initial BWP configuration | | ULBWP.0.1 | |
| DRX cycle configuration | ms | Not applicable | |
| PDSCH Reference measurement channel | | - | - |
| RMSI CORESET Reference Channel | | - | - |
| OCNG Patterns | | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | |
| | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void.
NOTE 3: Void.
NOTE 4: Void.

**Table 8.5.2.1.2.5-2: SS-RSRP Inter-RAT OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| | | Cell 2 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | Setup 1 according to A.9.1 |
| Assumption for UE beams Note 9 | | Rough | Rough |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105.1 | N/A |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -96.07 | N/A |
| $\hat{E}_s/N_{oc}$ | dB | 11 | N/A |
| $E_s$ | dBm/SCS Note 4 | | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +6.65dB) |
| SSB_RP Note2 | dBm/SCS Note4 | -85.07 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +6.65dB) |
| $\hat{E}_s/I_{ot\ BB}$ Note 7 | dB | 9.95 | 1.84 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.75 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +35.65dB) |

NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5: Void
NOTE 6: Void
NOTE 7: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.
NOTE 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

**Table 8.5.2.1.2.5-3: evaluation limits for the reported values**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 48 | n257, n258, n261 | 29 |
| | | n260 | 32 |
| | | n259 | 33 |
| Highest reported value (Cell 2) | 105 | n257, n258, n261 | 87 |
| | | n260 | 89 |
| | | n259 | 90 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 45 | n257, n258, n261 | 26 |
| | | n260 | 29 |
| | | n259 | 30 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | 108 | n257, n258, n261 | 90 |
| | | n260 | 92 |
| | | n259 | 93 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 8.5.2.2 SS-RSRQ

### 8.5.2.2.0 Minimum conformance requirements

The measurement period of NR SS-RSRQ measurements is the same as the measurement period of NR SS-RSRP measurements defined in TS 36.133 [23] clause 8.5.2.1.0.

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in TS 36.133 [23] Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.2.

#### 8.5.2.2.0.1 Inter-RAT E-UTRA - NR FR1 SS-RSRQ minimum conformance requirements

The accuracy requirements of NR SS-RSRQ measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRQ absolute accuracy requirements in clause 4.7.2.0.2.

#### 8.5.2.2.0.2 Inter-RAT E-UTRA - NR FR2 SS-RSRQ minimum conformance requirements

The accuracy requirements of NR SS-RSRP measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 5.7.2.0.2.

### 8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell

#### 8.5.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRQ measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

#### 8.5.2.2.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

#### 8.5.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.2.1.

#### 8.5.2.2.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

##### 8.5.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.2.1.4.1-1.

**Table 8.5.2.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |

| | |
|---|---|
| 8.5.2.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.2.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 8.5.2.2.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 8.5.2.2.1-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.2.1.4.1-2.

**Table 8.5.2.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the selected test configuration. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.5.2.2.1.4.1-3.
2. Message contents are defined in clause 8.5.2.2.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

### 8.5.2.2.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in clause 8.5.2.2.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.2.1.5-1 as appropriate and repeat steps 5-7.

### 8.5.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.2.1.4.3-1: Common Exception messages**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.2.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| ss-rsrq | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.5.2.2.1.5 Test requirement

Table 8.5.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.2.1.5-2.

**Table 8.5.2.2.1.5-1: SS-RSRQ inter-RAT test parameters**

| **Parameter** | | **Unit** | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|---|---|
| | | | **Cell 2** | **Cell 2** | **Cell 2** |
| SSB ARFCN | | | freq1 | freq1 | freq1 |
| Duplex mode | Config 1,4 | | FDD | | |
| | Config 2,3,5,6 | | TDD | | |
| TDD configuration | Config 1,4 | | Not Applicable | | |
| | Config 2,5 | | TDDConf.1.1 | | |
| | Config 3,6 | | TDDConf.2.1 | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | |
| DRX Cycle configuration | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | Config 1,4 | | - | - | - |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| RMSI CORESET Reference Channel | Config 1,4 | | - | - | - |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| Dedicated CORESET Reference Channel | Config 1,4 | | - | - | - |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| OCNG Patterns | | | OP.1 | | |
| SS-RSSI-Measurement | | | Not Applicable | | |
| SMTC configuration | | | SMTC.1 | | |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | | |
| | Config 3,6 | | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | | |
| | Config 3,6 | | 30 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |

| Parameter | | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 2 | Cell 2 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -81.68 | -106 | -116 + $\Delta_{BG_offset}$ |
| | Config 3,6 | | | -87.80 | -113 | Same as Noc for 15kHz for Config 1,2,4,5 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -81.68 | -106 | Same as Noc for 15kHz |
| | Config 3,6 | Depending on band group | | -84.80 | -110 | -113 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -83.43 | -107.75 | -117.75 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | | -86.55 | -111.75 | -114.75 + $\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | | dB | -14.77 | -14.76 | -14.76 |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -50 | -75.83 | -85.83 + $\Delta_{BG_offset}$ |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | -50 | -76.73 | -79.73 + $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 8.5.2.2.1.5-2: SS-RSRQ accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_51 | SS-RSRQ_51 | SS-RSRQ_51 |
| Highest reported value (Cell 2) | SS-RSRQ_63 | SS-RSRQ_63 | SS-RSRQ_63 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_48 | SS-RSRQ_48 | SS-RSRQ_48 |
| Highest reported value (Cell 2) | SS-RSRQ_66 | SS-RSRQ_66 | SS-RSRQ_66 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 8.5.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRQ measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

#### 8.5.2.2.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

#### 8.5.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.2.2.

#### 8.5.2.2.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

##### 8.5.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.2.2.4.1-1.

**Table 8.5.2.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.2.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.2.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.2.2.4.1-2.

**Table 8.5.2.2.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |
| Connection Diagram | TE Part: A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | UE Part: A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 8.5.2.2.2.4.1-3.
2. Message contents are defined in clause 8.5.2.2.2.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 8.5.2.2.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.2.2.5-1 and Table 8.5.2.2.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in clause 8.5.2.2.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Tables 8.5.2.2.2.5-1 and 8.5.2.2.2.5-2 as appropriate and repeat steps 5-7.

#### 8.5.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.2.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.2.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| rsrq | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.5.2.2.2.5 Test requirement

Table 8.5.2.2.2.5-1 defines the general test parameters and Table 8.5.2.2.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.2.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.2.2.5-3

**Table 8.5.2.2.2.5-1: SS-RSRQ Inter-RAT general test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| | | Cell 2 | Cell 2 |
| SSB ARFCN | | Freq1 | freq1 |
| Duplex mode | | TDD | TDD |
| TDD configuration | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Downlink initial BWP configuration | | DLBWP.0.1 | |
| Uplink initial BWP configuration | | ULBWP.0.1 | |
| DRX cycle configuration | ms | Not applicable | |
| PDSCH Reference measurement channel | | - | - |
| RMSI CORESET Reference Channel | | - | - |
| OCNG Patterns | | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 8.5.2.2.2.5-2: SS-RSRQ Inter-RAT OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| | | Cell 2 | Cell 2 |
| Angle of arrival configuration | | Setup 1 | Setup 1 |
| Assumption for UE beams Note 10 | | Rough | Rough |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak -5dB) (Note 7) |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -95.97 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +4dB) (Note 7) |
| $\hat{E}_s / N_{oc}$ | dB | -0.5 | 3.55 |
| SSB_RP Note2 | dBm/SCS Note4 | -96.47 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +7.55dB) (Note 8) |
| SS-RSRQ Note2 | dB | -14.06 | -12.38 |
| $\hat{E}_s / I_{ot}$ Note2 | dB | -0.5 | 3.55 |
| Io Note2 | dBm/95.04 MHz Note4 | -64.21 | (Table B.2.3-2 of TS 38.133 [6] Rx |

| | | | |
|---|---|---|---|
| | | | Beam Peak +43.16dB)<br><br>(Note 9) |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP, SS-RSRQ, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
NOTE 5: Void
NOTE 6: Void
NOTE 7: $N_{oc}$ for SCS 15kHz is applied at $-10\log_{10}(8)+4$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak. $N_{oc}$ for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.
NOTE 8: SSB_RP is applied at 2.25dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
NOTE 9: Io is applied at $10\log_{10}(792)+6.22$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
NOTE 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation.

**Table 8.5.2.2.2.5-3: evaluation limits for the reported values**

| **Normal Conditions** | **Test 1** | **Test 2** |
|---|---|---|
| Lowest reported value (Cell 2) | 23 | 26 |
| Highest reported value (Cell 2) | 95 | 98 |
| **Extreme Conditions** | **Test 1** | **Test 2** |
| Lowest reported value (Cell 2) | 20 | 23 |
| Highest reported value (Cell 2) | 98 | 101 |

## 8.5.2.3 SS-SINR

### 8.5.2.3.0 Minimum conformance requirements

The measurement period of NR SS-SINR measurements is the same as the measurement period of NR SS-RSRP measurements defined in TS 36.133 [23] clause 8.5.2.1.0.

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in TS 36.133 [23] Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.3.

#### 8.5.2.3.0.1 Inter-RAT E-UTRA - NR FR1 SS-SINR minimum conformance requirements

The accuracy requirements of NR SS-SINR measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-SINR absolute accuracy requirements in clause 4.7.3.0.2.

#### 8.5.2.3.0.2 Inter-RAT E-UTRA - NR FR2 SS-SINR minimum conformance requirements

The accuracy requirements of NR SS-SINR measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-SINR absolute accuracy requirements in clause 5.7.3.0.2.

### 8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell

#### 8.5.2.3.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-SINR measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

#### 8.5.2.3.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting ss-SINR-Meas and capable of NR measurements.

#### 8.5.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.3.1.

#### 8.5.2.3.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

##### 8.5.2.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.3.1.4.1-1.

**Table 8.5.2.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 8.5.2.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.3.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 8.5.2.3.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 8.5.2.3.1-6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.3.1.4.1-2.

**Table 8.5.2.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the selected test configuration. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part 2Rx | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.7.3 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 8.5.2.3.1.4.1-3.
2. Message contents are defined in clause 8.5.2.3.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

##### 8.5.2.3.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the expected SS- SINR. If the value is outside the limits in clause 8.5.2.3.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.3.1.5-1 as appropriate and repeat steps 5-7.

### 8.5.2.3.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.3.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| ss-sinr | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.5.2.3.1.5 Test requirement

Table 8.5.2.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.3.1.5-2.

**Table 8.5.2.3.1.5-1: SS-SINR inter-RAT test parameters**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| | | | Cell 2 | Cell 2 | Cell 2 |
| SSB ARFCN | | | freq1 | freq1 | freq1 |
| Duplex mode | Config 1,4 | | FDD | | |
| | Config 2,3,5,6 | | TDD | | |
| TDD configuration | Config 1,4 | | Not Applicable | | |
| | Config 2,5 | | TDDConf.1.1 | | |
| | Config 3,6 | | TDDConf.2.1 | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | |
| DRX Cycle configuration | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | Config 1,4 | | - | - | - |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | | Cell 2 | | Cell 2 | |
| RMSI CORESET Reference Channel | | Config 1,4 | | - | | - | | - | |
| | | Config 2,5 | | | | | | | |
| | | Config 3,6 | | | | | | | |
| Dedicated CORESET Reference Channel | | Config 1,4 | | - | | - | | - | |
| | | Config 2,5 | | | | | | | |
| | | Config 3,6 | | | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | |
| SMTC configuration | | | | SMTC.1 | | | | | |
| SSB configuration | | Config 1,2,4,5 | | SSB.1 FR1 | | | | | |
| | | Config 3,6 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 | | | | | |
| | | Config 3,6 | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | Depending on band group | dBm/15kHz | -88 | | -108.5 | | -119.5 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | | dBm/SCS | -88 | | -108.5 | | Same as Noc for 15kHz | |
| | Config 3,6 | Depending on band group | | -85 | | -105.5 | | -116.5 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | | 20 | | -3.2 | |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | | 20 | | -3.2 | |
| SS-RSRP Note3 | Config 1,2,4,5 | Depending on band group | dBm/SCS | -89.75 | | -88.5 | | -122.7 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | | -86.75 | | -85.5 | | -119.7 + $\Delta_{BG_offset}$ | |
| SS-SINR Note3 | | | dB | -1.75 | | 20 | | -4.0 | |
| Io Note3 | Config 1,2,4,5 | Depending on band group | dBm/ 9.36MHz | -57.83 | | -60.5 | | -89.85 + $\Delta_{BG_offset}$ | |
| | Config 3,6 | Depending on band group | dBm/ 38.16MHz | -51.73 | | -54.41 | | -83.75 + $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 8.5.2.3.1.5-2: SS-SINR accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_35 | SS-SINR_79 | SS-SINR_32 |
| Highest reported value (Cell 2) | SS-SINR_51 | SS-SINR_94 | SS-SINR_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_33 | SS-SINR_77 | SS-SINR_31 |
| Highest reported value (Cell 2) | SS-SINR_53 | SS-SINR_96 | SS-SINR_50 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

#### 8.5.2.3.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-SINR measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

#### 8.5.2.3.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting ss-SINR-Meas and capable of NR FR2 measurements.

#### 8.5.2.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.3.2.

#### 8.5.2.3.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

##### 8.5.2.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.3.2.4.1-1.

**Table 8.5.2.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 8.5.2.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD |
| 8.5.2.3.2-2 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.3.2.4.1-2.

**Table 8.5.2.3.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in clause C.2.1 |

| | | |
|---|---|---|
| Connection Diagram | TE Part: A.3.3.3.1<br>UE Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 8.5.2.3.2.4.1-3.
2. Message contents are defined in clause 8.5.2.3.2.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

#### 8.5.2.3.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.3.2.5-1 and Table 8.5.2.3.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the expected SS- SINR. If the value is outside the limits in clause 8.5.2.3.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Tables 8.5.2.3.2.5-1 and 8.5.2.3.2.5-2 as appropriate and repeat steps 5-7.

#### 8.5.2.3.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 8.5.2.3.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7<br>Table 4.6.6-2B in TS 36.508 [25] |

**Table 8.5.2.3.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)**

| Derivation Path: 36.508 [25] Table 4.6.6-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | |
| ReportQuantityNR-r15 SEQUENCE { | PRESENT | | |
| sinr | true | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.5.2.3.2.5 Test requirement

Table 8.5.2.3.2.5-1 defines the general test parameters and Table 8.5.2.3.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.3.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.3.2.5-3.

**Table 8.5.2.3.2.5-1: SS-SINR Inter-RAT general test parameters**

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|
| | | Cell 2 | Cell 2 | Cell 2 |
| SSB ARFCN | | Freq1 | freq1 | freq1 |
| Duplex mode | | TDD | TDD | TDD |
| TDD configuration | | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| Downlink initial BWP configuration | | DLBWP.0.1 | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | |
| DRX cycle configuration | ms | Not applicable | | |
| PDSCH Reference measurement channel | | - | - | - |
| RMSI CORESET Reference Channel | | - | - | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 | SMTC.1 | SMTC.1 |
| SSB configuration | | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH_DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 8.5.2.3.2.5-2: SS-SINR Inter-RAT OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|
| | | Cell 2 | Cell 2 | Cell 2 |
| Angle of arrival configuration | | Setup 1 | Setup 1 | Setup 1 |
| Assumption for UE beams Note 10 | | Rough | Rough | Rough |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | -105.1 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak -5dB) (Note 7) |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -95.97 | -96.07 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +4dB) |

| | | | | |
|---|---|---|---|---|
| | | | | (Note 7) |
| $\hat{E}_s/N_{oc}$ | dB | -0.5 | 11 | 3.7 |
| SSB_RP Note2 | dBm/SCS Note4 | -96.47 | -85.07 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +7.6dB)<br><br>(Note 8) |
| SS-SINR Note2 | dB | -0.5 | 11 | 3.6 |
| $\hat{E}_s/I_{ot}$ Note2 | dB | -0.5 | 11 | 3.6 |
| Io Note2 | dBm/95.04 MHz Note4 | -64.21 | -55.75 | (Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +43.19dB)<br><br>(Note 9) |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP, SS-SINR, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
NOTE 5: Void
NOTE 6: Void
NOTE 7: $N_{oc}$ for SCS 15kHz is applied at -10log$_{10}$(8)+4dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak. $N_{oc}$ for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 8: SSB_RP is applied at 3dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 9: Io is applied at level 10log$_{10}$(792)+6.54dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation.

**Table 8.5.2.3.2.5-3: evaluation limits for the reported values**

| Normal Conditions | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| Lowest reported value (Cell 2) | 9 | 32 | 17 |
| Highest reported value (Cell 2) | 82 | 105 | 90 |
| **Extreme Conditions** | **Test 1** | **Test 2** | **Test 3** |
| Lowest reported value (Cell 2) | 7 | 30 | 15 |
| Highest reported value (Cell 2) | 84 | 107 | 92 |

# 9 NR sidelink

## 9.1 NR sidelink in FR1

### 9.1.1 UE transmit timing

#### 9.1.1.0 Minimum conformance requirements

##### 9.1.1.0.1 Minimum conformance requirements for GNSS as synchronization reference source

The requirements in this subclause are applicable when the reference timing used by the UE for NR sidelink communication is derived from GNSS.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the subframe starting boundary as defined in TS 38.331 [13], where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.0.1-1.

**Table 9.1.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | $T_{e_}$ |
|---|---|
| FR1 | $12*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | |

The normative reference for this requirement is TS 38.133 [6] clause 12.2.2.

### 9.1.1.0.2 Minimum conformance requirements for SyncRef UE as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for deriving sidelink transmission is from SyncRef UE transmitting sidelink synchronization signals.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding timing reference frame from the SyncRef UE, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.0.2-1.

**Table 9.1.1.0.2-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | SCS of sidelink signals (kHz) | $T_e$ |
|---|---|---|
| FR1 | 15 | $12*64*T_c$ |
| | 30 | $8*64*T_c$ |
| | 60 | $5*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 12.2.5.

### 9.1.1.0.3 Minimum conformance requirements for FR1 NR Cell as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for sidelink transmissions is a NR serving cell on a non-NR sidelink carrier.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.0.3-1.

**Table 9.1.1.0.3-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | SCS of SSB signals ( kHz) | SCS of sidelink signals (kHz) | $T_e$ |
|---|---|---|---|
| FR1 | 15 | 15 | $14*64*T_c$ |
| | | 30 | $12*64*T_c$ |
| | | 60 | $12*64*T_c$ |
| | 30 | 15 | $10*64*T_c$ |
| | | 30 | $10*64*T_c$ |
| | | 60 | $9*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 12.2.3.

## 9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source

### 9.1.1.1.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.2, when the GNSS is used as timing reference.

### 9.1.1.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

### 9.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.1.

### 9.1.1.1.4 Test description

#### 9.1.1.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.1.4.1-1.

**Table 9.1.1.1.4.1-1: Initial conditions for NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. 1 | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.1.1.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.1.1.4.3
3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

**Table 9.1.1.1.4.1-2: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$) Note 1 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | kHz | 30 | |
| Active cell | | None | |
| Active SyncRef UE | | None | |
| NR sidelink communication pre-configuration | | As specified in section A.11.2 | IE values unless specified otherwise in this test. |

| | | | |
|---|---|---|---|
| PSCCH Reference Measurement Channel | | CC.1A HD | As specified in Table A.11.3-1 |
| PSSCH Reference Measurement Channel | | CD.1A HD | As specified in Table A.11.3-2 |
| Propagation condition | | AWGN | |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | |

#### 9.1.1.1.4.2 Test procedure

For this test, the UE is triggered by the test loop function to transmit for NR sidelink communication. There is one GNSS based synchronization source during the test. The test system can emulate and send the GNSS signal to the test UE.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* and GNSS Sync = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The UE starts to transmit NR sidelink communication data over the PC5 interface in accordance of pre-configuration and to schedule PSSCH.
6. After the UE is synchronized to the GNSS synchronization source, the SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the GNSS reference time in the GNSS simulator, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and $T_e$ is given in Table 9.1.1.1.5-1.
7. The SS sends AT command +CCUTLE to open test loop function.

#### 9.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.1.1.4.3-1: +CCUTLE (Test procedure, step 4)**

| |
|---|
| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |

**Table 9.1.1.1.4.3-2: +CCUTLE (Test procedure, step 7)**

| |
|---|
| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |

### 9.1.1.1.5 Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c$ before the subframe starting boundary as defined in TS 38.331 [13] clause 5.8.12, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.1.5-1.

**Table 9.1.1.1.5-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | $T_e$ Note 2 |
|---|---|
| FR1 | $15*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. Note 2: Including the test tolerance given in annex F. | |

## 9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source

### 9.1.1.2.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.5, when SyncRef UE is used as timing reference.

### 9.1.1.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

### 9.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.2.

### 9.1.1.2.4 Test description

#### 9.1.1.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.2.4.1-1.

**Table 9.1.1.2.4.1-1: Initial conditions for NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. 1 | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.1.2.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | GNSS System Simulator is not used. | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.1.2.4.3
3. There is one NR-SS-UE (SyncRef UE 1) specified in this test. SyncRef UE 1 is configured according to the parameters in Table 9.1.1.2.4.1-1.

**Table 9.1.1.2.4.1-2: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$) Note 3 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| Active cell | | None | |
| Active SyncRef UE | | SyncRef UE 1 | Transmitting S-SSB on RF channel number 1 |
| NR sidelink communication preconfiguration | | As specified in section A.11.2 | IE values unless specified otherwise in this test. |

| | | | | |
|---|---|---|---|---|
| PSCCH Reference Measurement Channel | | | CC.1A HD | As specified in Table A.11.3-1 |
| PSSCH Reference Measurement Channel | | | CD.1A HD | As specified in Table A.11.3-2 |
| Noc Note1,2 | | dBm/30kHz | -95 | |
| SyncRef UE 1 | sl-SSB-TimeAllocation | | sl-SSB-TimeAllocation1 | |
| | slssid | | 30 | |
| | inCoverage | | TRUE | In MIB-SL |
| | networkControlledSyncTx | | ON | |
| | NR sidelink communication configuration | | As specified in section A.11.2 | IE values unless specified otherwise in this test. |
| | Ês/Noc | | 3 | |
| | PSBCH-RSRP Note1, Note 2 | dBm/30kHz | -92 | |
| Propagation condition | | | AWGN | |
| Note 1: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: S-PSS Ês/Noc and S-PSS Ês/Noc are set the same as PSBCH Ês/Noc.<br>Note 3: The UE is only required to be tested in one of the supported test configurations. | | | | |

#### 9.1.1.2.4.2 Test procedure

In this test there is one active NR-SS-UE (SyncRef UE 1) and no serving cell nor GNSS signals. The UE is triggered by the test loop function to transmit for NR sidelink communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
3. The UE starts to transmit NR sidelink communication data over the PC5 interface in accordance of pre-configuration and to schedule PSSCH.
4. Power on SyncRef UE 1 and wait at least 8 seconds for the UE to be synchronized to SyncRef UE 1.
5. After the UE is synchronized to SyncRef UE 1, the SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of corresponding timing reference frame from SyncRef UE 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and $T_e$ is given in Table 9.1.1.2.5-1.
6. The SS sends AT command +CCUTLE to open test loop function.

#### 9.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.1.2.4.3-1: +CCUTLE (Test procedure, step 2)**

| |
|---|
| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |

**Table 9.1.1.2.4.3-2: MasterInformationBlockSidelink (SyncRef UE 1)**

| |
|---|
| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition NB_SYNC and RX |

**Table 9.1.1.2.4.3-3: SL-ConfigDedicatedNR (SyncRef UE 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ConfigDedicatedNR-r16 ::= SEQUENCE { | | | |
| sl-PHY-MAC-RLC-Config-r16 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 { | 1 entry | | |
| SL-FreqConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.1.2.4.3-4 | |
| } | | | |
| sl-SyncPriority-r16 | gnbEnb | | |
| } | | | |
| } | | | |
| networkControlledSyncTx-r16 | on | | |
| } | | | |
| } | | | |

**Table 9.1.1.2.4.3-4: SL-SyncConfig (Table 9.1.1.2.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-31 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-SyncConfig-r16 ::= SEQUENCE { | | | |
| sl-SSID-r16 | 30 | | |
| } | | | |
| } | | | |

**Table 9.1.1.2.4.3-5: +CCUTLE (Test procedure, step 6)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

### 9.1.1.2.5 Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding timing reference frame from SyncRef UE 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.2.5-1.

**Table 9.1.1.2.5-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | SCS of sidelink signals (kHz) | $T_e$ Note 2 |
|---|---|---|
| FR1 | 30 | $10*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7].<br>Note 2: Including the test tolerance given in annex F. | | |

## 9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

### 9.1.1.3.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.5, when the downlink timing of the serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) on a non-sidelink NR carrier is used as timing reference.

### 9.1.1.3.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

#### 9.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.3

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.3.

#### 9.1.1.3.4 Test description

##### 9.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.1.3.4.1-1.

**Table 9.1.1.3.4.1-1: Supported test configurations for FR1 NR Cell**

| Configuration | Description |
|---|---|
| 9.1.1.3-1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.1.3-2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.1.3-3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.3.4.1-2.

**Table 9.1.1.3.4.1-2: Initial conditions for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | Uu & PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1 | | |
| Channel bandwidth | Uu: As specified by the test configuration selected from Table 9.1.1.3.4.1-1<br>PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-3. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.3 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are defined in clause 9.1.1.3.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.1.3.4.1-3.

**Table 9.1.1.3.4.1-3: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$) Note 1 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | kHz | 30 | |
| Active cell | | Cell 1 | |
| Active SyncRef UE | | None | |

| | | | |
|---|---|---|---|
| V2X sidelink communication configuration | | As specified in section A.11.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | | CC.1A HD | As specified in Table A.11.3-1 |
| PSSCH Reference Measurement Channel | | CD.1A HD | As specified in Table A.11.3-2 |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | |

**Table 9.1.1.3.4.1-3: Cell Test Parameters for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| RF Channel Number | | | 2 |
| Duplex Mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| Channel Bandwidth ($BW_{channel}$) | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration | | | DLBWP.1.1<br>ULBWP.1.1 |
| DRX Cycle | | | N/A |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.2 |
| OCNG Patterns | | | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Noc Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
| Noc Note2 | Config 1,2 | dBm/SCS | -98 |
| | Config 3 | | -95 |
| Ês/Noc | | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| | Config 3 | | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| | Config 3 | dBm/38.1 MHz | -59.2 |
| Propagation Condition | | | AWGN |

| | |
|---|---|
| Note 1: | OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

#### 9.1.1.3.4.2 Test procedure

In this test there is one active cell (Cell 1). For this test, the UE is triggered by the test loop function or the upper layers to transmit for NR sidelink communication.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
3. The UE starts to transmit NR sidelink communication data over the PC5 interface in according to Pre-configuration and to schedule PSSCH.
4. The SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and $T_e$ is given in Table 9.1.1.3.5-1.
5. The SS sends AT command +CCUTLE to open test loop function.
6. Ensure the UE is in state 3N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
7. The SS sends an *RRCReconfiguration* message with *sl-ConfigDedicatedNR* to provide sidelink configuration.
8. The UE sends an *RRCReconfigurationComplete* message.
9. The SS sends a CLOSE UE TEST LOOP message to close test loop function and trigger UE to transmit.
10. The UE sends a CLOSE UE TEST LOOP COMPLETE message.
11. The SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and $T_e$ is given in Table 9.1.1.3.5-1.
12. The SS sends an OPEN UE TEST LOOP message to open test loop function.
13. The UE sends an OPEN UE TEST LOOP COMPLETE message.

#### 9.1.1.3.4.3 Message contents

**Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions: Table 9.1.1.3.4.3-1: Common Exception messages for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-2<br><br>Table H.3.1-3 with Condition INTRA-FREQ MO and Synchronous cells, where smtc1 field is set to SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3: with condition SMTC.2. |

**Table 9.1.1.3.4.3-2: SIB12-IEs-r16 (Preamble and test procedure, Cell 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-14A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB12-IEs-r16 ::= SEQUENCE { | | | |
| sl-ConfigCommonNR-r16 SEQUENCE { | | | |
| sl-FreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfigCommon-r16 { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncPriority-r16 | gnbEnb | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.1.3.4.3-3: +CCUTLE (Test procedure, step 2)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.1.3.4.3-4: +CCUTLE (Test procedure, step 5)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

**Table 9.1.1.3.4.3-5: RRCReconfiguration (Test procedure, step 7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SIDELINK | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| sl-ConfigDedicatedNR-r16 CHOICE { | | | |
| setup | SL-ConfigDedicatedNR | Table 9.1.1.3.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.1.3.4.3-6: SL-ConfigDedicatedNR (Table 9.1.1.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ConfigDedicatedNR-r16 ::= SEQUENCE { | | | |
| sl-PHY-MAC-RLC-Config-r16 SEQUENCE { | | | |
| sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 { | 1 entry | | |
| SL-FreqConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncPriority-r16 | gnbEnb | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.1.3.4.3-7: CLOSE UE TEST LOOP (Test procedure, step 9)**

| Derivation Path: 36.508 [25] Table 4.7A-3 with condition UE TEST LOOP MODE E(V2X Transmission) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode E LB setup | | | |
| Communication Transmit or Receive | 0 0 0 0 0 0 0 1 | '01' indicates V2X UE triggered to transmit NR sidelink communication with single spatial layer. | |

9.1.1.3.5 Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is defined in Table 9.1.1.3.5-1.

**Table 9.1.1.3.5-1: $T_e$ Timing Error Limit**

| Frequency Range of sidelink | SCS of SSB signals ( kHz) | SCS of sidelink signals (kHz) | $T_e$ Note2 |
|---|---|---|---|
| FR1 | 15 | 30 | 15*64*$T_c$ |
| | 30 | 30 | 13*64*Tc |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. Note 2: Including the test tolerance given in Annex F. | | | |

## 9.1.2 Initiation/Cease of S-SSB transmission

### 9.1.2.0 Minimum conformance requirements

#### 9.1.2.0.1 Minimum conformance requirements for FR1 NR cell as synchronization reference source

The requirements apply when the NR Cell is used as synchronization reference source and when the UE is

- out of coverage on the NR sidelink carrier and in-coverage with a serving cell on a NR non-sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331 [13] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SIB12*. The UE shall be capable of measuring the RSRP of the cell used as synchronization reference source to evaluate to initiate/cease SLSS transmissions within $T_{evaluate,SLSS}$

where,

- $T_{evaluate,SLSS}$ is as specified in Table 9.1.2.0.1-1 when UE performs SSB based measurements without measurement gaps.

- $T_{evaluate,SLSS}$ is as specified in Table 9.1.2.0.1-2 when UE performs SSB based measurements with measurement gaps.

**Table 9.1.2.0.1-1: $T_{evaluate,SLSS}$ for measurements without measurement gaps when NR cell is used as synchronization reference source (FR1)**

| DRX cycle in NR cell | $T_{evaluate,SLSS}$ |
|---|---|
| No DRX | max(400ms, ceil( 2 x 5 x $K_p$) x SMTC period)Note 1 |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x 2 x 5 x $K_p$) x max(SMTC period, DRX cycle)) |
| DRX cycle>320ms | ceil( 7 x $K_p$ ) x DRX cycle |

| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |
|---|

**Table 9.1.2.0.1-2: $T_{evaluate,SLSS}$ for measurements with measurement gaps when NR cell is used as synchronization reference source (FR1)**

| DRX cycle in NR cell | $T_{evaluate,SLSS}$ |
|---|---|
| No DRX | max(400ms, 2 x 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(2 x 1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 7 x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

If higher layer filtering is configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the NR cell as synchronization reference source:

- SS-RSRP related side conditions given in 38.133[6] clauses 10.1.2 for FR1, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in 38.133[6] clauses 10.1.7 for FR1, respectively, for a corresponding Band,
- SS-SINR related side conditions given in 38.133[6] clauses 10.1.12 for FR1, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

The normative reference for this requirement is TS 38.133 [6] clause 12.3.1.1.

### 9.1.1.0.2 Minimum conformance requirements for SyncRef UE as synchronization reference source

The requirements apply when SyncRef UE is used as synchronization reference source and when the UE is

- in any cell selection state, or
- out of coverage on the NR sidelink carrier and is associated with a serving cell on a non-sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331 [13] are met and when SyncRef UE is used as synchronization reference source and if *syncTxThreshOoC* is included in the pre-configuration parameters.

The UE shall be capable of measuring the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease SLSS transmissions within $T_{evaluate,SLSS}$ = 4 S-SSB periods.

If higher layer filtering for PSBCH-RSRP measurements is pre-configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the selected SyncRef UE as defined in TS 38.331 [13] used to derive transmission timing for NR sidelink communication:

- PSBCH-RSRP related side conditions given in 38.133[6] clause 10.4 for a corresponding Band are fulfilled,
- NR S-SSB_RP and S-SSB Ês/Iot according to Annex B.4 for a corresponding Band are fulfilled.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.1.0.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.1.0.2-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | Ês/Iot Note 3 | NR sidelink operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{SL}$ | | | | |
| dB | dB | dB | | $SCS_{SL}$ = 15 kHz | $SCS_{SL}$ = 30 kHz | $SCS_{SL}$ = 60 kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±4.5 | ±9 | ≥-6 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_TDD_FR1_B, NR_TDD_FR1_J | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2.<br>NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. | | | | | | | | |

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.1.0.2-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.1.0.2-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | Ês/Iot Note 3 | NR sidelink operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{SL}$ | | | | |
| dB | dB | dB | | $SCS_{SL}$ = 15 kHz | $SCS_{SL}$ = 30 kHz | $SCS_{SL}$ = 60 kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±2 | ±3 | ≥-3 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 4 | Note 4 | Note 4 | Note 4 | N/A | Note 4 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1.<br>NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.<br>NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. | | | | | | | | |

The normative references for this requirement are TS 38.133 [6] clause 10.4.2 and 12.3.1.4.

## 9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source

### 9.1.2.1.1 Test purpose

The purpose of this test is to verify that the NR sidelink UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in TS 38.133 [6] clause 12.3.1.1, when the reference timing used for sidelink transmissions is a NR serving cell in FR1 on a non-sidelink carrier.

### 9.1.2.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

### 9.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.2.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.2.1.

### 9.1.2.1.4 Test description

#### 9.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.2.1.4.1-1.

**Table 9.1.2.1.4.1-1: Supported test configurations for FR1 NR Cell**

| Configuration | Description |
|---|---|
| 9.1.2.1-1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.2.1-2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.2.1-3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 9.1.2.1.4.1-2.

**Table 9.1.2.1.4.1-2: Initial conditions for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | Uu & PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1 | | |
| Channel bandwidth | Uu: As specified by the test configuration selected from Table 9.1.1.3.4.1-1<br>PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.3 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are configured according to Table 9.1.2.1.4.1-3.
2. Message content exceptions are given in clause 9.1.2.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. General test parameters for Cell 1 are given in Table 9.1.2.1.4.1-3.

**Table 9.1.2.1.4.1-3: NR sidelink test parameters and NR Cell general test parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCS | kHz | 30 | |
| Active cell | | Cell 1 | Serving cell on RF channel number 1 |
| Active SyncRef UE | | None | |
| Active NR sidelink UE | | NR sidelink UE | Transmitting S-SSB on RF channel number 2(HD carrier in Band n47 or n38) |
| NR sidelink communication configuration | | As specified in A.11.2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx | | Not configured | |
| syncTxThreshIC | dBm/SCS | -110 | In SIB12 |
| DRX | | OFF | |
| T1 | s | 3 | |
| T2 | s | 5.24 | |
| T3 | s | 5.24 | |

### 9.1.2.1.4.2 Test procedure

In this test there is one active cell (Cell 1). The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS shall set parameters according to T1 in Table 9.1.2.1.5-1. T1 starts.
3. If the SS observes that no SL SSB is transmitted by the UE until T1 expires then count a success for the event "No S-SSB transmission", otherwise count a fail for the event "No S-SSB transmission".
4. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.2.1.5-1. T2 starts.
5. If the UE starts to send S-SSB within 560 ms from the start of T2 then count a success for the event "S-SSB transmission initiation", otherwise count a fail for the event "S-SSB transmission initiation".
6. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.2.1.5-1. T3 starts.
7. If the UE stops to send S-SSB within 560 ms from the start of T3 then count a success for the event "S-SSB transmission cease", otherwise count a fail for the event "S-SSB transmission cease".
8. Repeat step 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events "No S-SSB transmission", "S-SSB transmission initiation" and "S-SSB transmission cease" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

### 9.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.2.1.4.3-1: Common Exception messages for NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-1 with condition SMTC.2 and Asynchronous cells for test configuration 9.1.2.1-1<br>Table H.2.1-1 with condition SMTC.1 and Synchronous cells for test configuration 9.1.2.1-2 and 9.1.2.1-3 |

**Table 9.1.2.1.4.3-2: SIB12-IEs-r16 (Preamble and test procedure, Cell 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-14A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB12-IEs-r16 ::= SEQUENCE { | | | |
| sl-ConfigCommonNR-r16 SEQUENCE { | | | |
| sl-FreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfigCommon-r16 { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncPriority-r16 | gnbEnb | | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.2.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.2.1.4.3-3: SL-SyncConfig (Table 9.1.2.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-31 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-SyncConfig-r16 ::= SEQUENCE { | | | |
| sl-filterCoefficient-r16 | fc0 | L3 filtering is not used to avoid introducing additional delay | |
| txParameters-r16 SEQUENCE { | | | |
| syncTxThreshIC-r16 | 2 | actual threshold is -120+2*5 = -110 dBm | |
| syncTxThreshOoC-r16 | Not present | | |
| } | | | |
| } | | | |

9.1.2.1.5 Test requirement

Cell specific test parameters for NR Cell 1 is given in Table 9.1.2.1.5-1.

**Table 9.1.2.1.5-1: FR1 NR Cell-specific test parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source**

| **Parameter** | | **Unit** | **Cell 1** | | |
|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** |
| NR RF Channel Number | | | 1 | | |
| Duplex Mode | Config 1 | | FDD | | |
| | Config 2,3 | | TDD | | |
| TDD configuration | Config 1 | | Not applicable | | |
| | Config 2 | | TDDConf.1.1 | | |
| | Config 3 | | TDDConf.2.1 | | |
| Channel Bandwidth ($BW_{channel}$) | Config 1,2 | MHz | 10:$N_{RB,c}$ = 52 | | |
| | Config 3 | | 40:$N_{RB,c}$ = 106 | | |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | | DLBWP.1.1<br>ULBWP.1.1 | | |
| DRX Cycle | | ms | N/A | | |

| | | | | | |
|---|---|---|---|---|---|
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | |
| | Config 2 | | SR.1.1 TDD | | |
| | Config 3 | | SR.2.1 TDD | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | |
| | Config 2 | | CR.1.1 TDD | | |
| | Config 3 | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | | |
| | Config 2 | | CCR.1.1 TDD | | |
| | Config 3 | | CCR.2.1 TDD | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | |
| | Config 3 | | SSB.2 FR1 | | |
| SMTC Configuration | Config 1 | | SMTC.2 | | |
| | Config 2,3 | | SMTC.1 | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | |
| | Config 2 | | TRS.1.1 TDD | | |
| | Config 3 | | TRS.1.2 TDD | | |
| OCNG Patterns | | | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| Noc Note2 | | Config 1,2 | dBm/15 kHz | | |
| | | Config 3 | | | |
| | | Config 1,2,3 | dBm/SCS | | |
| Ês/Noc | | dB | 7.6 Note 5 | -4.5 | 7.6 Note 5 |
| Ês/Iot | | dB | 7.6 | -4.5 | 7.6 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -103.95 | 116.05 | -103.95 |
| | Config 3 | | -103.95 | -116.05 | -103.95 |
| Io Note3 | Config 1,2 | dBm/9.36MHz | -75.30 | -82.28 | -75.30 |
| | Config 3 | dBm/38.16MHz | -72.20 | -79.18 | -72.20 |
| Propagation condition | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Including the test tolerance given in Annex F.

During T1, the SS-RSRP of the PCell is above *syncTxThreshIC* and the UE is not expected to be transmitting S-SSB.

During T2, the SS-RSRP of the PCell is lowered below *syncTxThreshIC* and the UE is expected to initiate S-SSB transmissions.

During T3, the SS-RSRP of the PCell is increased back to be above *syncTxThreshIC* and the UE is expected to cease S-SSB transmissions.

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 560ms, where,

$T_{evaluate,SLSS}$ = max(400 ms, ceil (10 · Kp) · SMTC period) = 400 ms, is the evaluation time specified in 38.133 [6] Table 12.3.1.1-1, where

SMTC period = 20ms according to Table 9.1.2.1.5-1.

$K_p$ = 1 according to Table 9.1.2.1.5-1.

S-SSB period = 160 ms.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 560ms.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

## 9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source

### 9.1.2.2.1 Test purpose

The purpose of this test is to verify that the NR sidelink UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in TS 38.133 [6] clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE.

### 9.1.2.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

### 9.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.2.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.2.2.

### 9.1.2.2.4 Test description

#### 9.1.2.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.2.2.4.1-1.

**Table 9.1.2.2.4.1-1: Initial conditions for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | GNSS System Simulator is not used. | |

1. The parameter settings for the NR sidelink communication are configured according to Table 9.1.2.2.4.1-2.
2. Message content exceptions are given in clause 9.1.2.2.4.3
3. There is one NR-SS-UE (SyncRef UE 1) specified in this test. SyncRef UE 1 is configured according to the parameters in Table 9.1.1.2.4.1-2.

**Table 9.1.2.2.4.1-2: NR sidelink test parameters for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCS | kHz | 30 | |
| Active cell | | None | |
| Active SyncRef UE | | SyncRef UE 1 | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| Active NR sidelink UE | | NR sidelink UE | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| NR sidelink communication preconfiguration | | As specified in section A.11.2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx | | Not configured | |
| syncTxThreshOoC | dBm/30kHz | -100 | |
| T1 | s | 3 | |
| T2 | s | 5.24 | |
| T3 | s | 5.24 | |

### 9.1.2.2.4.2 Test procedure

In this test there is one active NR-SS-UE (SyncRef UE 1) and no serving cell nor GNSS signals. The test system shall emulate SyncRef UE 1 to transmit S-SSB every synchronization period with the SLSSID and inCoverage indicator as specified in Table 9.1.2.2.5-1.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS powers on SyncRef UE 1, sets parameters according to T3 in Table 9.1.2.2.5-1. Then the SS waits at least 8 seconds for the UE to be synchronized to SyncRef UE 1.
3. The SS sets parameters according to T1 in Table 9.1.2.2.5-1, T1 starts.
4. During T1, if the SS observes that no SL SSB is transmitted by the UE until T1 expires, then count a success for the event "No S-SSB transmission", otherwise count a fail for the event "No S-SSB transmission".
5. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.2.2.5-1. T2 starts.
6. If the UE
   a) starts to send S-SSB within 800 ms from the start of T2, and
   b) uses SLSSID = 30, and
   c) *inCoverage* = FALSE in *MasterInformationBlockSidelink*

then count a success for the event "S-SSB transmission initiation", otherwise count a fail for the event "S-SSB transmission initiation".

7. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.2.2.5-1. T3 starts.
8. If the UE transmits no SL SSB from 800 ms after the start of T3 then count a success for the event "S-SSB transmission cease", otherwise count a fail for the event "S-SSB transmission cease".
9. Repeat step 3-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events "No S-SSB transmission", "S-SSB transmission initiation" and "S-SSB transmission cease" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 9.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.2.2.4.3-1: MasterInformationBlockSidelink (SyncRef UE 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition NB_SYNC and RX |
|---|

**Table 9.1.2.2.4.3-2: SL-ConfigDedicatedNR (SyncRef UE 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ConfigDedicatedNR-r16 ::= SEQUENCE { | | | |
| sl-PHY-MAC-RLC-Config-r16 SEQUENCE { | | | |
| sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 { | 1 entry | | |
| SL-FreqConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.2.2.4.3-3 | |
| } | | | |
| sl-SyncPriority-r16 | gnbEnb | | |
| } | | | |
| } | | | |
| networkControlledSyncTx-r16 | on | | |
| } | | | |
| } | | | |

**Table 9.1.2.2.4.3-3: SL-SyncConfig (Table 9.1.2.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-31 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-SyncConfig-r16 ::= SEQUENCE { | | | |
| sl-SSID-r16 | 30 | | |
| } | | | |
| } | | | |

#### 9.1.2.2.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UE 1 is given in Table 9.1.2.2.5-1.

**Table 9.1.2.2.5-1: SyncRef UE Specific test parameters for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source**

| Parameter | Unit | SyncRef UE 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |

| | | | | |
|---|---|---|---|---|
| NR RF Channel Number | | 1 | | |
| V2X SL communication resource pool configuration | | As specified in section A.11.2 | | |
| Channel Bandwidth ($BW_{channel}$) Note3 | MHz | 20($N_{RB,c}$ = 50) or 40($N_{RB,c}$ = 100) | | |
| SLSSID | | 30 | | |
| inCoverage | | TRUE | | |
| networkControlledSyncTx | | ON | | |
| Noc Note1 | dBm/30 kHz | -99.35 Note 5 | -102.55 Note 5 | -99.35 Note 5 |
| Ês/Noc | dB | 5.5 | -3.5 | 5.5 |
| PSBCH Ês/Noc | dB | 5.5 | -3.5 | 5.5 |
| PSBCH-RSRP Note2 | dBm/30 kHz | -93.85 | -106.05 | -93.85 |
| Io Note2 | dBm /18MHz | -71.57 | -79.74 | -71.57 |
| | dBm /36MHz | -71.57 | -79.74 | -71.57 |
| Propagation condition | | AWGN | | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: PSBCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for S-PSS/S-SSS/PSBCH symbols.
Note 3: The UE is only required to be tested in one of the supported test configurations.
Note 4: S-PSS Es/Noc and S-SSS Es/Noc are set the same as PSBCH Es/Noc.
Note 5: Including the test tolerance given in Annex F.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting S-SSB.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate S-SSB transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease S-SSB transmissions.

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 800 ms, where,

$T_{evaluate,SLSS}$ = 4 · S-SSB period, is the evaluation time specified in 38.133 [6] clause 12.3.1.4,

S-SSB period = 160 ms.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 800 ms.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

## 9.1.3 Synchronization reference selection/reselection

### 9.1.3.0 Minimum conformance requirements

#### 9.1.3.0.1 Minimum conformance requirements for GNSS configured as the highest priority synchronization reference source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in 38.133 [6] clause 10.4 are fulfilled for a corresponding Band,

- S-SSB_RP and S-SSBÊs/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

When GNSS synchronization reference source is configured as the highest priority and

- UE is synchronized to GNSS directly,
  - UE shall not drop any NR SLSS and data transmission for the purpose of selection/reselection to the SyncRef UE.
- UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly,
  - UE shall not drop any NR sidelink data transmission for the purpose of selection/reselection to the SyncRef UE. The UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331 [13]. $T_{detect,SyncRef\ UE_V2X}$ is defined as 1.6 seconds at S-SSB Ês/Iot $\geq$ 0 dB, provided that the UE is allowed to drop a maximum of 30% of its SLSS transmissions during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.
- in other case
  - The UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331 [13]. $T_{detect,SyncRef\ UE_V2X}$ is defined as 8 seconds at S-SSB Ês/Iot $\geq$ 0 dB, provided that the UE is allowed to drop a maximum of 6 % of its NR sidelink data and SLSS transmissions during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.
  - UE is allowed to drop up to 2 slots of its NR sidelink data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its NR sidelink data reception during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

When UE is synchronized to GNSS directly, before selection / reselection of the new synchronization reference source UE shall evaluate the GNSS synchronization source reliability for at least 20 seconds before changing the synchronization reference from GNSS to another synchronization reference source. UE shall be always synchronized to GNSS directly during the evaluation of GNSS synchronization source reliability.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.3.0.1-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.3.0.1-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | Ês/Iot Note 3 | NR Sidelink operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{SL}$ | | | | |
| dB | dB | dB | | $SCS_{SL}$ = 15 kHz | $SCS_{SL}$ = 30 kHz | $SCS_{SL}$ = 60 kHz | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| ±4.5 | ±9 | ≥-6 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_TDD_FR1_B, | N/A | N/A | N/A | -70 | -50 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | NR_TDD_FR1_J | | | | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2.<br>NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. | | | | | | | | |

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.3.0.1-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.3.0.1-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Io [Note 1] range** | | | | | |
| **Normal condition** | **Extreme condition** | **Ês/Iot [Note 3]** | **NR sidelink operating band groups [Note 2]** | **Minimum Io** | | | | **Maximum Io** |
| | | | | **dBm / $SCS_{SL}$** | | | | |
| **dB** | **dB** | **dB** | | **$SCS_{SL}$ = 15 kHz** | **$SCS_{SL}$ = 30 kHz** | **$SCS_{SL}$ = 60 kHz** | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| ±2 | ±3 | ≥-3 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 4 | Note 4 | Note 4 | Note 4 | N/A | Note 4 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1.<br>NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.<br>NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. | | | | | | | | |

The normative references for this requirement are TS 38.133 [6] clause 10.4.2 and 12.4.

### 9.1.3.0.2 Minimum conformance requirements for eNB/gNB configured as the highest priority synchronization reference source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in 38.133 [6] clause 10.4 are fulfilled for a corresponding Band,
- S-SSB_RP and S-SSB Ês/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

When serving cell/PCell synchronization reference source is configured as the highest priority,

- UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331 [13]. $T_{detect,SyncRef\ UE_V2X}$ is defined as 8 seconds at S-SSB Ês/Iot ≥ 0 dB, provided that the NR sidelink UE is allowed to drop a maximum of 6 % of its NR sidelink data and SLSS transmissions for the purpose of selection / reselection to the SyncRef UE.
- UE is allowed to drop up to 2 slots of its NR sidelink data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its NR sidelink data reception during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.3.0.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.3.0.2-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | Ês/Iot Note 3 | NR Sidelink operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{SL}$ | | | | |
| dB | dB | dB | | $SCS_{SL}$ = 15 kHz | $SCS_{SL}$ = 30 kHz | $SCS_{SL}$ = 60 kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±4.5 | ±9 | ≥-6 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_TDD_FR1_B, NR_TDD_FR1_J | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2.<br>NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. | | | | | | | | |

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.3.0.2-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 9.1.3.0.2-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | | | |
| Normal condition | Extreme condition | Ês/Iot Note 3 | NR sidelink operating band groups Note 2 | Minimum Io | | | | Maximum Io |
| | | | | dBm / $SCS_{SL}$ | | | | |
| dB | dB | dB | | $SCS_{SL}$ = 15 kHz | $SCS_{SL}$ = 30 kHz | $SCS_{SL}$ = 60 kHz | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±2 | ±3 | ≥-3 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 4 | Note 4 | Note 4 | Note 4 | N/A | Note 4 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1. | | | | | | | | |

NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.
NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

## 9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source

### 9.1.3.1.1 Test purpose

The purpose of this test is to verify the requirements related to SyncRef UE (re)selection as specified in TS 38.133 [6] clause 12.4, when GNSS is configured as the highest priority.

### 9.1.3.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

### 9.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.3.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.3.1.

### 9.1.3.1.4 Test description

#### 9.1.3.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.3.1.4.1-1.

**Table 9.1.3.1.4.1-1: Initial conditions for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.3.1.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | GNSS System Simulator is not used. | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.3.1.4.3
3. There are three NR-SS-UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) specified in this test. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are configured according to the generic parameters in Table 9.1.3.1.4.1-2.

**Table 9.1.3.1.4.1-2: NR sidelink test parameters for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active synchronization source | | Sync Ref UE 1 | DUT transmits for NR Sidelink Communication and S-SSB with |

| | | | | |
|---|---|---|---|---|
| | | | | SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| T2 end condition | Active synchronization source | | Sync Ref UE 2 | DUT transmits for NR Sidelink Communication and S-SSB with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source | | Sync Ref UE 3 | UE transmits for NR Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs | | | SyncRef UE 1<br>SyncRef UE 2<br>SyncRef UE 3 | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38) |
| Timing offset among SyncRef UEs | | µs | CP/2 | Synchronous |
| Frequency offset of SyncRef UE 1,2 and 3 | | ppm | 0 | |
| NR sidelink Communication configuration | | | As specified in clause A.11.2 | IE values unless specified otherwise in this test. |
| sl-SyncPriority | | | gnss | |
| syncTxThreshOoC | | | +infinity | |
| T1 | | s | 24 | |
| T2 | | s | 16 | |
| T3 | | s | 3.2 | |

#### 9.1.3.1.4.2 Test procedure

In this test there are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) and no GNSS signals nor Cells. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit S-SSB every S-SSB period with the SLSSIDs and inCoverage indicators specified in Table 9.1.3.1.5-1.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all switched off before starting the test. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The UE transmits S-SSB with SLSSID belonging to id_oon set and *inCoverage* = false in SL MIB.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
4. The SS sets parameters according to T1 in Table 9.1.3.1.5-1. T1 starts.
5. If the UE

   a) starts to transmit S-SSB within 8800 ms from the start of T1 with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T1.

   then count a success for the event "select SyncRef UE 1", otherwise count a fail for the event "select SyncRef UE 1".
6. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.3.1.5-1. T2 starts.
7. If the UE

   a) starts to transmit S-SSB within 8800 ms from the start of T2 with SLSSID = 336 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2.

   then count a success for the event "reselect SyncRef UE 2", otherwise count a fail for the event "reselect SyncRef UE 2".
8. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.3.1.5-1. T3 starts.

9. If the UE

   a) starts to transmit S-SSB within 2400 ms from the start of T3 with SLSSID = 0 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 30 % of its S-SSB transmissions within 1600 ms from the start of T3.

   then count a success for the event "reselect SyncRef UE 3", otherwise count a fail for the event" reselect SyncRef UE 3".

10. When T3 expires, the SS shall switch off all three SyncRef UEs and wait at least 8 seconds.

11. The SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events " select SyncRef UE 1", " reselect SyncRef UE 2" and " reselect SyncRef UE 3" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 9.1.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.3.1.4.3-1: SL-ConfigDedicatedNR (SyncRef UE 1 and SyncRef UE 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ConfigDedicatedNR-r16 ::= SEQUENCE { | | | |
| sl-PHY-MAC-RLC-Config-r16 SEQUENCE { | | | |
| sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 { | 1 entry | | |
| SL-FreqConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.3.1.4.3-3 | |
| } | | | |
| sl-SyncPriority-r16 | gnbEnb | | SyncRef UE 1 |
| | gnss | | SyncRef UE 3 |
| } | | | |
| } | | | |
| networkControlledSyncTx-r16 | on | | |
| } | | | |
| } | | | |

**Table 9.1.3.1.4.3-2: SL-PreconfigurationNR (SyncRef UE 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.10.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PreconfigurationNR-r16 ::= SEQUENCE { | | | |
| sidelinkPreconfigNR-r16 SEQUENCE { | | | |
| sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.3.1.4.3-3 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.3.1.4.3-3: SL-SyncConfig (Table 9.1.3.1.4.3-1 and Table 9.1.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-31 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-SyncConfig-r16 ::= SEQUENCE { | | | |
| sl-SSID-r16 | 30 | | SyncRef UE 1 |
| txParameters-r16 SEQUENCE { | | | SyncRef UE 2 |
| syncTxThreshOoC-r16 | 13 | the special value corresponding to +infinity | |
| } | | | |
| gnss-Sync-r16 | true | | SyncRef UE 2<br>SyncRef UE 3 |
| } | | | |

**Table 9.1.3.1.4.3-4: SL-PreconfigurationNR (The UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.10.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PreconfigurationNR-r16 ::= SEQUENCE { | | | |
| sidelinkPreconfigNR-r16 SEQUENCE { | | | |
| sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncRefMinHyst-r16 | dB0 | | |
| sl-filterCoefficient-r16 | fc0 | | |
| txParameters-r16 SEQUENCE { | | | |
| syncTxThreshOoC-r16 | 13 | the special value corresponding to +infinity | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.3.1.4.3-5: MasterInformationBlockSidelink (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlockSidelink ::= SEQUENCE { | | | |
| inCoverage-r16 | true | | SyncRef UE 1,<br>SyncRef UE 3 |
| | false | | SyncRef UE 2 |
| } | | | |

**Table 9.1.3.1.4.3-6: MasterInformationBlockSidelink (Test procedure, step 2,5 and 7, the UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition TX | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlockSidelink ::= SEQUENCE { | | | |
| inCoverage-r16 | false | | |
| } | | | |

**Table 9.1.3.1.4.3-7: +CCUTLE (Test procedure, step 2)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.3.1.4.3-8: +CCUTLE (Test procedure, step 11)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

9.1.3.1.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UEs are given in Table 9.1.3.1.5-1.

**Table 9.1.3.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source**

| Parameter | Unit | SyncRef UE 1 | | | SyncRef UE 2 | | | SyncRef UE 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | 1(HD carrier in Band n47 or n38) | | | | | | | | |
| Channel Bandwidth ($BW_{channel}$) Note 4 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | | | | | | | | |
| V2X Sidelink Communication resource pool configuration | | As specified in Table A.11.2-2 | | | | | | | | |
| networkControlledSyncTx | | ON | | | N/A | | | ON | | |
| syncTxThreshOoC | dBm/SCS | N/A | | | +∞ | | | N/A | | |
| SLSSID | | 30 | | | 0 | | | 0 | | |
| inCoverage (in MIB-SL) | | TRUE | | | FALSE | | | TRUE | | |
| $N_{oc}$ Note1 | dBm/SCS | -95 | | | | | | | | |
| $\hat{E}_s/N_{oc}$ Note2 | dB | 0.35 Note 5 | 0 | 0 | −∞ | 0.35 Note 5 | 0 | −∞ | −∞ | 3.35 Note 5 |
| $\hat{E}_s/I_{ot}$ | dB | 0.35 | 0 | -5.00 | −∞ | 0.35 | 0 | −∞ | −∞ | 0.34 |
| Io Note2 | dBm/18 MHz | -70.61 | -70.78 | -67.60 | -73.79 | -70.61 | -70.78 | -70.61 | -70.78 | -67.60 |
| | dBm/36 MHz | -70.61 | -70.78 | -67.60 | -73.79 | -70.61 | -70.78 | -70.61 | -70.78 | -67.60 |
| PSBCH-RSRP Note2, Note 3 | dBm/SCS | -94.65 | -95 | -95 | −∞ | -94.65 | -95 | −∞ | −∞ | -91.65 |
| Propagation Condition | | AWGN | | | | | | | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: $\hat{E}_s/I_{ot}$, Io, PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: S-PSS/S-SSS Es/Iot is set the same as PSBCH Es/Iot.
Note 4: The UE is only required to be tested in one of the supported test configurations.
Note 5: Including test tolerance given in Annex F.

During T1, the UE shall detect, evaluate and select SyncRef UE 1 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 30 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE selection delay from start of T1.

During T2, the UE shall detect, evaluate and reselect SyncRef UE 2 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 336 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

During T3, the UE will detect, evaluate and reselect SyncRef UE 3 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 0 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

SyncRef UE (re)selection delay is defined as the time from the beginning of corresponding time instant to the time UE is synchronized to SyncRef UE and changes its S-SSB transmissions timing and SLSSID to follow SyncRef UE as the synchronization source. The SyncRef UE (re)selection delay can be expressed as:

SyncRef UE selection delay = $T_{detect,SyncRef\ UE}$ + $T_{evaluate,SLSS}$ + S-SSB period

- $T_{detect,SyncRef\ UE}$ = 1.6 seconds, is the time to identify newly detectable intra-frequency SyncRef UE as specified in 38.133 [6] clause 12.4 when UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly, otherwise $T_{detect,SyncRef\ UE}$ = 8 seconds if UE is not directly synchronized to GNSS.
- $T_{evaluate,SLSS}$ = 4 S-SSB periods, is the time to measure the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease S-SSB transmissions.
- S-SSB period = 160 ms.

Which gives SyncRef UE (re)selection delay = 8800 ms for T1 and T2, and 2400 ms for T3.

The test system will also verify that the UE does not drop or delay more than 6% of its sidelink data and S-SSB transmissions during the duration of T1 and T2, and does not drop or delay more than 30% of its S-SSB transmissions during the duration of T3.

The rate of correct SyncRef UE (re)selection observed during repeated tests shall be at least 90%.

## 9.1.3.2 NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source

### 9.1.3.2.1 Test purpose

The purpose of this test is to verify the requirements related to SyncRef UE (re)selection as specified in TS 38.133 [6] clause 12.4, when gNB is configured as the highest priority.

### 9.1.3.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting gNB as synchronization source and NR sidelink communication.

### 9.1.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.3.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.3.2.

### 9.1.3.2.4 Test description

#### 9.1.3.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.3.2.4.1-1.

**Table 9.1.3.2.4.1-1: Initial conditions for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.3.2.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.3.2.4.3
3. There are two NR-SS-UEs (SyncRef UE 1 and SyncRef UE 2) specified in this test. SyncRef UE 1 and SyncRef UE 2 are configured according to the generic parameters in Table 9.1.3.2.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

**Table 9.1.3.2.4.1-2: NR sidelink test parameters for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| SCS | | kHz | 30 | |
| Initial condition | Active synchronization source | | GNSS | DUT transmits for NR Sidelink Communication and S-SSB with SLSSID = 0 and inCoverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source | | Sync Ref UE 1 | DUT transmits for NR Sidelink Communication and S-SSB with SLSSID = 395 and inCoverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source | | Sync Ref UE 2 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSSID = 30 and inCoverage set as FALSE in MIB-SL. |
| Active cell | | | None | |
| Active SyncRef UEs | | | SyncRef UE 1<br>SyncRef UE 2 | Transmitting S-SSB on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1 and 2 | | ppm | 0 | |
| NR sidelink Communication preconfiguration | | | As specified in Clause A.11.2 | IE values unless specified otherwise in this test. |
| syncPriority | | | gnb | |
| syncTxThreshOoC | | | 13 (+infinity) | |
| T1 | | s | 24 | |
| T2 | | s | 16 | |
| T3 | | s | 16 | |

### 9.1.3.2.4.2 Test procedure

In this test there are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit S-SSB every S-SSB period with the SLSSIDs and inCoverage indicators specified in Table 9.1.3.2.5-1.

The test consists of three successive time periods with time duration of T1, T2 and T3 respectively. SyncRef UE 1 and SyncRef UE 2 are all switched off before starting the test. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS sets parameters according to T1 in Table 9.1.3.2.5-1. T1 starts.
6. The UE transmits S-SSB with SLSSID = 0 and *inCoverage* = true in *MasterInformationBlockSidelink*.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.3.2.5-1. T2 starts.
8. If the UE

   a) starts to transmit S-SSB within 8800 ms from the start of T2 with SLSSID = 395 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2

   then count a success for the event "reselect SyncRef UE 1", otherwise count a fail for the event "reselect SyncRef UE 1".

9 When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.3.2.5-1. T3 starts.

10. If the UE

    a) starts to transmit S-SSB within 8800 ms from the start of T3 with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

    b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2

    then count a success for the event "reselect SyncRef UE 2", otherwise count a fail for the event" reselect SyncRef UE 2".

11. When T3 expires, the SS shall switch off all SyncRef UEs.
12. The SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.
13. Repeat step 3-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events " reselect SyncRef UE 1" and " reselect SyncRef UE 2" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 9.1.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.3.2.4.3-1: SL-PreconfigurationNR (SyncRef UE 1)**

| Derivation Path: TS 38.508-1 [14], Table 4.10.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PreconfigurationNR-r16 ::= SEQUENCE { | | | |
| sidelinkPreconfigNR-r16 SEQUENCE { | | | |
| sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncPriority-r16 | gnbEnb | | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1 | |

| | | | |
|---|---|---|---|
| | | Table 9.1.3.2.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.3.2.4.3-2: SL-ConfigDedicatedNR (SyncRef UE 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ConfigDedicatedNR-r16 ::= SEQUENCE { | | | |
| sl-PHY-MAC-RLC-Config-r16 SEQUENCE { | | | |
| sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 { | 1 entry | | |
| SL-FreqConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] | SL-SyncConfig | entry 1<br>Table 9.1.3.2.4.3-3 | |
| } | | | |
| sl-SyncPriority-r16 | gnbEnb | | |
| } | | | |
| } | | | |
| networkControlledSyncTx-r16 | on | | |
| } | | | |
| } | | | |

**Table 9.1.3.2.4.3-3: SL-SyncConfig (Table 9.1.3.2.4.3-1 and Table 9.1.3.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-31 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-SyncConfig-r16 ::= SEQUENCE { | | | |
| sl-SSID-r16 | 30 | | SyncRef UE 2 |
| txParameters-r16 SEQUENCE { | | | SyncRef UE 1 |
| syncTxThreshOoC-r16 | 13 | the special value corresponding to +infinity | |
| } | | | |
| } | | | |

**Table 9.1.3.2.4.3-4: SL-PreconfigurationNR (The UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.10.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PreconfigurationNR-r16 ::= SEQUENCE { | | | |
| sidelinkPreconfigNR-r16 SEQUENCE { | | | |
| sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF { | 1 entry | | |
| SL-FreqConfigCommon-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncPriority-r16 | gnbEnb | | |
| sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 { | 1 entry | | |
| SL-SyncConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-SyncRefMinHyst-r16 | dB0 | | |
| sl-filterCoefficient-r16 | fc0 | | |
| txParameters-r16 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| syncTxThreshOoC-r16 | 13 | the special value corresponding to +infinity | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.3.2.4.3-5: MasterInformationBlockSidelink (SyncRef UE 1 and SyncRef UE 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlockSidelink ::= SEQUENCE { | | | |
| inCoverage-r16 | true | | SyncRef UE 2, |
| | false | | SyncRef UE 1 |
| } | | | |

**Table 9.1.3.2.4.3-6: MasterInformationBlockSidelink (Test procedure, step 6,8 and 10, the UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition TX | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlockSidelink ::= SEQUENCE { | | | |
| inCoverage-r16 | true | | Step 6 |
| | false | | Step 8, Step 10 |
| } | | | |

**Table 9.1.3.2.4.3-7: +CCUTLE (Test procedure, step 4)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.3.2.4.3-8: +CCUTLE (Test procedure, step 12)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

9.1.3.2.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UEs are given in Table 9.1.3.2.5-1.

**Table 9.1.3.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source**

| **Parameter** | **Unit** | **SyncRef UE 1** | | | **SyncRef UE 2** | | |
|---|---|---|---|---|---|---|---|
| | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| NR RF Channel Number | | 1(HD carrier in Band n47 or n38) | | | | | |
| Channel Bandwidth ($BW_{channel}$) Note 4 | MHz | 20($N_{RB,c}$ = 50) or 40($N_{RB,c}$ = 100) | | | | | |
| NR Sidelink Communication resource pool configuration | | As specified in Table A.11.2-2 | | | As specified in Table A.11.2-2 | | |
| networkControlledSyncTx | | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| SLSSID | | 59 | | | 30 | | |
| inCoverage (in MIB-SL) | | FALSE | | | TRUE | | |
| Noc Note1 | dBm/30 kHz | -95 | | | | | |
| Ês/Noc | dB | -∞ | 0 | 0 | -∞ | -∞ | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | -∞ | 0 | 0 | -∞ | -∞ | 0 |
| PSBCH-RSRP Note2, Note 3 | dBm/30 kHz | -∞ | -95 | -95 | -∞ | -∞ | -95 |
| Propagation Condition | | AWGN | | | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. | | | | | | | |
| Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot. | | | | | | | |
| Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | | | | |

During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off. The UE will select GNSS as synchronization source.

During T2, the UE shall detect, evaluate and reselect SyncRef UE 1 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 395 and *inCoverage* = false in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

During T3, the UE will detect, evaluate and reselect SyncRef UE 2 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

SyncRef UE reselection delay is defined as the time from the beginning of corresponding time instant to the time UE is synchronized to SyncRef UE and changes its S-SSB transmissions timing and SLSSID to follow SyncRef UE as the synchronization source. The SyncRef UE (re)selection delay can be expressed as:

SyncRef UE reselection delay = $T_{detect,SyncRef\ UE}$ + $T_{evaluate,SLSS}$ + S-SSB period

- $T_{detect,SyncRef\ UE}$ = 8 seconds, is the time to identify newly detectable intra-frequency SyncRef UE as specified in 38.133 [6] clause 12.4 when UE is not directly synchronized to GNSS.

- $T_{evaluate,SLSS}$ = 4 S-SSB periods, is the time to measure the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease S-SSB transmissions.

- S-SSB period = 160 ms.

Which gives SyncRef UE reselection delay = 8800 ms.

The test system will also verify that the UE does not drop or delay more than 6% of its sidelink data and S-SSB transmissions during the duration of T1 and T2.

The rate of correct SyncRef UE reselection observed during repeated tests shall be at least 90%.

## 9.1.4 L1 SL-RSRP measurements

### 9.1.4.0 Minimum conformance requirements

#### 9.1.4.0.1 Minimum conformance requirements for resource selection/reselection, re-evaluation and pre-emption

The UE physical layer shall be capable of performing the L1 SL-RSRP measurements on the carrier operating NR sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 2. The L1 SL-RSRP measurement period corresponds to one slot and the measurement shall meet the L1 SL-RSRP measurement accuracy requirement in 38.133 [6] clause 10.4.4. After resource (re-)selection procedure, re-evaluation is performed on the reserved resources by L1 SL-RSRP measurements before transmission of SCI with reservation when the conditions specified in TS 38.214 [9] are satisfied.

When the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from, after UE selects from the resource not excluded based on L1 SL-RSRP measurement procedure, the UE shall be capable of triggering reselection of already signalled resource(s) as a resource reservation when the conditions specified in TS 38.214 [9] are satisfied.

The requirements for absolute accuracy of L1 SL-RSRP in this clause apply to a UE performing PSCCH-RSRP and/or PSSCH-RSRP measurements on the same frequency as used by operating NR sidelink communication.

The accuracy requirements in Table 9.1.4.0.1-1 are valid under the following conditions:

- Demodulation reference signals for PSCCH and/or PSSCH are transmitted from one port.
- Conditions defined in clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- PSCCH-RSRP|dBm and/or PSSCH-RSRP|dBm according to Annex B.4.4 for a corresponding Band are fulfilled.

**Table 9.1.4.0.1-1: Intra-frequency L1 SL-RSRP absolute accuracy for UE capable of NR sidelink communication**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Io [Note 1] range | | | | | |
| Normal condition | Extreme condition | Ês/Iot [Note 3] | NR Sidelink operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| | | | | dBm/SCS | | | dBm/BW$_{Channel}$ | dBm/BW$_{Channel}$ |
| dB | dB | dB | | SCS = 15kHz | SCS = 30kHz | SCS = 60kHz | | |
| ± 4.5 | ± 9 | ≥0 dB | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ± 8 | ± 11 | ≥0 dB | NR_TDD_FR1_B NR_TDD_FR1_J | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR sidelink operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.
NOTE 3: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS.

The normative references for this requirement are TS 38.133 [6] clause 10.4.4 and 12.5.

## 9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

### 9.1.4.1.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

### 9.1.4.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

### 9.1.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.1.

### 9.1.4.1.4 Test description

#### 9.1.4.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.1.4.1-1.

**Table 9.1.4.1.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.4.1.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.1.4.3
3. There are 50 NR-SS-UEs (active sidelink UE i, i=0,1,...,49) specified in this test. active sidelink UE i, i=0,1,...,49, is configured according to the generic parameters in Table 9.1.4.1.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

**Table 9.1.4.1.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$) Note 2 | | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | | kHz | 30 | |
| NR sidelink communication pre-configuration | | | As specified in clause A.11.2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | | | 1111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | | | 5 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | | | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Number of Active Sidelink UEs | | | 50 | Active Sidelink UE i = 0, .., 49 |
| SL-Thres-RSRP | | | 15 Note 3 | Corresponding -100 dBm as defined in Section 6.3.5 in TS 38.331 [13] Same for all priority level pairs. |
| Active Sidelink UEs (UE i = 0, .., 49) | NR sidelink Communication preconfiguration | | As specified in clause A.11.2 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | {1$_i$} Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | Indicates the number of sub-channels for TX resource pool |

| | | | | |
|---|---|---|---|---|
| | sl-StartRB-Subchannel-r16 included in SL-ResourcePool | | floor(i/10)x10 | Indicates the lowest RB index of the subchannel with the lowest index.<br>UE 0~9 start RB=0;<br>UE 10~19 start RB=10;<br>UE 20~29 start RB=20;<br>UE 30~39 start RB=30;<br>UE 40~49 start RB=40; |
| | sl-SubchannelSize-r16 included in SL-ResourcePool | | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| Note 1: {1i} is a sequence of nine 0's with one 1 in (mod(i,10 )+1'th position.<br>Note 2: The UE is only required to be tested in one of the supported test configurations.<br>Note 3: Including test tolerance given in Annex F. | | | | |

#### 9.1.4.1.4.2 Test procedure

In this test there are 50 active sidelink UEs (UE i, i=0,1,...,49). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. DUT and all active sidelink UEs select GNSS as synchronization reference source. The test system shall emulate the active sidelink UEs to transmit PSCCH/PSSCH every 5ms as specified in Table 9.1.4.1.4.1-2.

The test consists of two successive time periods with time duration of T1, T2 respectively. T1 and T2 should be long enough. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS switches on all sidelink UEs and sets parameters according to T1 in Table 9.1.4.1.5-1. T1 starts.
6. During T1, the SS records:

   - $N_{resource,\ total}$: the number of resources occupied by the PSSCH transmissions of the DUT on all subchannels.
   - $N_{resource,\ subch\ 2}$ the number of resources occupied by the PSSCH transmissions of the DUT on subchannel #2.

   If $N_{resource,\ subch\ 2}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource,\ total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1, T1 expires.
7. If the ratio $N_{resource,\ subch\ 2}$/ $N_{resource,\ total}$ is less than 10%, count a success for the event "subchannel #2 resource not available", otherwise count a fail for the event "subchannel #2 resource not available ".
8. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.1.5-1. T2 starts.
9. During T2, the SS records:

   - $N_{resource,\ total}$: the number of resources occupied by PSSCH transmission of the DUT on all subchannels.

   - $N_{resource,\ non\text{-}subch\ 2}$ the number of resources occupied by PSSCH transmission of the DUT on subchannels other than subchannel #2.

   If $N_{resource,\ non\text{-}subch\ 2}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource,\ total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1, T2 expires.

10. If the ratio $N_{resource,\ non\text{-}subch\ 2}$/ $N_{resource,\ total}$ is less than 10%, count a success for the event "subchannel #2 resource available", otherwise count a fail for the event " subchannel #2 resource available ".

12. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.

Each of the events " subchannel #2 resource not available" and " subchannel #2 resource available" is evaluated independently, resulting in an event verdict pass or fail. If all events pass, the test passes. If one event fails, the test fails.

#### 9.1.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.4.1.4.3-1: SL-ResourcePool (UE under test)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-NumSubchannel-r16 | 5 | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 15 | entry k<br>actual value is -130 +2*15 = -100 dBm | |
| } | | | |
| } | | | |
| sl-PreemptionEnable-r16 | Not present | | |
| sl-TimeResource-r16 | 1111111111 | | |
| } | | | |

**Table 9.1.4.1.4.3-2: SL-ResourcePool (active sidelink UE 0 ~ 49)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-StartRB-Subchannel-r16 | floor(i/10)x10 | i is the index of active sidelink UE, i = 0, 1,..., 49 | active sidelink UE i |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 0 | entry k<br>special value corresponds to -infinity | |
| } | | | |
| } | | | |
| sl-PreemptionEnable-r16 | Not present | | |
| sl-TimeResource-r16 | $\{1_i\}$ | $\{1_i\}$ is a sequence of nine 0's with one 1 in (mod(i,10 )+1'th position. | active sidelink UE i |
| } | | | |

**Table 9.1.4.1.4.3-3: +CCUTLE (Test procedure, step 4)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.4.1.4.3-4: +CCUTLE (Test procedure, step 12)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

9.1.4.1.5 Test requirement

Active sidelink UE specific test parameters are given in Table 9.1.4.1.5-1.

**Table 9.1.4.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection**

| Parameter | Unit | Active Sidelink UE i (i = 0, .., 49) | |
|---|---|---|---|
| | | T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 5 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC | - | CC.1A HD | |
| PSSCH RMC | - | CD.1A HD | |
| Noc Note1 | dBm/30 kHz | -111 | -121 |
| Ês/Noc Note3 | dB | 10 | |
| Ês/Iot Note2,3 | dB | 10 | |
| Ês/Noc Note3 | dB | 20.55 Note 6 | 10 |
| Ês/Iot Note2,3 | dB | 20.55 | 10.00 |
| Ês/Noc Note4 | dB | 0.35 Note 6 | 30.55 Note 6 |
| Ês/Iot Note2,4 | dB | 0 | 30.55 |
| PSSCH-RSRP1 Note 2,3 | dBm/SCS | -90.45 | -111 |
| PSSCH-RSRP2 Note 2,4 | dBm/SCS | -110.65 | -90.45 |
| Io Note 2 | dBm/18 MHz | -69.31 | -63.62 |
| | dBm/36 MHz | -69.31 | -63.62 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: For UE 20 to 29, occupying subchannel #2
Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/1/3/4
Note 5: The UE is only required to be tested in one of the supported test configurations.
Note 6 Including test tolerance given in Annex F.

During T1, the signal from test equipment are configured such that

- The measured PSSCH-RSRP for 10 active NR sidelink UEs(UE 20~UE 29) is above *SL-Thres-RSRP*. Then the resources occupied by these 10 active NR sidelink UEs (resources on subchannel #2) are expected to be excluded in the resource selection procedure and,

- The measured PSSCH-RSRP for other 40 active NR sidelink UEs(UE 0~UE 19, UE 30~UE 49) is below the *SL-Thres-RSRP*, and the resources occupied by these 40 active NR sidelink UEs (resources on subchannels other than subchannel #2) are expected to be included in the resource selection procedure.

The rate of PSSCH transmissions on the resources on subchannel #2 shall be less than 10% during T1.

During T2, the signal from test equipment are configured such that

- the measured PSSCH-RSRP for the 10 active NR sidelink UEs (UE 20~UE 29) is below *SL-Thres-RSRP*. Then the resources occupied by these 10 active NR sidelink UEs (resources on subchannel #2) are expected to be included in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active NR sidelink UEs (UE 0~UE 19, UE 30~UE 49) is above *SL-Thres-RSRP*, and the resources occupied by these 40 active NR sidelink UEs (subchannels other than subchannel #2) are expected to be excluded in the resource selection procedure.

The rate of PSSCH transmissions on the resources on subchannel #2 shall be larger than 90% during T2.

Figure 9.1.4.1.5-2 shows the two different time durations and the corresponding variation of the power level in the active sidelink UEs to emulate change of candidate resource set.

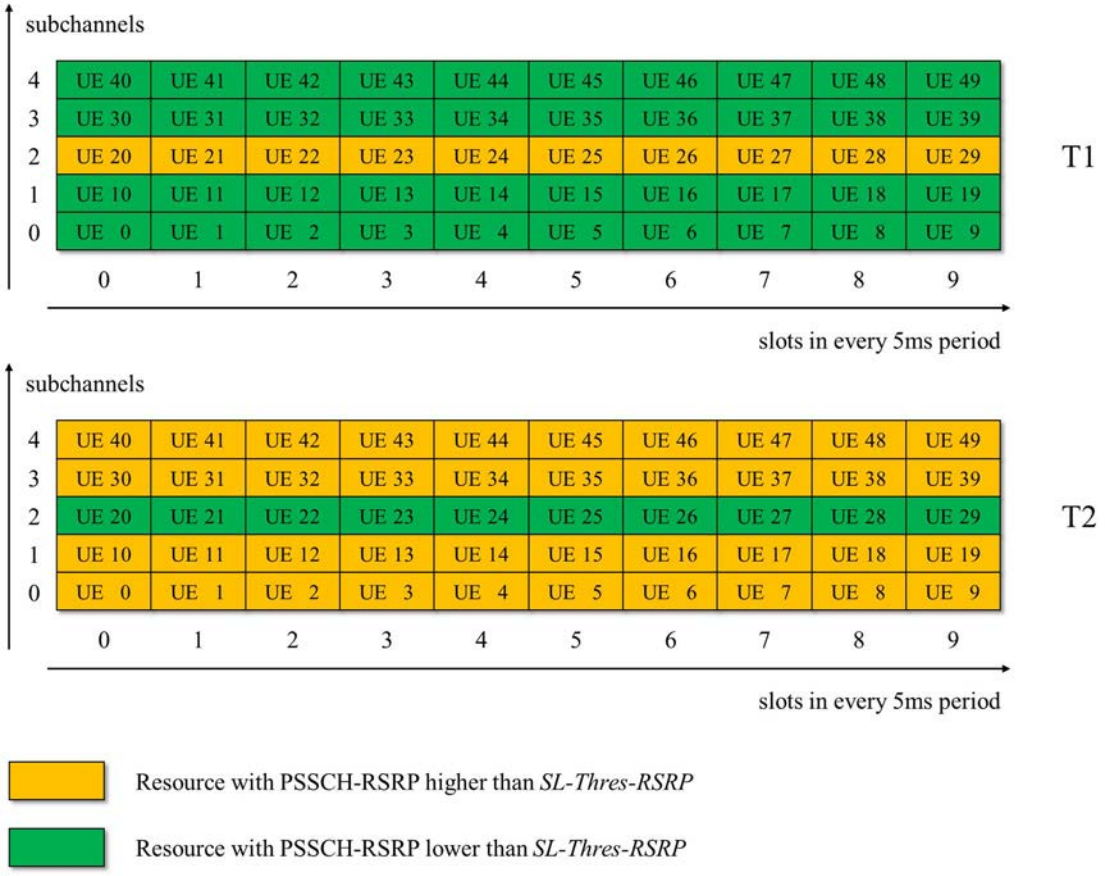



**Figure 9.1.4.1.5-2: Power level variation of active sidelink UEs for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection**

## 9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

### 9.1.4.2.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

### 9.1.4.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

### 9.1.4.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.2.

9.1.4.2.4 Test description

9.1.4.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.2.4.1-1.

**Table 9.1.4.2.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.4.2.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.2.4.3
3. There are 1 NR-SS-UEs (active NR sidelink UE) specified in this test. active NR sidelink UE is configured according to the generic parameters in Table 9.1.4.2.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

**Table 9.1.4.2.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth ($BW_{channel}$) Note 1 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | kHz | 30 | |
| V2X sidelink communication pre-configuration | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16 | | 10000000000000000000 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [8]) Note that this is for Tx pool. |
| sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16 | | 11111111111111111111 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [8]) Note that this is for Rx pool. |
| sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only |
| sl-SubchannelSize-r16 included in SL-ResourcePool | | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |

| | | | | |
|---|---|---|---|---|
| Number of Active Sidelink UEs | | | 1 | |
| SL-Thres-RSRP | | | 12 | Corresponding -106 dBm as defined in Section 6.3.8 in TS 38.331 [13] |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | 1111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | Indicates the number of sub-channels for TX resource pool |
| | sl-StartRB-Subchannel-r16 included in SL-ResourcePool | | 0 | Indicates the lowest RB index of the subchannel with the lowest index. |
| | Sl-SubchannelSize-r16 included in SL-ResourcePool | | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink Ues | | μs | CP/2 | Synchronous |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

#### 9.1.4.2.4.2 Test procedure

In this test there is one active sidelink UE. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. Both DUT and active sidelink UE select GNSS as synchronization reference source.

The test consists of two successive time periods with time duration of T1, T2 respectively. T1 and T2 should be long enough. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS switches on active sidelink UE and sets parameters according to T1 in Table 9.1.4.2.5-1. T1 starts.
6. The SS keeps monitoring PSCCH sent by the UE. If the SS detecting a PSCCH sent by the UE which reserves multiple PSSCH resources, T1 expires.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.2.5-1. T2 starts.
8. Denoting the slot occupied by the second PSCCH scheduled by the PSSCH in step 6 as "slot n". The active sidelink UE shall send PSCCH no later than slot n-5 which:
   - indicates higher priority than the PSCCH in step 6, and
   - schedules the same resource in slot n as the PSCCH in step 6.
9. If the UE sends no PSSCH on the resource in slot n, count a success for the test, otherwise count a fail for the test. T2 expires.

10. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting

11. Repeat step 4-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved

#### 9.1.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.4.2.4.3-1: SL-BWP-PoolConfigCommon (UE under test)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-BWP-PoolConfigCommon-r16 ::= SEQUENCE { | | | |
| sl-RxPool-r16 SEQUENCE (SIZE (1..maxNrofRXPool-r16)) OF SL-ResourcePool-r16 { | 1 entry | | |
| SL-ResourcePool-r16[1] | SL-ResourcePool-TX | entry 1<br>Table 9.1.4.2.4.3-2 | |
| } | | | |
| sl-TxPoolSelectedNormal-r16 SEQUENCE (SIZE (1..maxNrofTXPool-r16)) OF SL-ResourcePoolConfig-r16 { | 1 entry | | |
| SL-ResourcePoolConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-ResourcePool-r16 | SL-ResourcePool-RX | Table 9.1.4.2.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.4.2.4.3-2: SL-ResourcePool-TX (Table 9.1.4.2.4.3-1)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 12 | entry k<br>actual value is -130 +2*12 = -106 dBm | |
| } | | | |
| sl-MultiReserveResource-r16 | enabled | | |
| } | | | |
| sl-TimeResource-r16 | 10000000000000000000 | | |
| } | | | |

**Table 9.1.4.2.4.3-3: SL-ResourcePool-RX (Table 9.1.4.2.4.3-1)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 12 | entry k<br>actual value is -130 +2*12 = -106 dBm | |
| } | | | |
| sl-MultiReserveResource-r16 | enabled | | |
| } | | | |
| sl-TimeResource-r16 | 11111111111111111111 | | |
| } | | | |

**Table 9.1.4.2.4.3-4: SL-LogicalChannelConfig (UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-12 with condition LO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-LogicalChannelConfig-r16 ::= SEQUENCE { | | | |
| sl-Priority-r16 | 8 | PSSCH sents from DUT has the lowest priority | |
| } | | | |

**Table 9.1.4.2.4.3-5: SL-ResourcePool (active sidelink UE)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-TimeResource-r16 | 1111111111111111111 | | |
| } | | | |

**Table 9.1.4.2.4.3-6: +CCUTLE (Test procedure, step 4)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.4.2.4.3-7: +CCUTLE (Test procedure, step 10)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

9.1.4.2.5 Test requirement

Active sidelink UE specific test parameters are given in Table 9.1.4.2.5-1.

**Table 9.1.4.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption**

| **Parameter** | **Unit** | **Active Sidelink UE** | |
|---|---|---|---|
| | | **T1** | **T2** |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 3 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC | - | CC.1A HD | |
| PSSCH RMC | - | CD.1A HD | |
| Noc Note1 | dBm/30 kHz | N/A | -100 |
| PSCCH Ês/Noc | dB | | 5 |
| PSSCH Ês/Noc | dB | | 5 |
| PSCCH Ês/Iot Note2 | dB | | 5 |
| PSSCH Ês/Iot Note2 | dB | | 5 |
| PSSCH-RSRP Note 2 | dBm/30kHz | | -95 |
| Io Note 2 | dBm/18MHz | | -73.01 |
| | dBm/36MHz | | -73.01 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |

| | |
|---|---|
| Note 1: | Interference from other Ues and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. |
| Note 2: | Es/Iot, PSSCH-RSRP and Io have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | The UE is only required to be tested in one of the supported test configurations. |

During T1, The UE under test keep transmitting PSCCH/PSSCH and reserve resources in slot n for future transmission.

During T2, The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active sidelink UE before n-$T_{pre-empt}$, where,

$T_{pre-empt} = T_3 + T_{proc,0}$

- $T_3$ = 5 slots, is given in 38.214 [9] Table 8.1.4-2.
- $T_{proc,0}$ = 1 slot, is given in 38.214 [9] Table 8.1.4-1.

Which gives a total of $T_{pre-empt}$ = 6 slots.

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

Figure 9.1.4.2.5-2 shows the two different time durations and the corresponding variation of the power level in the active sidelink UE to emulate resource pre-emption.

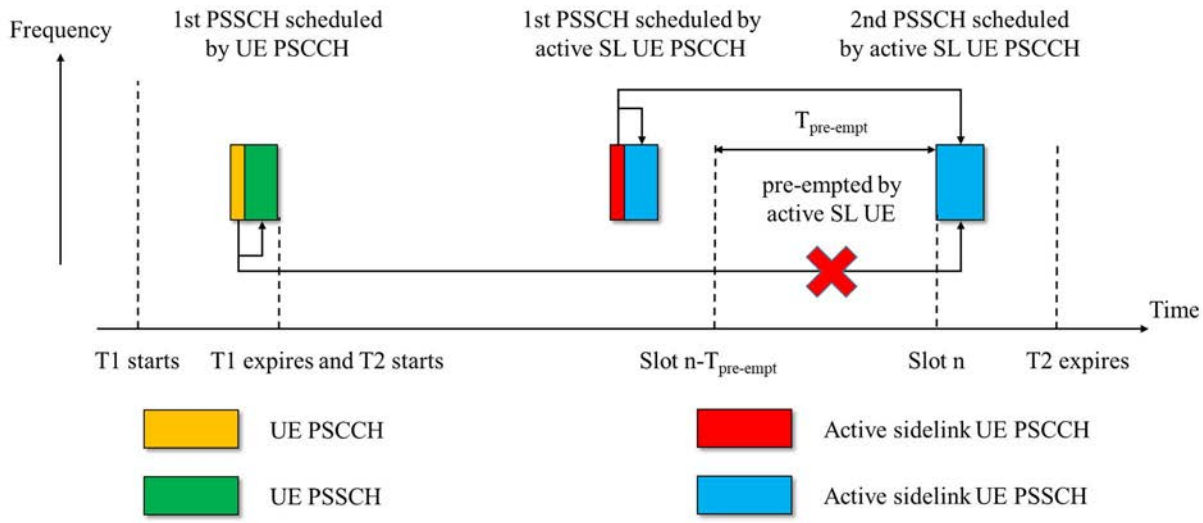



**Figure 9.1.4.2.5-2: Power level variation of active sidelink UE for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption**

## 9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation

### 9.1.4.3.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

### 9.1.4.3.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

### 9.1.4.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.3.

9.1.4.3.4 Test description

9.1.4.3.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.3.4.1-1.

**Table 9.1.4.3.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.4.3.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.3.4.3
3. There are 130 NR-SS-UEs (active NR sidelink UE i, i = 0, 1, ..., 129) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.4.3.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

**Table 9.1.4.3.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth ($BW_{channel}$) Note 2 | | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | | kHz | 30 | |
| V2X sidelink communication pre-configuration | | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | | | 11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | | | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | | | 10 | |
| sl-StartRB-Subchannel-r16 | | | 0 | |
| Number of Active Sidelink UEs | | | 130 | Active Sidelink UE i = 0, .., 129 |
| SL-Thres-RSRP-r16 | | | 14 Note 3 | Corresponding -102 dBm as defined in Section 6.3.5 in TS 38.331 [13] |
| Active Sidelink UEs(UE i=0-99) | V2X sidelink Communication preconfiguration | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | {1$_i$} Note1 | Indicates the bitmap of the TX resource pool, which is defined by |

| | | | | |
|---|---|---|---|---|
| | | | | repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | Indicates the number of sub-channels for TX resource pool |
| | sl-SubchannelSize-r16 included in SL-ResourcePool | | 10 | Indicates the size of sub-channels for TX resource pool |
| | sl-ResourceReservePeriod2-r16 | ms | 50 | |
| Active Sidelink UEs(UE i= 100-129) | V2X sidelink Communication preconfiguration | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | $\{1_i\}^{Note1}$ | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | Indicates the number of sub-channels for TX resource pool |
| | sl-SubchannelSize included in SL-ResourcePool | | 10 | Indicates the size of sub-channels for TX resource pool |
| | sl-MultiReserveResource-r16 | | enabled | |
| | sl-MaxNumPerReserve-r16 | | n2 | |
| | sl-ResourceReservePeriod2-r16 | | 0 | Unit:ms |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| T0 | | s | 1 | |
| T1 | | ms | 50 | |
| T2 | | ms | 50 | |
| Note 1: $\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position.<br>Note 2: The UE is only required to be tested in one of the supported test configurations.<br>Note 3: Including the test tolerance given in Annex F. | | | | |

#### 9.1.4.3.4.2 Test procedure

In this test there is 130 active sidelink UEs (denoted as UE i, i = 0,1,...,129). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. DUT and all active sidelink UEs select GNSS as synchronization reference source. The first 100 active sidelink UEs are scheduled to send with 50ms periodicity. The last 30 active sidelink UEs are aperiodic service UE with reservation period of 15ms.

The test consists of three successive time periods with time duration of T0, T1 and T2 respectively. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS switches on UE 0~UE 99, triggers UE 0 ~UE 99 to transmit PSCCH/PSSCH with 50ms periodicity, and set power level of UE 0~UE 99 to ensure their measured PSSCH-RSRP is higher than *SL-Thres-RSRP*. T0 starts.
5. When T0 expires, the SS sets parameters according to T1 in Table 9.1.4.3.5-1. T1 starts.
6. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit at the end of T1.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.3.5-1. T2 starts.
8. The SS switches off UE 0~UE 29, switches on UE 101~UE 129, and triggers UE 101~UE 129 to transmit PSCCH/PSSCH aperiodically with a time resource assignment interval of 15ms.
9. During T2, the SS accumulates:
   - $N_{resource, total}$: the number of resources occupied by the PSSCH transmissions of the DUT during T2 since the beginning of the test.
   - $N_{resource, 65-84}$ the number of resources in slot (i mod 100 = 65,66...,84) occupied by the PSSCH transmissions of the DUT during T2 since the beginning of the test.
10. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting
11. The SS switches off all active sidelink UEs.
12. Repeat step 4-11 until $N_{resource, total}$ - $N_{resource, 65-84}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource, total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1.

If the ratio $N_{resource, 65-84}$/ $N_{resource, total}$ is larger than 90%, count a success for the test, otherwise count a fail for the test.

#### 9.1.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.4.3.4.3-1: SL-ResourcePool (UE under test)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 14 | entry k<br>actual value is -130 +2*14 = -102 dBm | |
| } | | | |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-PreemptionEnable-r16 | Not present | | |
| sl-TimeResource-r16 | ones(1,100) | ones(1,100) is a sequence of 100 "1"s | |
| } | | | |

**Table 9.1.4.3.4.3-2: SL-ResourcePool (active sidelink UE 0~129)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 { | 64 entries | | |
| SL-Thres-RSRP-r16[k, k=1,..64] | 14 | entry k | |

| | | | |
|---|---|---|---|
| | | actual value is -130 +2*14 = -102 dBm | |
| } | | | |
| sl-MultiReserveResource-r16 | Not present | | sidelink UE 0~99 |
| | enabled | | sidelink UE 100~129 |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-PreemptionEnable-r16 | Not present | | |
| sl-TimeResource-r16 | $\{1_i\}$ | $\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position i = 0,1,...,129 | sidelink UE i |
| } | | | |

**Table 9.1.4.3.4.3-3: Physical layer parameters for SCI format 1-A (Sidelink UE 0~129)**

| Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| Frequency resource assignment | Not present | - | |
| Time domain resource assignment | Indicates only one resource is scheduled | "00000"B | Sidelink UE 0~99 |
| | Indicate 2 resources are scheduled and the time interval between the 1st resource and 2nd resource is 30 slot (i.e. 15ms) | "11110"B | Sidelink UE 10~129 |
| Resource reservation period | Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms | "1"B | Sidelink UE 0~99 |
| | Indicates the 1st entry in sl-ResourceReservePeriodList, i.e. 0 ms | "0"B | Sidelink UE 10~129 |

**Table 9.1.4.3.4.3-4: +CCUTLE (Test procedure, step 6)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.4.3.4.3-5: +CCUTLE (Test procedure, step 10)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

### 9.1.4.3.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 99 and UE 100~UE 129 are given in Table 9.1.4.3.5-1 and Table 9.1.4.3.5-2 respectively.

**Table 9.1.4.3.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation (UE #0...99)**

| Parameter | Unit | Active Sidelink UE i (i = 0, .., 99) | |
|---|---|---|---|
| | | T1 | T2 |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 7 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC | - | CC.1A HD | |
| PSSCH RMC | - | CD.1A HD | |
| Noc Note1 | dBm/SCS | -110.05 Note 13 | |
| PSSCH1 Ês/Noc Note 3 | dB | 32.60 Note 13 | 32.60 Note 13 |
| PSSCH2 Ês/Noc Note 4 | dB | 2 | 2 |
| PSSCH3 Ês/Noc Note 5 | dB | 14.10 Note 13 | -infinity |
| PSSCH4 Ês/Noc Note 6 | dB | 14.1 Note 13 | 14.10 Note 13 |
| PSSCH1 Ês/Iot Note2,3,10 | dB | 32.60 | -0.45 |
| PSSCH1 Ês/Iot Note2,3,11 | | 32.60 | 32.60 |
| PSSCH2 Ês/Iot Note2,4 | dB | 2 | -31.05 |
| PSSCH3 Ês/Iot Note2,5 | dB | 14.10 | -infinity |
| PSSCH4 Ês/Iot Note2,6 | dB | 14.10 | 14.10 |
| PSSCH -RSRP1 Note 2, 3 | dBm/SCS | -77.45 | -77.45 |
| PSSCH -RSRP2 Note 2, 4 | dBm/SCS | -108.05 | -108.05 |
| PSSCH -RSRP3 Note 2, 5 | dBm/SCS | -95.95 | -infinity |
| PSSCH -RSRP4 Note 2, 6 | dBm/SCS | -95.95 | -95.95 |
| Io Note 2, 8 | dBm/18 MHz | -74.99 | -56.21 |
| | dBm/36 MHz | -74.99 | -56.21 |
| Io Note 2, 9 | dBm/18 MHz | -85.13 | -56.20 |
| | dBm/36 MHz | -85.13 | -56.20 |
| Io Note 2, 10 | dBm/18 MHz | -56.66 | -53.42 |
| | dBm/36 MHz | -56.66 | -53.42 |
| Io Note 2, 11 | dBm/18 MHz | -56.66 | -56.66 |
| | dBm/36 MHz | -56.66 | -56.66 |
| Io Note 2, 12 | dBm/18 MHz | -74.99 | -74.99 |
| | dBm/36 MHz | -74.99 | -74.99 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Ês/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #50-64 and #85-99.
Note 4: UE #30~49 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #30-49.
Note 5: UE #0~29 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #0-29.
Note 6: UE #65~84 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #65-84.
Note 7: The UE is only required to be tested in one of the supported configurations.
Note 8: Calculated on slot with “#slot index mod 100” = #0~29.
Note 9: Calculated on slot with “#slot index mod 100” = #30~49.
Note 10: Calculated on slot with “#slot index mod 100” = #50~59.
Note 11: Calculated on slot with “#slot index mod 100” = #60~64 and slot #85~99.
Note 12: Calculated on slot with “#slot index mod 100” = #65~84.
Note 13 Including test tolerance given in Annex F.

**Table 9.1.4.3.5-2: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation (UE #100...129)**

| Parameter | Unit | Active Sidelink UE i (i = 100, ..., 129) | |
|---|---|---|---|
| | | T1 | T2 |

| | | | |
|---|---|---|---|
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 4 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC | - | CC.1A HD | |
| PSSCH RMC | - | CD.1 A HD | |
| Noc Note1 | dBm/SCS | -110.05 Note 8 | |
| PSSCH Ês/Noc | dB | -infinity | 33.05 Note 8 |
| PSSCH Ês/Iot Note2,5 | dB | -infinity | 33.05 |
| PSSCH Ês/Iot Note2,6 | | -infinity | 28.93 |
| PSSCH Ês/Iot Note2,7 | | -infinity | 0.45 |
| PSSCH-RSRP Note 2, Note 3 | dBm/SCS | -infinity | -77.0 |
| Io Note 2, 5 | dBm/18 MHz | -74.99 | -56.21 |
| | dBm/36 MHz | -74.99 | -56.21 |
| Io Note 2, 6 | dBm/18 MHz | -85.13 | -56.20 |
| | dBm/36 MHz | -85.13 | -56.20 |
| Io Note 2, 7 | dBm/18 MHz | -56.66 | -53.42 |
| | dBm/36 MHz | -56.66 | -53.42 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: UE #100~129 will occupy the subchannels on the slots with "#slot index mod 100"= #0-29 during T2.
Note 4: The UE is only required to be tested in one of the supported configurations.
Note 5: Calculated on slot with "#slot index mod 100" = #0~29.
Note 6: Calculated on slot with "#slot index mod 100" = #30~49.
Note 7: Calculated on slot with "#slot index mod 100" = #50~59.
Note 8: Including the test tolerance given in Annex F.

During T0, the SS shall configure UE 0~UE 99 to transmit PSCCH/PSSCH every 50ms. The measured PSSCH-RSRP of UE 0 ~UE 99 is above *SL-Thres-RSRP*. Hence the resources occupied by UE 0 ~UE 99 are expected to be excluded in the resource selection procedure.

During T1, the SS shall configure UE 0~UE 99 to transmit PSCCH/PSSCH every 50ms. The measured PSSCH-RSRP of UE 0~UE 29, UE 50 ~ UE 99 is above *SL-Thres-RSRP*, and the measured PSSCH-RSRP of UE 30~UE 49 is below *SL-Thres-RSRP*. Hence the resource occupied by UE 30 ~UE 49 are expected to be included in the resource selection procedure and other resources are expected to be excluded in the resource selection procedure.

At the end of T1, the UE under test shall be triggered to periodically transmit PSCCH/PSSCH.

During T2, the SS switches off UE 0~UE 29. and switches on UE 100~UE 129. UE 100~UE 129 transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling n2 and time resource assignment interval as 15ms in the beginning 30 slots. The measured PSSCH-RSRP of UE 100~UE 129 is above *SL-Thres-RSRP*. Hence the resource occupied by UE 100 ~UE 129 are expected to be excluded in the resource re-evaluation procedure. The UE under test is expected to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

The rate of PSSCH transmissions on the resources which are occupied by UE #65-84 shall be more than 90% during T2.

Figure 9.1.4.3.5-3 shows the two different time durations and the corresponding variation of the power level in the active sidelink UEs to emulate change of candidate resource set.

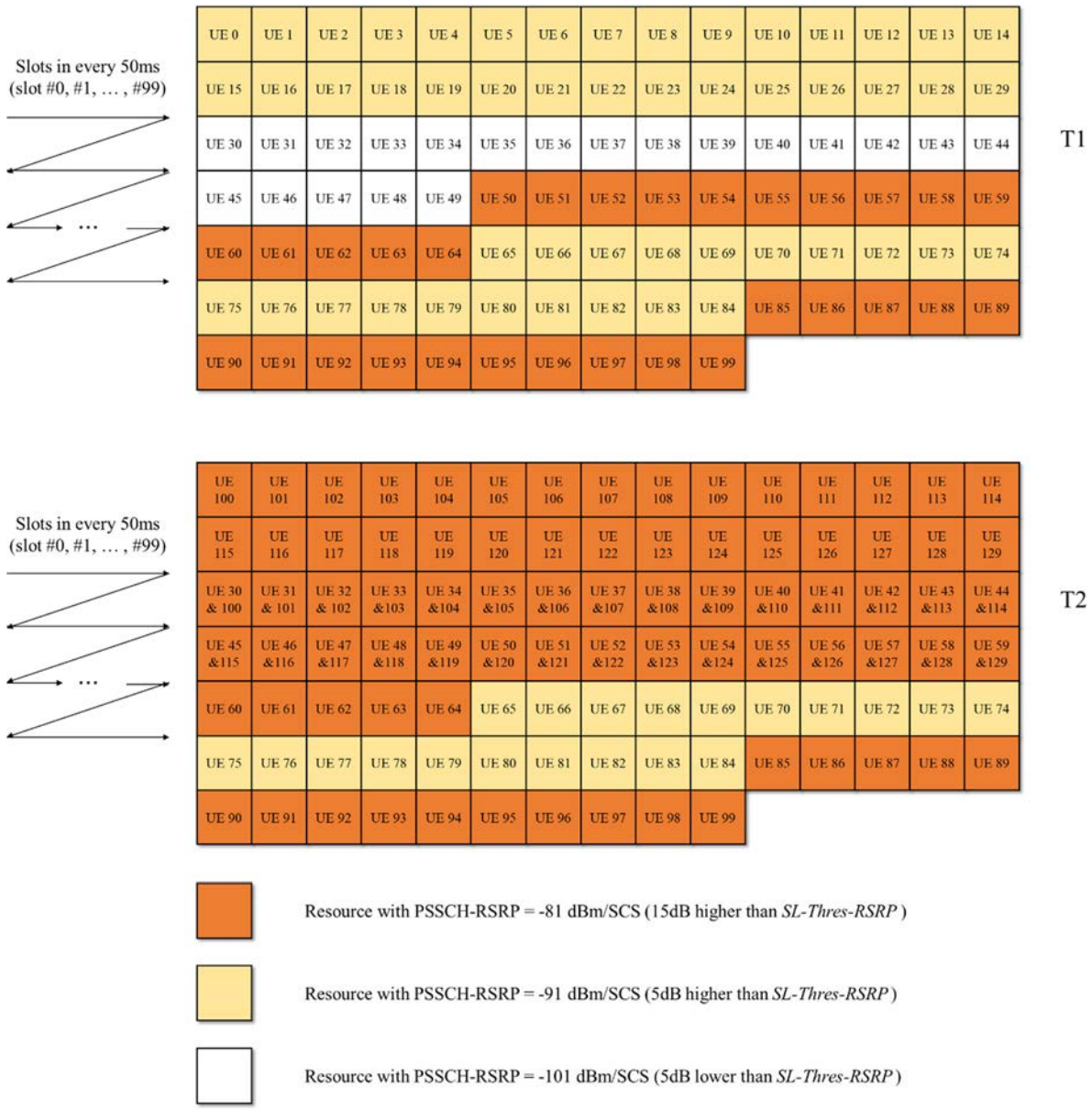



**Figure 9.1.4.3.5-3: Power level variation of active sidelink UEs for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation**

## 9.1.5 Congestion control measurement

### 9.1.5.0 Minimum conformance requirements

#### 9.1.5.0.1 Minimum conformance requirements for congestion control measurements

The UE shall be capable of estimating the channel busy ratio for one or more transmission pools indicated by higher layers in TS 38.331 [13], based on SL-RSSI measurements provided by the physical layer.

When no sidelink transmissions occur, the UE physical layer shall perform a single-shot SL-RSSI measurement for each sub-channel included in all the slots configured as transmission pools.

The SL-RSSI measurement performed according to this clause shall meet the SL-RSSI measurement accuracy requirements defined in 38.133 [6] clause 10.4.

The UE shall perform channel busy ratio (CBR) measurement based on SL-RSSI measurements as described in TS 38.215 [10].

The intra-frequency SL-RSSI requirements are specified in Table 9.1.5.0.1-1. The requirements apply for measurement period of 1 slot and for any configured measurement bandwidth larger than 10 RBs, provided that:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same measurement interval.

**Table 9.1.5.0.1-1: Intra-frequency SL-RSSI absolute accuracy**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| | | Io Note 1 range | | | | |
| Normal condition | Extreme condition | NR sidelink operating band groups Note 2 | Minimum Io | | | Maximum Io |
| | | | dBm/$SCS_{SL}$ | | | |
| dB | dB | | $SCS_{SL}$ = 15kHz | $SCS_{SL}$ = 30kHz | $SCS_{SL}$ = 60kHz | dBm/$BW_{Channel}$ |
| ±2.5 | ±5.5 | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | -50 |
| | | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | -50 |
| ±4.5 | ±7.5 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

The normative references for this requirement are TS 38.133 [6] clause 10.4.3 and 12.6.

## 9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation

### 9.1.5.1.1 Test purpose

The purpose of this test is to verify the congestion control measurement requirements in TS 38.133 [6] clause 12.6. This test will also verify that UE makes correct reporting of an event for CBR measurement.

### 9.1.5.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting both Uu and sidelink communication.

### 9.1.5.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.5.

### 9.1.5.1.4 Test description

#### 9.1.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.5.1.4.1-1.

**Table 9.1.5.1.4.1-1: Supported test configurations for FR1 NR Cell**

| Configuration | Description |
|---|---|
| 9.1.5.1-1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |

| | |
|---|---|
| 9.1.5.1-2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.5.1-3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 9.1.5.1.4.1-2.

**Table 9.1.5.1.4.1-2: Initial conditions for NR SA FR1 congestion control measurement for concurrent operation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | Uu&PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1. | | |
| Channel bandwidth | Uu: As specified by the test configuration selected from Table 9.1.5.1.4.1-1<br>PC5: As specified by the test configuration selected from Table 9.1.5.1.4.1-3. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.3 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.5.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.5.1.5-2.
5. There are 4 NR-SS-UEs (active NR sidelink UE i, i = 0,1,2,3) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.5.1.4.1-3.

**Table 9.1.5.1.4.1-3: NR sidelink test parameters for NR SA FR1 congestion control measurement for concurrent operation**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$)[Note 2] | MHz | 20 ($N_{RB,c}$ = 50) or<br>40 ($N_{RB,c}$ = 100) | |
| SCS | kHz | 30 | |
| V2X sidelink communication configuration | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | | 1111111111111111111<br>1111111111111111111<br>1111111111111111111<br>1111111111111111111<br>1111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | ENUMERATED {n1} |
| sl-SubchannelSize included in SL-ResourcePool | | 10 | ENUMERATED {n10} |
| sl-StartRB-Subchannel-r16 | | 0 | |
| *threshS-RSSI-CBR* | | 19 | Corresponding -74dBm as defined in Section 6.3.8 in TS 38.331 [13] |
| Number of Active Sidelink UEs every 50ms | | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |

| | | | | |
|---|---|---|---|---|
| Active Sidelink UEs (i = 0,1,2,3) | V2X sidelink Communication configuration | | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | $\{1_i\}^{Note1}$ | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | |
| | sl-SubchannelSize included in SL-ResourcePool | | 10 | |
| Timing offset between V2X UE and Active Sidelink UEs | | µs | CP/2 | Synchronous |
| c1-Threshold-r16 | | | 2 | Corresponding 0.02 as defined in Section 6.3.2 in TS 38.331 [13] |
| Hysteresis | | | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| T1 | | s | 5 | |
| T2 | | s | 5 | |
| Note 1: $\{1_i\}$ is a sequence of ninety nine 0's with one 1 in i+1'th position.<br>Note 2: The UE is only required to be tested in one of the channel bandwidths. | | | | |

#### 9.1.5.1.4.2 Test procedure

In this test there is 4 active sidelink UEs (denoted as UE i, i = 0,1,2,3). There are 1 active cells (Cell 1) and no GNSS during the whole test. DUT and all active sidelink UEs select Cell 1 as synchronization reference source. All active sidelink UEs are scheduled to transmit PSCCH/PSSCH with 50ms periodicity.

The test consists of two successive time periods with time duration of T1 and T2 respectively.

1. Ensure the UE is in state 3N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs, triggers all active sidelink UEs to transmit PSCCH/PSSCH with 50ms periodicity.
3. The SS sets parameters according to T1 in Table 9.1.5.1.5-1. T1 starts.
4. The SS sends a *RRCReconfiguration* message with *sl-ConfigDedicatedNR* and *measConfig* to configure event C1 triggered CBR measurement and reporting.
5. The UE sends a *RRCReconfigurationComplete* message.
6. If the UE send no *measurmentReport* message before T1 expires, then count a success for the event "entry condition is not satisfied", otherwise count a fail for the event "entry condition is not satisfied".
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.5.1.5-1. T2 starts.
8. If the UE sends a *measurmentReport* message before T2 expires, then count a success for the event "entry condition is satisfied", otherwise count a fail for the event "entry condition is satisfied".
9. The SS sends a *RRCReconfiguration* message with *measConfig* to release configure event C1 triggered CBR measurement and reporting.
10. The UE sends a *RRCReconfigurationComplete* message.
11. Repeat step 3-10 until the confidence level according to Table G.3.3-1 is achieved.

9.1.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.5.1.4.3-1: RRCReconfiguration (Test procedure, step 4 and step 9)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SIDELINK | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 9.1.5.1.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| sl-ConfigDedicatedNR-r16 | SL-ConfigDedicatedNR specified in 38.508-1 [14] Table 4.6.6-7 with condition SELECTED | | Step 4 |
| | Not present | | Step 9 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.5.1.4.3-2: MeasConfig (Table 9.1.5.1.4.3-1)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | step 9 |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod { | 2 entries | | step 4 |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO | MO for PCell | |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR-SL-r16 | MeasObjectNR-SL specified in 38.508-1 [14] Table 4.6.3-76A | MO for CBR | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList | Not present | | step 9 |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | step 4 |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |

| | | | |
|---|---|---|---|
| reportConfigNR-SL-r16 | ReportConfigNR-SL | Table 9.1.5.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToRemoveList | Not present | | step 4 |
| measIdToRemoveList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasId { | 1 entry | | step 9 |
| MeasId[1] | 1 | entry 1 | |
| } | | | |
| measIdToAddModList | Not present | | step 9 |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 1 entry | | step 4 |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| } | | | |

**Table 9.1.5.1.4.3-3: ReportConfigNR-SL (Table 9.1.5.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142A with condition EVENT_C1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR-SL-r16 ::= SEQUENCE { | | | |
| reportType-r16 CHOICE { | | | |
| eventTriggered-r16 SEQUENCE { | | | |
| eventId-r16 CHOICE { | | | |
| eventC1 SEQUENCE { | | | |
| c1-Threshold-r16 | 2 | actual CBR threshold value is 2*0.01 = 2% | |
| hysteresis-r16 | 0 | | |
| timeToTrigger-r16 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.5.1.4.3-4: SL-ResourcePool (UE under test)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-ThreshS-RSSI-CBR-r16 | 19 | actual value is -112 + 2*19 = -74 dBm | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-FilterCoefficient-r16 | fc0 | L3 filtering is disabled | |
| sl-TimeResource-r16 | ones(1,100) | ones(1,100) is a sequence of 100 "1"s | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 9.1.5.1.4.3-5: SL-ResourcePool (active sidelink UE 0~3)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-TimeResource-r16 | {$1_i$} | {$1_i$} is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position<br>i = 0,1,2,3 | sidelink UE i |
| } | | | |

**Table 9.1.5.1.4.3-6: Physical layer parameters for SCI format 1-A (Sidelink UE 0~3)**

| Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| Frequency resource assignment | Not present | - | |
| Time domain resource assignment | Indicates only one resource is scheduled | "00000"B | |
| Resource reservation period | Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms | "1"B | |

**Table 9.1.5.1.4.3-7: MeasurementReport (Test procedure, step 8)**

| Derivation Path: TS 38.38.508-1[14] Table 4.6.1-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | MeasResults | | |
| measId | 1 | | |
| measResultServingMOList | Not checked | | |
| measResultsSL-r16 SEQUENCE { | | | |
| measResultsListSL-r16 CHOICE { | | | |
| measResultNR-SL-r16 SEQUENCE { | | | |
| measResultListCBR-NR-r16 SEQUENCE (SIZE (1.. maxNrofSL-PoolToMeasureNR-r16)) OF MeasResultCBR-NR-r16 { | 1 entry | | |
| MeasResultCBR-NR-r16[1] SEQUENCE { | | entry 1 | |
| sl-poolReportIdentity-r16 | 1 | | |
| sl-CBR-ResultsNR-r16 | (3..4) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

9.1.5.1.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 4 are given in Table 9.1.5.1.5-1. Cell specific test parameters for Cell 1 are given in Table 9.1.5.1.5-2.

**Table 9.1.5.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 congestion control measurement for concurrent operation**

| Parameter | Unit | Active Sidelink UE *i* (*i* = 0, 1, 2, 3) | |
|---|---|---|---|
| | | T1 | T2 |
| NR RF Channel Number | | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 7 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC (defined in A.3.21.3) | | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | | CD.1A HD | |
| Noc Note1 | dBm/30 kHz | -104.55 Note 8 | |
| Ês/Noc | dB | 4.35 | 13.62 Note 8 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -78.05 | -69.95 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -83.76 | -83.76 |
| Io1 Note 2,5 | dBm/18 MHz | -78.05 | -69.95 |
| | dBm/36 MHz | -78.05 | -69.95 |
| Io2 Note 2,6 | dBm/18 MHz | -83.76 | -83.76 |
| | dBm/36 MHz | -83.76 | -83.76 |
| Propagation Condition | - | AWGN | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 7: The UE is only required to be tested in one of the supported test configurations.
Note 8: Including test tolerance given in Annex F.

**Table 9.1.5.1.5-2: Cell specific Test Parameters for NR SA FR1 congestion control measurement for concurrent operation**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| RF Channel Number | | | 2 |
| Duplex Mode | Config 1 | | FDD |
| | Config 2,3 | | TDD |
| TDD configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| Channel Bandwidth ($BW_{channel}$) | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 40: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP Configuration | | | DLBWP.1.1<br>ULBWP.1.1 |
| DRX Cycle | | | N/A |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |

| | | | |
|---|---|---|---|
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1,2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.2 |
| OCNG Patterns | | | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Noc Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
| Noc Note2 | Config 1,2 | dBm/SCS | -98 |
| | Config 3 | | -95 |
| Ês/Noc | | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| | Config 3 | | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| | Config 3 | dBm/38.1 MHz | -59.2 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is lower than *threshS-RSSI-CBR*. Then the measured CBR is lower than *c1-Threshold*. No CBR measurement reporting shall be triggered.

During T2, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is higher than *threshS-RSSI-CBR*. Then the measured CBR is higher than *c1-Threshold*. CBR measurement reporting shall be triggered.

The rate of correct events observed during repeated tests shall be at least 98%.

## 9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation

### 9.1.5.2.1 Test purpose

The purpose of this test is to verify the congestion control measurement requirements in TS 38.133 [6] clause 12.6.

### 9.1.5.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting only sidelink communication.

### 9.1.5.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.5.

9.1.5.2.4 Test description

9.1.5.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.5.2.4.1-1.

**Table 9.1.5.2.4.1-1: Initial conditions for NR SA FR1 congestion control measurement for PC5-only operation**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. | | |
| Channel bandwidth | PC5: As specified by the test configuration selected from Table 9.1.5.2.4.1-2. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.1 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.5.2.4.3
3. There are 4 NR-SS-UEs (active NR sidelink UE i, i = 0,1,2,3) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.5.2.4.1-2.

**Table 9.1.5.2.4.1-2: NR sidelink test parameters for NR SA FR1 congestion control measurement for PC5-only operation**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$)[Note 2] | | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| SCS | | kHz | 30 | |
| V2X sidelink communication configuration | | | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | | | 11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | | | 1 | ENUMERATED {n1} |
| sl-SubchannelSize included in SL-ResourcePool | | | 10 | ENUMERATED {n10} |
| sl-StartRB-Subchannel-r16 | | | 0 | |
| *threshS-RSSI-CBR* | | | 19 | Corresponding -74dBm as defined in Section 6.3.8 in TS 38.331 [13] |
| Number of Active Sidelink UEs every 50ms | | | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Active Sidelink UEs (i = 0,1,2,3) | V2X sidelink Communication configuration | | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| | sl-TimeResource-r16 included in SL-ResourcePool | | $\{1_i\}$[Note1] | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8]) |

| | | | | |
|---|---|---|---|---|
| | sl-NumSubchannel-r16 included in SL-ResourcePool | | 1 | |
| | sl-SubchannelSize included in SL-ResourcePool | | 10 | |
| Timing offset between V2X UE and Active Sidelink UEs | | µs | CP/2 | Synchronous |
| sl-CBR-RangeConfigList-r16 | | | [2 100] | Two ranges are defined by this list: 0 to 0.02 and 0.02 to 1 |
| sl-CR-Limit-r16 | | | 10000 and 10 | Corresponding to the two CBR ranges: if CBR > 0.02, CR ≤ 0.001, otherwise CR > 0.001 |
| sl-Thres-RSRP-r16 | | | 12 | Configure threshold <-98.64dBm/30kHz to ensure not blocking transmission |
| Hysteresis | | | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| T1 | | s | 5 | |
| T2 | | s | 5 | |
| Note 1: $\{1_i\}$ is a sequence of ninety nine 0's with one 1 in i+1'th position.<br>Note 2: The UE is only required to be tested in one of the channel bandwidths. | | | | |

### 9.1.5.2.4.2 Test procedure

In this test there is 4 active sidelink UEs (denoted as UE i, i = 0,1,2,3). There are 1 active cells (Cell 1) and no GNSS during the whole test. DUT and all active sidelink UEs select Cell 1 as synchronization reference source. All active sidelink UEs are scheduled to transmit PSCCH/PSSCH with 50ms periodicity.

The test consists of two successive time periods with time duration of T1 and T2 respectively.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs, triggers all active sidelink UEs to transmit PSCCH/PSSCH with 50ms periodicity.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
4. The SS sets parameters according to T1 in Table 9.1.5.2.5-1. T1 starts.
5. During T1, the SS recodes the number of resources occupied by the PSSCH transmission of the UE under test (denoted as $N_{resource,\ low\ CBR}$:) until T1 expires. If $N_{resource,\ low\ CBR} > 10$, then count as success for the event "high CR limit", otherwise count a fail for the event "high CR limit".
6. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.5.2.5-1. T2 starts.
7. During T2, the SS recodes the number of resources occupied by the PSSCH transmission of the UE under test (denoted as $N_{resource,\ high\ CBR}$:) until T2 expires. If $N_{resource,\ low\ CBR} \leq 10$, then count as success for the event "low CR limit", otherwise count a fail for the event "low CR limit".
8. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.
9. Repeat step 3-7 until the confidence level according to Table G.3.3-1 is achieved.

### 9.1.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.5.2.4.3-1: SL-ResourcePool (UE under test)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-ThreshS-RSSI-CBR-r16 | 19 | actual value is -112 + 2*19 = -74 dBm | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-CBR-PriorityTxConfigList-r16 | SL-CBR-PriorityTxConfigList | Table 9.1.5.2.4.3-2 | |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-FilterCoefficient-r16 | fc0 | L3 filtering is disabled | |
| sl-TimeResource-r16 | ones(1,100) | ones(1,100) is a sequence of 100 "1"s | |
| } | | | |

**Table 9.1.5.2.4.3-2: SL-CBR-PriorityTxConfigList (Table 9.1.5.2.4.3-1)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.6-5 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CBR-PriorityTxConfigList -r16 ::= SEQUENCE (SIZE (1..8)) OF SL-PriorityTxConfigIndex-r16 { | 8 entries | | |
| SL-PriorityTxConfigIndex-r16[k, k=1..8] SEQUENCE { | | entry k | |
| sl-DefaultTxConfigIndex-r16 | Not present | | |
| sl-Tx-ConfigIndexList-r16 SEQUENCE (SIZE (1..maxCBR-Level-r16)) OF SL-TxConfigIndex-r16 { | 2 entries | | |
| SL-TxConfigIndex-r16[1] | 0 | entry 1<br>First entry in sl-CBR-PSSCH-TxConfigList is used for the first CBR range in sl-CBR-RangeConfigList, i.e. 0<=CBR<0.02 | |
| SL-TxConfigIndex-r16[2] | 1 | entry 2<br>Second entry in sl-CBR-PSSCH-TxConfigList is used for the second CBR range in sl-CBR-RangeConfigList, i.e. 0.02<=CBR<1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.5.2.4.3-3: SL-CBR-CommonTxConfigList (UE under test)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.6-6 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| SL-CBR-CommonTxConfigList-r16 ::= SEQUENCE { | | | |
| sl-CBR-RangeConfigList-r16 SEQUENCE (SIZE (1..maxCBR-Config-r16)) OF SL-CBR-LevelsConfig-r16 { | 1 entry | | |
| SL-CBR-LevelsConfig-r16[1] SEQUENCE (SIZE (1..maxCBR-Level-r16)) OF SL-CBR-r16 { | 2 entries | entry 1 | |
| SL-CBR-r16[1] | 2 | entry 1<br>0<=CBR<0.02 | |
| SL-CBR-r16[2] | 100 | entry 2<br>0.02<=CBR<1 | |
| } | | | |
| } | | | |
| sl-CBR-PSSCH-TxConfigList-r16 SEQUENCE (SIZE (1.. maxTxConfig-r16)) OF SL-CBR-PSSCH-TxConfig-r16 { | 2 entries | | |
| SL-CBR-PSSCH-TxConfig-r16[1] SEQUENCE { | | entry 1 | |
| sl-CR-Limit-r16 | 10000 | 0.001 <CR <=1 | |
| sl-TxParameters-r16 | Not present | | |
| } | | | |
| SL-CBR-PSSCH-TxConfig-r16[2] SEQUENCE { | | entry 2 | |
| sl-CR-Limit-r16 | 10 | CR <=0.001 | |
| sl-TxParameters-r16 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.1.5.2.4.3-4: SL-ResourcePool (active sidelink UE 0~3)**

| Derivation Path: TS 38.508-1 [14] Table 7.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-ResourcePool-r16 ::= SEQUENCE { | | | |
| sl-UE-SelectedConfigRP-r16 SEQUENCE { | | | |
| sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 { | 2 entries | | |
| SL-ResourceReservePeriod-r16[1] CHOICE { | | entry 1 | |
| sl-ResourceReservePeriod1-r16 | ms0 | | |
| } | | | |
| SL-ResourceReservePeriod-r16[2] CHOICE { | | entry 2 | |
| sl-ResourceReservePeriod2-r16 | 50 | | |
| } | | | |
| } | | | |
| } | | | |
| sl-TimeResource-r16 | $\{1_i\}$ | $\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position<br>i = 0,1,2,3 | sidelink UE i |
| } | | | |

**Table 9.1.5.2.4.3-5: Physical layer parameters for SCI format 1-A (Sidelink UE 0~3)**

| Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1 | | | |
|---|---|---|---|
| **Parameter** | **Value** | **Value in binary** | **Condition** |
| Frequency resource assignment | Not present | - | |
| Time domain resource assignment | Indicates only one resource is scheduled | "00000"B | |
| Resource reservation period | Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms | "1"B | |

**Table 9.1.5.2.4.3-6: +CCUTLE (Test procedure, step 3)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit |
|---|

**Table 9.1.5.2.4.3-7: +CCUTLE (Test procedure, step 8)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

### 9.1.5.2.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 4 are given in Table 9.1.5.2.5-1.

**Table 9.1.5.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 congestion control measurement for PC5-only operation**

| Parameter | Unit | Active Sidelink UE *i* (*i* = 0, 1, 2, 3) | |
|---|---|---|---|
| | | T1 | T2 |
| NR RF Channel Number | | 1 | |
| Channel Bandwidth ($BW_{channel}$) Note 7 | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| PSCCH RMC (defined in A.3.21.3) | | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | | CD.1A HD | |
| Noc Note1 | dBm/30 kHz | -104.55 Note 8 | |
| Ês/Noc | dB | 4.35 | 13.62 Note 8 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | --78.05 | -69.95 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -83.76 | -83.76 |
| Io1 Note 2,5 | dBm/18 MHz | -78.05 | -69.95 |
| | dBm/36 MHz | -78.05 | -69.95 |
| Io2 Note 2,6 | dBm/18 MHz | -83.76 | -83.76 |
| | dBm/36 MHz | -83.76 | -83.76 |
| Propagation Condition | - | AWGN | |

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 7: The UE is only required to be tested in one of the supported test configurations.
Note 8: Including test tolerance given in Annex F.

During T1, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is lower than *threshS-RSSI-CBR*. Then the measured CBR is lower than 2%. The UE needs to ensure its channel occupancy ratio higher than 1% in T1.

During T2, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is higher than *threshS-RSSI-CBR*. Then the measured CBR is higher than 2%. The UE needs to ensure its channel occupancy ratio lower than 1% in T2.

The rate of correct events observed during repeated tests shall be at least 98%.

## 9.1.6 Interruption

### 9.1.6.0 Minimum conformance requirements

#### 9.1.6.0.1 Minimum conformance requirements for interruption to WAN due to NR sidelink communication

This clause contains the requirements related to the interruptions on the PCell/serving cell due to NR sidelink communication.

A UE capable of NR sidelink communication may indicate its interest (initiation or termination) in NR sidelink communication to the connected gNB using IE *SidelinkUEInformationNR* in TS 38.331 [13].

The UE is allowed an interruption of up to the duration shown in Table 9.1.6.0.1-1 on the PCell/serving cell during the RRC reconfiguration procedure that includes the V2X sidelink communication configuration message *SL-ConfigDedicatedNR* in TS 38.331 [13] (setup and release). This interruption is for both uplink and downlink of the PCell/serving cell.

**Table 9.1.6.0.1-1: Interruption length at V2X RRC reconfiguration**

| $\mu$ | NR Slot length (ms) | Interruption length (number of slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

The normative references for this requirement are TS 38.133 [6] clause 12.7.

## 9.1.6.1 NR SA FR1 interruption to WAN due to NR sidelink communication

### 9.1.6.1.1 Test purpose

The purpose of this test is to verify the requirements related to interruptions due to NR sidelink communication as specified in TS 38.133 [6] clause 12.7.1, when UE is out of coverage on the NR sidelink carrier and is associated with a serving cell on a non-sidelink carrier.

### 9.1.6.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

### 9.1.6.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.6.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.6.1.

### 9.1.6.1.4 Test description

#### 9.1.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.6.1.4.1-1.

**Table 9.1.6.1.4.1-1: Supported test configurations for FR1 NR Cell**

| Configuration | Description |
|---|---|
| 9.1.6.1-1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.6.1-2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 9.1.6.1-3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 9.1.6.1.4.1-2.

**Table 9.1.6.1.4.1-2: Initial conditions for NR SA FR1 interruption to WAN due to NR sidelink communication**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | Uu&PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1. | | |
| Channel bandwidth | Uu: As specified by the test configuration selected from Table 9.1.6.1.4.1-1<br>PC5: As specified by the test configuration selected from Table 9.1.6.1.4.1-4 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.9.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.7.3 | |
| Exceptions to connection diagram | N/A | | |

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are defined in clause 9.1.6.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.6.1.4.1-3.
5. There are 8 active sidelink UEs (UE i, i=0,1,...,7) in this test. Test parameters for active sidelink UEs are given in Table 9.1.6.1.4.1-3 and Table 9.1.6.1.4.1-4.

**Table 9.1.6.1.4.1-3: General test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | - | 1, 2 | RF channel 1 is non-sidelink carrier<br>RF channel 2 is sidelink carrier |
| SCS | kHz | 30 | |
| Active cell | - | Cell 1 | PCell on RF channel number 1 |
| CP length of Cell 1 | - | Normal | |
| T1 | s | 5.12 | |
| T2 | s | Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit *SidelinkUEInformationNR* during this period. | |
| T3 | s | 10 | |

**Table 9.1.6.1.4.1-4: Sidelink test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | - | 2 | HD carrier in Band n47 or n38 |
| Channel Bandwidth ($BW_{channel}$) Note 1 | | MHz | 20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100) | |
| Sidelink Communication configuration | | - | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |
| Number of Active Sidelink UEs | | - | 8 | Active Sidelink UE i = 0, .., 7 |
| Active Sidelink | Sidelink Communication configuration | - | As specified in Annex A.11.2 | IE values unless specified otherwise in this test. |

| | | | | |
|---|---|---|---|---|
| UEs (UE i = 0, .., 7) | PSCCH Reference Measurement Channel | - | CC.1A HD | As specified in Table A.11.2.2-1 |
| | PSSCH Reference Measurement Channel | - | CD.1A HD | As specified in Table A.11.2.2-2 |
| | sl-NumSubchannel-r16 included in SL-ResourcePool | - | 1 | Indicates the number of sub-channels for TX resource pool |
| | sl-StartRB-Subchannel-r16 included in SL-ResourcePool | - | i | Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE i = 0, .., 7. |
| | PSBCH-RSRP | dBm/30kHz | -95 | |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

#### 9.1.6.1.4.2 Test procedure

In this test there is one active cell (Cell 1) and 8 active sidelink UEs transmitting sidelink communication. The UE under test and all active sidelink UEs select the active cell as synchronization source.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

For this test, the UE is triggered by the test loop function or the upper layers to monitor NR sidelink communication.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs. Active sidelink UEs are configured to transmit PSCCH/PSSCH according to the parameters specified in Table 9.1.6.1.4.1-4.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to receive.
4. The SS sets parameters according to T1 in Table 9.1.6.1.5-1. T1 starts.
5, When T1 expires, the SS sends a paging message including matched *ng-5G-S-TMSI*.
6. The UE sends an *RRCSetupRequest* message.
7. The SS sends an *RRCSetup* message.
8. The UE sends an *RRCSetupComplete* message.
9. The SS shall switch the power setting from T1 to T2 in Table 9.1.6.1.5-1 upon receiving the *RRCSetupComplete* message sent by the UE, T2 starts.
10. If the UE sends a *SidelinkUEInformationNR* message within 2 seconds from the beginning of T2. continues with step 11, otherwise skips to step 13.
11. The SS sends an *RRCReconfiguration* message with *SL-ConfigDedicatedNR* to provide sidelink communication configuration to the UE.
12. The UE sends a *RRCReconfigurationComplete* message.
13. T2 expires. The SS shall switch the power setting from T2 to T3 in Table 9.1.6.1.5-1. T3 starts.
14. During T3, The SS continuously schedules the UE to perform DL reception in every DL slots and monitoring corresponding ACK/NACK feedback in UL slots.
15. If the SS observes on missing ACK/NACKs until T3 expiring, then count a success for the test, otherwise count a fail for the test.
16. When T3 expires, the SS sends AT command +CCUTLE to open test loop function.

#### 9.1.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 9.1.6.1.4.3-1: +CCUTLE (Test procedure, step 3)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Receive |
|---|

**Table 9.1.6.1.4.3-2: +CCUTLE (Test procedure, step 16)**

| Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open |
|---|

#### 9.1.6.1.5 Test requirement

Cell-specific test parameters for Cell 1 are given in Table 9.1.6.1.5-1.

**Table 9.1.6.1.5-1: Cell specific test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication**

| Parameter | | Unit | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF Channel Number | | | 1 | | |
| UE RRC state | | | IDLE | CONNECTED | |
| Duplex Mode | Config 1 | | FDD | | |
| | Config 2,3 | | TDD | | |
| TDD configuration | Config 1 | | Not Applicable | | |
| | Config 2 | | TDDConf.1.1 | | |
| | Config 3 | | TDDConf.2.1 | | |
| Channel Bandwidth ($BW_{channel}$) | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | | DLBWP.1.1<br>ULBWP.1.1 | | |
| DRX Cycle | | | N/A | | |
| PDSCH Reference measurement channel | Config 1 | | N/A | None | SR.1.1 FDD |
| | Config 2 | | N/A | None | SR.1.1 TDD |
| | Config 3 | | N/A | None | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | |
| | Config 2 | | CR.1.1 TDD | | |
| | Config 3 | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | | |
| | Config 2 | | CCR.1.1 TDD | | |
| | Config 3 | | CCR.2.1 TDD | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | |
| | Config 3 | | SSB.2 FR1 | | |
| SMTC Configuration | | | SMTC.2 | | |
| OCNG Patterns | | | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| Noc Note2 | Config 1,2,3 | dBm/15 kHz | -98 | | |
| Noc Note2 | Config 1,2 | dBm/SCS | -98 | | |
| | Config 3 | | -95 | | |
| Ês/Noc | | dB | 3 | | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 | | |

| | | | |
|---|---|---|---|
| | Config 3 | | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.3 |
| | Config 3 | dBm/38.1 MHz | -59.2 |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

During T1, the UE is in RRC_IDLE and monitoring the sidelink communication transmission from other active Sidelink UEs on the sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, the test system shall send *RRCReconfiguration* message to the UE and wait for the UE to respond with *RRCReconfigurationComplete* message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is continuously scheduled with PDSCH on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during NR sidelink communication. 100% of all expected ACK/NACKs shall be transmitted by the UE.

# 10 EN-DC Tests with NR PSCell under CCA and Other NR Cells in FR1

## 10.0 General

### 10.0.1 Principle of testing for UE capable of EN-DC with only NR bands with shared spectrum access

Test cases in table 10.0.1-1 are defined for UE capable of EN-DC with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access). The EN-DC configurations are defined in clause 5.5B of TS 38.101-3 [4].

**Table 10.0.1-1: Test cases applicable to UE supporting EN-DC with only NR bands with shared spectrum access**

| Test category | Clause | Test case |
|---|---|---|
| Active BWP switching | 10.3.5.2.1 | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC |
| | 10.3.5.2.2 | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC |
| | 10.3.5.3.1 | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC |

## 10.1 RRC_CONNECTED state mobility

### 10.1.1 Random Access

#### 10.1.1.0 Minimum conformance requirements

#### 10.1.1.0.1 Minimum conformance requirements for 4-step RA type

The random access procedure is initiated to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [8] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [12]. Two types of procedure are defined for the random access, the 4-step RA type, and the 2-step RA type [7]. The decision on which type of procedure to adopt is as described in clause 5.1.1 of TS 38.321 [12]. The requirements for the 4-step RA type procedure are described in clause 6.2.2A.2, whereas the requirements for the 2-step RA type procedure are described in the clause 6.2.2A.3 of this specification.

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2].

The UE shall indicate a random access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [12].

The requirements in this clause apply for UE operating in a carrier frequency with CCA in SA operation mode or any MR-DC operation mode, in a carrier frequency with CCA.

##### 10.1.1.0.1.1 Contention based random access

###### 10.1.1.0.1.1.1 Correct behaviour when transmitting Random Access Preamble

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [12].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [12].

###### 10.1.1.0.1.1.2 Correct behaviour when receiving Random Access Response

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 10.1.1.0.1.1.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], if the UL CCA is successful, and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

#### 10.1.1.0.1.1.4 Correct behaviour when receiving an UL grant for msg3 retransmission

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission, if the UL CCA is successful,

#### 10.1.1.0.1.1.5 Correct behaviour when receiving a message over Temporary C-RNTI

If the UL CCA is successful, The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires and the UL CCA is successful, unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

#### 10.1.1.0.1.1.6 Correct behaviour when contention Resolution timer expires

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

### 10.1.1.0.1.2 Non-contention based random access

#### 10.1.1.0.1.2.1 Correct behaviour when transmitting Random Access Preamble

If the UL CCA is successful on the next available PRACH occasion and if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the UL CCA is successful, and if the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with SSBs configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [12].

#### 10.1.1.0.1.2.2 Correct behaviour when receiving Random Access Response

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [12].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 10.1.1.0.1.2.3 Correct behaviour when not receiving Random Access Response

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

### 10.1.1.0.2 Minimum conformance requirements for 2-step RA type

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2].

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE operating in a carrier frequency with CCA in SA operation mode or any MR-DC operation mode, in a carrier frequency with CCA.

#### 10.1.1.0.2.1 Contention based random access

##### 10.1.1.0.2.1.1 Correct behaviour when transmitting MsgA

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [12].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, UE shall have the capability to transmit MsgA PRACH on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured.

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, if the UL CCA is successful, the UE shall be able to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [12]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that PREAMBLE_TRANSMISSION_COUNTER = *msgA-TransMax* + 1.

#### 10.1.1.0.2.1.2 Correct behaviour when receiving MsgB

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If the UL CCA is successful, the UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, and monitor contention resolution as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power, if the UL CCA is successful on the next available PRACH occasion, when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

#### 10.1.1.0.2.1.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and if the UL CCA is successful, transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

### 10.1.1.0.2.2 Non-contention based random access

#### 10.1.1.0.2.2.1 Correct behaviour when transmitting MsgA

If the UL CCA is successful, if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, the UE shall be able to transmit MsgA PUSCH, if the UL CCA is successful, on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall have cancel the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [2] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [12]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that PREAMBLE_TRANSMISSION_COUNTER = *msgA-TransMax* + 1.

#### 10.1.1.0.2.2.2 Correct behaviour when receiving MsgB

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful, if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

#### 10.1.1.0.2.2.3 Correct behaviour when not receiving MsgB

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

### 10.1.1.1.1 EN-DC FR1 4-step RA type contention based random access test for NR PSCell with CCA

#### 10.1.1.1.1.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in TS 38.133 [6] clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

#### 10.1.1.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier.

#### 10.1.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.1.1.1.1.

#### 10.1.1.1.1.4 Test description

##### 10.1.1.1.1.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 10.1.1.1.1.4.1-1.

**Table 10.1.1.1.1.4.1-1: Supported test configurations for contention based random access test in FR1 for PSCell with CCA**

| Configuration | Description |
|---|---|
| 10.1.1.1.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.1.1.1.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 10.1.1.1.1.4.1-2

**Table 10.1.1.1.1.4.1-2: Initial conditions for contention based random access test in FR1 for PSCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.1.1.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.1.1.1.1.4.3.

2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

#### 10.1.1.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up E-UTRA PCell according to parameters given in Table A.6B.1-1 and setup NR PSCell according to parameters given in Table 10.1.1.1.1.5-1. The SS shall enable DL and UL CCA model according to Table 10.1.1.1.1.5-1.

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting Random Access Preamble:

   4.1. If the UL CCA is successful , The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response:

   5.1. Repeat steps 1-3.

   5.2. If the UL CCA is successful, The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and if the UL CCA is successful , transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response:

   6.1. Repeat steps 1-3.

   6.2. If the UL CCA is successful,The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no Random Access Response was received within the RA Response window, and if the UL CCA is successful, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and if the UL CCA is successful , transmit with the calculated PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

   7.1. Repeat steps 1-3.

   7.2. If the UL CCA is successful , The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

   7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, UE shall transmit the msg3 including C-RNTI MAC control element.

   7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

   7.5. If the UL CCA is successful, The UE shall re-transmit the msg3 including C-RNTI MAC control element.

   7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

8.1. Repeat steps 1-3.

8.2. If the UL CCA is successful, The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, and If the UL CCA is successful, the UE shall transmit the msg3 including C-RNTI MAC control element.

8.4. The System Simulator shall send a PDCCH addressed to the C-RNTI.

8.5. The UE shall send PUSCH according to the received PDCCH addressed to the C-RNTI.

9. Test 7: Correct behaviour when contention Resolution timer expires:

9.1. Repeat steps 1-3.

9.2. If the UL CCA is successful,The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

9.4. The System Simulator shall not send a PDCCH addressing the C-RNTI.

9.5. As there was no PDCCH addressing the C-RNTI, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and if the UL CCA is successful, transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

9.6. Measure the power and timing of the first preamble after the Contention Resolution Timer and backoff timer expire and it shall not exceed the values specified in clause 10.1.1.1.1.5.

#### 10.1.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.1.1.1.1.4.3-0: Common Exception messages for contention based random access test in FR1 for PSCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.1.1.1.1.4.3-1: RACH-ConfigCommon for contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | FR1 |
| } | | | |

| | | | |
|---|---|---|---|
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 30 | | 30 kHz |
| } | | | |

**Table 10.1.1.1.1.4.3-2: RACH-ConfigGeneric for contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | FR1 |
| msg1-FDM | one | | FR1 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -114 | | |
| preambleTransMax | N20 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | Sl20 | | |
| } | | | |

**Table 10.1.1.1.1.4.3-3: *ServingCellConfigCommon* for contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 7.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 10.1.1.1.1.5 Test requirement

Table 10.1.1.1.1.5-1 defines the primary level settings for contention based random access test in FR1 for PSCell in EN-DC. Tables 10.1.1.1.1.5-2, 10.1.1.1.1.5-3 and 10.1.1.1.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

**Table 10.1.1.1.1.5-1: General test parameters for contention based random access test in FR1 for PSCell with CCA**

| Parameter | | | Unit | Test 1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1,2 | | SSB.1 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1,2 | | SSB.2 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1,2 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | TDD | |
| TDD Configuration | | Config 1,2 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.6B.1. |
| PDSCH parameters Note 3 | | Config 1,2 | | SR.1.1 CCA | As defined in A.1A.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | FR1 PRACH configuration 1 under CCA | As defined in A.7.1A.1. |
| DL CCA probability $P_{CCA_DL}$ | | Note 4, 6 | | 0.9375 | |
| | | Note 5, 6 | | 0.75/0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability $P_{CCA_UL}$ | | Note 4, 6 | | 0.87 | |
| | | Note 5, 6 | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.

Note 7: $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$.

Note 8: A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run.

Test 1: Correct behaviour when transmitting Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 10.1.1.1.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 10.1.1.1.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission:

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving a successful UE Contention Resolution:

- The UE shall send PUSCH according to the PDCCH addressed to the C-RNTI.

Test 7: Correct behaviour when contention resolution timer expires:

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 10.1.1.1.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 10.1.1.1.1.5-4.

**Table 10.1.1.1.1.5-2: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.1.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ±3.2 |

**Table 10.1.1.1.1.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 10.1.1.1.2 EN-DC FR1 4-step RA type non-contention based random access for NR PSCell with CCA

### 10.1.1.1.2.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in TS 38.133 [6] clause 6.2.2A.2 and clause 7.1.2 in an AWGN model.

#### 10.1.1.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier. Subtest 2 requires support of CSI-RS-based random access.

#### 10.1.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.1.1.1.2.

#### 10.1.1.1.2.4 Test description

##### 10.1.1.1.2.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 10.1.1.1.2.4.1-1.

**Table 10.1.1.1.2.4.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell with CCA**

| Configuration | Description |
|---|---|
| 10.1.1.1.2-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.1.1.1.2-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 10.1.1.1.2.4.1-2

**Table 10.1.1.1.2.4.1-2: Initial conditions for non-contention based random access test in FR1 for PSCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.1.1.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.1.1.1.2.4.3.

2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

#### 10.1.1.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. For the NR PSCell, the System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2). The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC , DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 10.1.1.1.2.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to the Tables for Non-contention Random Access in clause 10.1.1.1.2.4.3. The SS shall enable DL and UL CCA model according to Table 10.1.1.1.2.5-1.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

   4.1. If the UL CCA is successful , The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

   5.1. Set the parameters according to Table 10.1.1.1.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3.

   5.3. If the UL CCA is successful, The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response:

   6.1. Repeat steps 1-3.

   6.2. If the UL CCA is successful ,The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response:

   7.1. Repeat steps 1-3.

   7.2. If the UL CCA is successful, The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and if the UL CCA is successful , transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.2.5.

#### 10.1.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 with the following exceptions.

**Table 10.1.1.1.2.4.3-0: Common Exception messages for non-contention based random access test in FR1 for PSCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.1.1.1.2.4.3-1: RACH-ConfigCommon for non-contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| l139 | 0 | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 30 | | 30kHz |
| } | | | |

**Table 10.1.1.1.2.4.3-2: RACH-ConfigDedicated for non-contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 50 | | Subtest 1 |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF { | | | |

| | | | |
|---|---|---|---|
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 50 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_51 | | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.1.1.1.2.4.3-3: RACH-ConfigGeneric for non-contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -114 | | |
| preambleTransMax | N20 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | Sl20 | | |
| } | | | |

**Table 10.1.1.1.2.4.3-4: *ServingCellConfigCommon* for non-contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

**Table 10.1.1.1.2.4.3-5: CellGroupConfig for non-contention based random access test in FR1 for PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 with Condition CFRA and PSCell_Change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.1.1.1.2.5 Test requirement

Table 10.1.1.1.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for PSCell in EN-DC. Tables 10.1.1.1.2.5-2, 10.1.1.1.2.5-3 and 10.1.1.1.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances

**Table 10.1.1.1.2.5-1: General test parameters for non-contention based random access test in FR1 for PSCell with CCA**

| Parameter | | | Unit | Test 1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1,2 | | SSB.1 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1,2 | | SSB.2 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1,2 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | TDD | |
| TDD Configuration | | Config 1,2 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.6B.1. |
| PDSCH parameters Note 3 | | Config 1,2 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm | -62.2/38.16MHz | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,\ f,\ c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | FR1 PRACH configuration 2 under CCA | As defined in A.7.1A.2. |
| DL CCA probability $P_{CCA_DL}$ | Note 4, 6 | | | 0.9375 | |
| | Note 5, 6 | | | 0.75/0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability $P_{CCA_UL}$ | Note 4, 6 | | | 0.87 | |
| | Note 5, 6 | | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |

| | | | |
|---|---|---|---|
| $W_{CCA_UL}$ Note 8 | | Inf | |
| Semi-static channel access config period Note 4, 6 | ms | 2 | |
| Propagation Condition | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.

Note 7: $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$.

Note 8: A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run.

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble:

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble:

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 10.1.1.1.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 10.1.1.1.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.2.5-4.

**Table 10.1.1.1.2.5-2: Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.2.5-3: Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 10.1.1.1.2.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

## 10.1.1.1.3 EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA

### 10.1.1.1.3.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 10.1.1.0.2 and 38.133 [6] clause 7.1.2 in an AWGN model.

### 10.1.1.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier, and supporting twoStepRACH-r16.

### 10.1.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.10.1.1.1.3.

### 10.1.1.1.3.4 Test description

For all tests described in section 10.1.1.1.3, the following three requirements apply:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.

- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.

- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [12], and transmit with the calculated MsgA transmission power in case of UL CCA failure.

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### 10.1.1.1.3.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 10.1.1.1.3.4.1-1.

**Table 10.1.1.1.3.4.1-1: Supported test configurations for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 10.1.1.1.3-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.1.1.1.3-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 10.1.1.1.3.4.1-2

**Table 10.1.1.1.3.4.1-2: Initial conditions for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.1.1.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.1.1.1.3.4.3.

2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

### 10.1.1.1.3.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up E-UTRA PCell according to parameters given in Table A.6B.1-1 and setup NR PSCell according to parameters given in Table 10.1.1.1.3.5-1. The SS shall enable DL and UL CCA model according to Table 10.1.1.1.3.5-1

3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. If the UL CCA is successful , The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB_RP above the configured rsrp-ThresholdSSB.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

5.2. If the UL CCA is successful, The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and If the UL CCA is successful , transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. If the UL CCA is successful, the UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.3.5.

#### 10.1.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.1.1.1.3.4.3-1: Common Exception messages for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-81A |

**Table 10.1.1.1.3.4.3-2: *RACH-ConfigCommonTwoStepRA* for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE { | | | |
| oneFourth | n48 | | |
| } | | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | 0 | | |
| msgA-TransMax-r16 | n20 | | |
| msgA-SubcarrierSpacing-r16 | Same as UL carrier SCS | | |
| ra-ContentionResolutionTimer-r16 | sf48 | | |
| } | | | |

**Table 10.1.1.1.3.4.3-3: *RACH-ConfigGenericTwoStepRA* for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 102 | | |
| msgA-RO-FDM-r16 | One | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -114 | | |
| msgB-ResponseWindow-r16 | sl20 | | |
| preambleTransMax-r16 | n20 | | |
| } | | | |

**Table 10.1.1.1.3.4.3-4: *ServingCellConfigCommon* for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 10.1.1.1.3.5 Test requirement

Table 10.1.1.1.3.5-1 defines the primary level settings for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA.

**Table 10.1.1.1.3.5-1: General test parameters for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1,2 | | SSB.1 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1,2 | | SSB.2 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1,2 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | |

| | | | | | |
|---|---|---|---|---|---|
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | TDD | |
| TDD Configuration | | Config 3,4 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 3 | | Config 1,2 | | SR.1.1 CCA | As defined in A.1A.1.1. |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 2 | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 2 | | dBm/SCS | -115 | |
| Io | | Config 1,2 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 1 under CCA | As defined in A.7A.1A.1. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| DL CCA probability | | Note 4, 6 | | 0.9375 | |
| $P_{CCA_DL}$ | | Note 5, 6 | | 0.75/0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability | | Note 4, 6 | | 0.87 | |
| $P_{CCA_UL}$ | | Note 5, 6 | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

| | |
|---|---|
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration. |
| Note 7: | $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$. |
| Note 8: | A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run. |

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.3.5-2.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.3.5-2A.

**Table 10.1.1.1.3.5-2: MsgA PRACH Absolute power tolerance Test requirements for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.3.5-3: Relative power tolerance Test requirements for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 dB |

**Table 10.1.1.1.3.5-4: $T_e$ Timing error Test requirements for EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 10.1.1.1.4 EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA

### 10.1.1.1.4.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in clause 10.1.1.0.2 and 38.133 [6] clause 7.1.2 in an AWGN model.

### 10.1.1.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier, and supporting twoStepRACH-r16.

### 10.1.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.10.1.1.1.4.

### 10.1.1.1.4.4 Test description

For all tests described in section 10.1.1.4, the following three requirements apply:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.
- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.
- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [12], and transmit with the calculated MsgA transmission power in case of UL CCA failure.

Non-contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### 10.1.1.1.4.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 10.1.1.1.4.4.1-1.

**Table 10.1.1.1.4.4.1-1: Supported test configurations for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Configuration | Description |
|---|---|
| 10.1.1.1.4-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.1.1.1.4-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

| NOTE: | The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. |
|---|---|

Configure the test equipment and the DUT according to the parameters in Table 10.1.1.1.4.4.1-2

**Table 10.1.1.1.4.4.1-2: Initial conditions for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.1.1.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.1.1.1.4.4.3.

2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

### 10.1.1.1.4.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 10.1.1.1.4.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to the Tables for Non-contention Random Access in clause 10.1.1.1.4.4.3. The SS shall enable DL and UL CCA model according to Table 10.1.1.1.4.5-1.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. If the UL CCA is successful, The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and If the UL CCA is successful , transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 10.1.1.1.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 10.1.1.1.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 10.1.1.1.4.5.

#### 10.1.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.1.1.1.4.4.3-1: Common Exception messages for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-81A |

**Table 10.1.1.1.4.4.3-2: *RACH-ConfigCommonTwoStepRA* for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |

| | | | |
|---|---|---|---|
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | 0 | | |
| msgA-TransMax-r16 | n20 | | |
| msgA-SubcarrierSpacing-r16 | Same as UL carrier SCS | | |
| ra-ContentionResolutionTimer-r16 | sf48 | | |
| } | | | |

**Table 10.1.1.1.4.4.3-3: *CellGroupConfig* for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicted | | | |
| uplink | RACH-ConfigDedicated for Non-contention Based Random Access | Table 10.1.1.1.4.4.3-4 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.1.1.1.4.4.3-4: *RACH-ConfigDedicated* for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated ::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF CFRA-SSB-Resource { | 1 entry | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | entry 1 | |
| ssb | SSB-Index | | |
| ra-PreambleIndex | 40 | | |
| } | | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| cfra-TwoStep-r16 SEQUENCE { | | | 2-step RA |
| occasionsTwoStepRA-r16 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| ssb-PerRACH-OccasionTwoStepRA-r16 | oneFourth | | |
| } | | | |
| msgA-CFRA-PUSCH-r16 SEQUENCE { | | | |
| msgA-MCS-r16 | 1 | | |
| nrofSlotsMsgA-PUSCH-r16 | 1 | | |
| nrofMsgA-PO-PerSlot-r16 | one | | |
| msgA-PUSCH-TimeDomainOffset-r16 | 1 | | |
| nrofPRBs-PerMsgA-PO-r16 | 2 | | |
| nrofMsgA-PO-FDM-r16 | one | | |
| msgA-DMRS-Config-r16 SEQUENCE { | | | |
| msgA-DMRS-AdditionalPosition-r16 | Pos1 | | |
| msgA-PUSCH-NrofPorts-r16 | 1 | | |
| } | | | |
| msgA-Alpha-r16 | alpha1 | | |
| } | | | |
| resourcesTwoStep-r16 SEQUENCE { | | | |
| } | | | |
| } | | | |

**Table 10.1.1.1.4.4.3-5: *RACH-ConfigGenericTwoStepRA* for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 102 | | |
| msgA-RO-FDM-r16 | One | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -114 | | |
| msgB-ResponseWindow-r16 | sl20 | | |
| preambleTransMax-r16 | n20 | | |
| } | | | |

**Table 10.1.1.1.4.4.3-6: *ServingCellConfigCommon* for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 10.1.1.1.4.5 Test requirement

Table 10.1.1.1.4.5-1 defines the primary level settings for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA.

**Table 10.1.1.1.4.5-1: General test parameters for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1,2 | | SSB.1 CCA | As defined in A.3A.1 |

| | | | | | |
|---|---|---|---|---|---|
| | Note 5, 6 | Config 1,2 | | SSB.2 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1,2 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1,2 | | TDD | |
| TDD Configuration | | Config 1,2 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 3 | | Config 1,2 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1,2 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 2 under CCA | As defined inA.7A.1A.2. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| DL CCA probability | Note 4, 6 | | | 0.9375 | |
| $P_{CCA_DL}$ | Note 5, 6 | | | 0.75/0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability | Note 4, 6 | | | 0.87 | |
| $P_{CCA_UL}$ | Note 5, 6 | | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration. |
| Note 7: | $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$. |
| Note 8: | A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run. |

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.4.5-2.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 10.1.1.1.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 10.1.1.1.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 10.1.1.1.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2)) within the accuracy specified in Table 10.1.1.1.4.5-2A.

**Table 10.1.1.1.4.5-2: MsgA PRACH Absolute power tolerance Test requirements for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 10.1.1.1.4.5-3: Relative power tolerance Test requirements for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 dB |

**Table 10.1.1.1.4.5-4: $T_e$ Timing error Test requirements for EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 10.1.2 EN-DCFR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA

### 10.1.2.1 Test purpose

To verify that the requirement for E-UTRA handover with NR PSCell change, where NR PSCell is on carrier with CCA. This test will verify the requirements for EN-DC HO with PSCell change on CCA specified in clause 5.9 in TS 36.133 [23] for the case when the target PSCell is on carrier with CCA.

### 10.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, RRM measurements and UL transmission with a shared spectrum NR carrier.

### 10.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.1.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.1.2.

### 10.1.2.4 Test description

Table 10.1.2.4.1-1 gives general test configurations for Handover with PSCell from EN-DC to EN-DC, Table 10.1.2.4.1-3 provides general test parameters for Handover from E-UTRA to E-UTRA cell in EN-DC to EN-DC, Table 10.1.2.5-1 provides E-UTRAN cell specific test parameters for Handover with PSCell from EN-DC to EN-DC, Table 10.1.2.4.1-4 provides general test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA, Table 10.1.2.5-2 provides cell specific test parameters for PSCell change from FR1 carrier under CCA to FR1 carrier under CCA.

In the test there are four cells: Cell1 and Cell2 are PCell and target PCell on E-UTRA carrier, Cell3 and Cell4 are PSCell and target PSCell on NR CCA carrier. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. Before the test starts the UE is connected to Cell1 (E-UTRA PCell) and Cell3 (NR PSCell) with EN-DC mode.

At the start of time duration T1, the UE do not have any information of cell 2 and cell 4. At the end of T1, UE is configured with neighbour cell measurements on the Cell 3 and Cell 4 for Event A3 conditional measurement report.

During T2, UE acquires the timing information of Cell3 and Cell 4 and performs L3-RSRP measurements on the configured neighbour cells. UE sends measurement report to the Cell1 to indicate the event triggering condition A3 is satisfied for the configured for neighbour cells. By end of T2, E-UTRA PCell (Cell1) shall send a RRC message implying handover with PSCell change.

The start of T3 is defined as the end of the last TTI containing the RRC message implying handover with PSCell. UE shall complete PRACH transmission to PCell and PSCell by end of T3.

#### 10.1.2.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 10.1.2.4.1-1.

**Table 10.1.2.4.1-1: Supported test configurations for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Configuration | Description |
|---|---|
| 10.1.2-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.1.2-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 10.1.2.4.1-2

**Table 10.1.2.4.1-2: Initial conditions for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.1.2.4.3.

2. There are four cells in the test. Cell1 and Cell2 are PCell and target PCell on E-UTRA carrier, Cell3 and Cell4 are PSCell and target PSCell on NR CCA carrier. The UE is initially in an EN-DC connection with Cell 1 and Cell 3. In addition, Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

**Table 10.1.2.4.1-3: General test parameters for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | One is E-UTRA RF channel and one is NR RF channel |
| Initial conditions | Active E-UTRA PCell | | Cell1 | On E-UTRA RF channel number 1. |
| | Active NR PSCell | | Cell3 | On NR RF channel number 2. |
| Final conditions | Active E-UTRA PCell | | Cell2 | On E-UTRA RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| | Active NR PSCell | | Cell4 | On NR RF channel number 2. |
| CP length | | | Normal | Applicable to Cell1, Cell2, Cell3 and Cell4. |
| A3-Offset | | dB | -1 Note1,2 | |
| Hysteresis | | dB | 0 Note1 | |
| Time To Trigger | | s | 0 Note1 | |
| Filter coefficient | | | 0 Note1 | L3 filtering is not used |
| DRX | | | OFF | Continuous monitoring of primary cell |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between same RAT cells | | μs | 3 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | Tinterrupt is defined in TS 38.133 [6] clause 6.1B.1.2 |
| Note 1: Applies to the measurement configuration on E-UTRAN carrier. The measurement configuration on NR carrier is given in Table 10.1.2.4.1-4.<br>Note 2: Includes test tolerance. | | | | |

**Table 10.1.2.4.1-4: General test parameters for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 3 | On the carrier under CCA |
| | Neighbouring cell | | Cell 4 | On the carrier under CCA |
| Final condition | Active cell | | Cell 4 | On the carrier under CCA |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| A3-Offset | | dB | -1 Note4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T304 | | ms | 500 | |
| $L_{CCA_DL}$ | | | 5 | |
| $W_{CCA_DL}$ | | ms | T304 | |
| $L_{CCA_UL}$ | | | 5 | |
| $W_{CCA_UL}$ | | ms | T304 | |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |
| T3 | | s | ≥ $T_{interrupt}$ | $T_{interrupt}$ is defined in TS 38.133 [6] clause 6.1B.1.2 |
| Note 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.<br>Note 4: Includes test tolerance. | | | | |

10.1.2.4.2 Test procedure

During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 4. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 and Cell 3 are the active cells.

2. Set the parameters according to T1 in Tables 10.2.1.5-1 and 10.1.2.5-2. The SS shall enable DL and UL CCA model according to Table 10.1.2.5-2. T1 starts.

3. SS shall transmit an *RRCConnectionReconfiguration* message configuring two event A3 with the corresponding offsets, for both E-UTRA and NR, correspondingly, according to Tables 10.1.2.4.1-3 and 10.1.2.4.1-4.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 10.1.2.5-1 and 10.1.2.5-2. T2 starts.

5. UE shall transmit two *MeasurementReport* messages triggered by Event A3, for both E-UTRA and NR neighbour cells, embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the UE transmits both *MeasurementReport* messages proceed with step 6, otherwise proceed with step 9 once T2 expires.

6. SS shall transmit *RRCConnectionReconfiguration* message to the UE implying EN-DC handover from Cell1+Cell3 to Cell2+Cell4. T3 starts immediately after the end of the last TTI containing the handover request. At that instant the SS shall switch the power settings from T2 to T3 as specified in Tables 10.1.2.5-1 and 10.1.2.5-2.

7. If the UE transmits PRACH to Cell 2 less than 62 ms from the beginning of time period T3, and if the UE transmits PRACH to Cell 4 less than 57+20*(1+ $L_2$)+10*(1+ $L_3$) ms, where $L_2 \leq L_{CCA_DL}$= 5 and $L_3 \leq L_{CCA_UL}$= 5, then the number of successful tests is increased by one (the maximum allowed delay is 57+120+60 = 237ms). Otherwise, the number of failure tests is increased by one.

8. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2. After T3 expires proceed with step 9.

9. The SS shall switch off and then on the UE. The SS shall disable the CCA model (both DL and UL) (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) and set Cell 4 physical cell identity = ((current cell 4 physical cell identity + 3) mod1008) for the next iteration of the test procedure loop.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

### 10.1.2.4.3 Message contents

**Table 10.1.2.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset set as per Table 10.2.1.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with A3-offset set as per Table 10.2.1.4.1-4<br>Table H.3.4-10<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 10.1.2.5 Test requirement

Tables 10.1.2.5-1 and 10.1.2.5-2 define the primary level settings including test tolerances for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA.

**Table 10.1.2.5-1: E-UTRAN cell specific test parameters for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Parameter | Unit | Cell1 | | | Cell2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | | FDD or TDD | | | FDD or TDD | | |
| TDD special subframe configuration[Note1] | | 6 | | | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 1 | | | 1 | | |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns [Note2] | | 5 MHz: OP.20 FDD<br>10MHz: OP.1 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | OP.18 FDD<br>OP.2 FDD<br>OP.14 FDD<br>OP.10 TDD<br>OP.2 TDD<br>OP.8 TDD | 5MHz: OP.18 FDD<br>10MHz: OP.2 FDD<br>20MHz: OP.14 FDD<br>5MHz: OP.10 TDD<br>10MHz: OP.2 TDD<br>20MHz: OP.8 TDD | | OP.20 FDD<br>OP.1 FDD<br>OP.17 FDD<br>OP.9 TDD<br>OP.1 TDD<br>OP.7 TDD |
| PRACH configuration | | - | | | 4, As specified in table 5.7.1-2 in TS 36.211[24] | | |
| PBCH_RA | dB | 0 | | | 0 | | |
| PBCH_RB | dB | | | | | | |
| PSS_RA | dB | | | | | | |
| SSS_RA | dB | | | | | | |
| PCFICH_RB | dB | | | | | | |
| PHICH_RA | dB | | | | | | |
| PHICH_RB | dB | | | | | | |
| PDCCH_RA | dB | | | | | | |
| PDCCH_RB | dB | | | | | | |
| PDSCH_RA | dB | | | | | | |
| PDSCH_RB | dB | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OCNG_RA Note3 | dB | | | | | | |
| OCNG_RB Note3 | dB | | | | | | |
| $N_{oc}$ Note4 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| $\hat{E}_s/I_{ot}$ | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| RSRP Note5 | dBm/15 kHz | -90 | -90 | -90 | -Infinity | -88 | -88 |
| SCH_RP Note5 | dBm/15 kHz | -90 | -90 | -90 | -Infinity | -88 | -88 |
| Io Note5 | dBm/Ch BW | -61.58+10log($N_{RB,c}$/50) | -57.84+10log($N_{RB,c}$/50) | | N/A | -57.84+10log($N_{RB,c}$/50) | |
| Propagation Condition | | AWGN | | | | | |
| Antenna Configuration | | 1x2 | | | | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 10.1.2.5-2: NR cell specific test parameters for EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA**

| Parameter | | Unit | Cell 3 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | - | $P_{CCA_DL}$=0.9375 | | | $P_{CCA_DL}$=0.9375 | | |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | - | 0.75 | | | 0.75 | | |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | - | 0.87 | | | 0.87 | | |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | Config 1, 2 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1, 2 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference | Config 1, 2 | | SR.1.1 CCA | | | | | |
| CORESET Reference Channel | Config 1, 2 | | CR.1.1 CCA | | | | | |
| Dedicated CORESET RMC configuration | Config 1, 2 | | CCR.1.1 CCA | | | | | |
| TRS configuration | Config 1, 2 | | TRS.1.1 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| DBT window configuration | Config 1, 2 | | DBT.1 | | | | | |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1, 2 | | SSB.1 CCA | | | | | |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1, 2 | | SSB.2 CCA | | | | | |
| ssb-PositionQCL | Config 1, 2 | | 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | kHz | 30 kHz | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PUCCH/PUSCH subcarrier spacing | Config 1, 2 | kHz | 30 kHz | | | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1, 2 | dBm/SCS | -95 | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB_RP | Config 1, 2 | dBm/SCS | -87 | -87 | -87 | -Infinity | -85 | -85 |
| Io Note3 | Config 1, 2 | dBm/ 38.16MHz | -55.31 | -51.56 | -51.56 | -55.31 | -51.56 | -51.56 |
| Propagation condition | | - | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall start to transmit the PRACH to Cell 2 less than 60 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover requirements for handover with PSCell for EN-DC is defined in clause 5.9 in TS 36.133 [23] as:

$D_{HOwithPSCel_PCell} = T_{RRC_delay} + T_{search} + T_{IU} + T_{processing}$

Where:

$T_{RRC_delay}$ = 20 ms for 'RRC connection reconfiguration (NR SCG establishment/ /modification/release)'.

$T_{search}$ = 0 ms for known cell.

$T_{IU}$ = 15 ms in the test configuration.

$T_{processing}$ = 25ms for source Cell and target Cell are in the same FR.

This gives a total of 60ms for handover delay.

The UE shall transmit the PRACH preamble to Cell 4 less than $D_{HOwithPSCell_PSCell}$ from the beginning of time period T3.

NOTE: The PSCell change delay for handover with PSCell for EN-DC is defined in clause 5.8 in TS 36.133 [23] as:

$D_{HOwithPSCell_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{IU_PSCell} + 2$ ms

Where:

$T_{RRC_delay}$ = 20 ms for 'RRC connection reconfiguration (NR SCG establishment/ /modification/release)'.

$T_{processing}$ = 25ms for source Cell and target Cell are in the same FR.

$T_{search}$ = 0 ms for known cell.

$T_{\Delta} = (1+ L_2) *20$ ms.

$T_{IU} = (1+ L_3) *10 + 10$ ms

$L_2$ is the number of SMTC occasions not available at the UE during the time tracking period where $L_2 \leq L_{CCA_DL}$, and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where $L_3 \leq L_{CCA_UL}$. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. The interruption time considering the potential extensions caused by $L_1$, $L_2$, $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [13]. Test equipment should make sure that $L_{CCA_DL}$ and $L_{CCA_UL}$ are not exceeded during a test by monitoring the number of CCA failures and preventing additional CCA failures from happening after $L_{CCA_DL}$ or $L_{CCA_UL}$ is reached.

The rate of correct PSCell addition observed during repeated tests shall be at least 90%.

# 10.2 Timing

## 10.2.1 UE transmit timing

### 10.2.1.0 Minimum conformance requirements

#### 10.2.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

Same as section 4.4.1.0.1 with the following additional considerations:

The term reference cell on a carrier frequency subject to CCA is not available at the UE refers to when at least one SSB is configured by gNB, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available during at least one discovery burst transmission window, at the UE due to DL CCA failures at gNB during the last 1280 ms; otherwise the reference cell on the carrier frequency subject to CCA is considered as available at the UE.

If the UE uses a reference cell on a carrier frequency subject to CCA for deriving the UE transmit timing, then the UE shall meet all the transmit timing requirements defined in TS 38.133 [6] clause 7.1.2 provided that the reference cell is available at the UE. If the reference cell is not available at the UE on a carrier frequency subject to CCA, then the UE is allowed to transmit in the uplink provided that the UE meets all the transmit timing requirements defined in TS 38.133 [6] clause 7.1.2; otherwise the UE shall not transmit any uplink signal.

If a reference cell on a carrier frequency belonging to the pTAG, which is subject to CCA, is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in pTAG as a new reference cell. If the SCell used as reference cell is deactivated, or becomes not available, the UE is allowed to use another active serving cell in pTAG as new reference cell.

If a reference cell on a carrier frequency belonging to the sTAG, which is subject to CCA is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in sTAG as a new reference cell.

The normative reference for this requirement is TS 38.133 [6] clause 7.1.2.

## 10.2.1.1 EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA

### 10.2.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB when PSCell is subject to DL CCA and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits.

### 10.2.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier.

### 10.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.2.1.1.

### 10.2.1.1.4 Test Description

#### 10.2.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 10.2.1.1.4.1-1.

**Table 10.2.1.1.4.1-1: Supported test configurations for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Configuration | Description |
|---|---|
| 10.2.1.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.2.1.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability. | |

Configure the test equipment and the DUT according to the parameters in Table 10.2.1.1.4.1-2

**Table 10.2.1.1.4.1-2: Initial conditions for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.2.1.1.4.3.
2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6B.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

#### 10.2.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

The test sequence shall be carried out in RRC_CONNECTED for every test case.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up E-UTRA PCell according to parameters given in Table A.6B.1-1 and setup NR PSCell according to parameters given in Table 10.2.1.1.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 10.2.1.1.4.3.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.2.1.1.5-1

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within ($N_{TA}$ + $N_{TA_offset}$) $\times T_c \pm T_e$ of the first detected path of DL SSB:

   a. The $N_{TA}$ offset value (in $T_c$ units) is 25600 for FR1.

   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 10.2.1.1.5-4.

6. The test system shall adjust the timing of the DL path by values given in Table 10.2.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

**Table 10.2.1.1.4.2-1: Adjustment Value for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 30 | $+32*64T_c$ | $+16*64T_c$ |

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 10.2.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 10.2.1.0.1 and Table 10.2.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 10.2.1.0.1 and Table 10.2.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 10.2.1.0.1 and Table 10.2.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS), as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 10.2.1.0.1 and Table 10.2.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=DL_timing_change[Ts]/6.6Ts and DL_timing_change is specified in Table 10.2.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within

$(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

#### 10.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.2.1.1.4.3-0: Common Exception messages for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.2.1.1.4.3-1: *SRS-Config* : Additional test requirement for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Derivation Path: TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | SCS15 |
| | 25 | | SCS30 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl320 | 3 | | Test 2 and SCS15 |
| sl640 | 5 | | Test 2 and SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.2.1.1.4.3-2: *DRX-Config* : Additional test requirement for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Derivation Path: TS 38.331 [13], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |

| | | | |
|---|---|---|---|
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | Not present | |
| } | | | |

10.2.1.1.5 Test Requirements

**Table 10.2.1.1.5-1: Cell Specific Test Parameters for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Parameter | | Unit | Config | Test1 | Test2 |
|---|---|---|---|---|---|
| SSB ARFCN | | | 1,2 | Freq1 | Freq1 |
| TDD configuration | | | 1,2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | MHz | 1,2 | 40: $N_{RB,c}$ = 106 | |
| Initial BWP Configuration | | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | |
| DRX Cycle | | ms | 1,2 | N/A | DRX.8 Note5 |
| DL CCA model | | | 1,2 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1,2 | As specified in clause D.7.2.2 | |
| PDSCH Reference | | | 1,2 | SR.1.1 CCA | |
| CORESET Reference | | | 1,2 | CR.1.1 CCA | |
| OCNG Patterns | | | 1,2 | OP.1 | |
| SSB configuration | Semi- static channel access | | 1,2 | SSB.1 CCA | |
| | Dynamic channel access | | 1,2 | SSB.2 CCA | |
| SMTC configuration | | | 1,2 | SMTC.1 FR1 | |
| TRS configuration | | | 1,2 | TRS.1.2 TDD | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | | 1,2 | 0.9375 | 0.9375 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | | 1,2 | 0.75 | 0.75 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | | 1,2 | 0.75 | 0.75 |
| UL CCA probability ($P_{CCA_UL}$) | | | 1,2 | 1 | 1 |
| EPRE ratio of PSS to SSS | | dB | 1,2 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/30 kHz | 1,2 | -95 | -95 |
| $\hat{E}_s / I_{ot}$ | | | 1,2 | 3 | 3 |
| $\hat{E}_s / N_{oc}$ | | | 1,2 | 3 | 3 |
| SS-RSRP Note3 | | dBm/30 kHz | 1,2 | -92 | -92 |
| Io Note3 | | dBm/38.1MHz | 1,2 | -59.2 | -59.2 |
| Propagation condition | | | 1,2 | AWGN | |

| | | | | |
|---|---|---|---|---|
| SRS Config | | 1,2 | SRSConf.1[Note6] | SRSConf.2[Note6] |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: DRX related parameters are given in Table 10.2.1.1.5-3.
Note 6: SRS configs are given in Table 10.2.1.1.5-2.
Note 7: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.
Note 8: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.2.1.1.5-2: SRS Configuration for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| *SRS-ResourceSet* | *srs-ResourceSetId* | 0 | 0 | |
| | *srs-ResourceIdList* | 0 | 0 | |
| | *resourceType* | Periodic | Periodic | |
| | *Usage* | Codebook | Codebook | |
| *SRS-Resource* | *SRS-ResourceId* | 0 | 0 | |
| | *nrofSRS-Ports* | Port1 | Port1 | |
| | *transmissionComb* | n2 | n2 | |
| | *combOffset-n2* | 0 | 0 | |
| | *cyclicShift-n2* | 0 | 0 | |
| | *resourceMapping startPosition* | 0 | 0 | |
| | *resourceMapping nrofSymbols* | n1 | n1 | |
| | *resourceMapping repetitionFactor* | n1 | n1 | |
| | *freqDomainPosition* | 0 | 0 | |
| | *freqDomainShift* | 0 | 0 | |
| | *freqHopping c-SRS* | 14 for test configuration 1,2<br>25 for test configuration 3 | 25 | Matches $N_{RB,c}$ |
| | *freqHopping b-SRS* | 0 | 0 | |
| | *freqHopping b-hop* | 0 | 0 | |
| | *groupOrSequenceHopping* | Neither | Neither | |
| | *resourceType* | Periodic | Periodic | |
| | *periodicityAndOffset-p* | sl1, 0 | sl640, 0 | Offset to align with DRx periodicity |
| | *sequenceId* | 0 | 0 | Any 10 bit number |

**Table 10.2.1.1.5-3: DRX-Configuration for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Field | Test 2 |
|---|---|
| | Value |
| *drx-onDurationTimer* | 6 ms |
| *drx-InactivityTimer* | 1 ms |
| *drx-RetransmissionTimerDL* | 1 slot |
| *drx-RetransmissionTimerUL* | 1 slot |
| *longDRX-CycleStartOffset* | 320 ms |
| *shortDRX* | disable |
| *TimeAlignmentTimer* | Infinity |
| NOTE: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | |

**Table 10.2.1.1.5-4: $T_e$ Timing Error Limit for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 15 | $9.75*64*T_c$ |
| | | 30 | $9.75*64*T_c$ |
| | | 60 | $8.75*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 10.2.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate for EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ | Maximum Adjustment Rate |
|---|---|---|---|---|
| 1 | 15 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 30 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 60 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | | |

## 10.2.2 UE timing advance

### 10.2.2.0 Minimum conformance requirements

The timing advance is initiated from PSCell in EN-DC operation mode with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

#### 10.2.2.0.1 Minimum conformance requirements for timing advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot *n+ k+1* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

#### 10.2.2.0.2 Minimum conformance requirements for timing advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 10.2.2.0.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 10.2.2.0.1-1: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 | 120 | 480 | 960 |
|---|---|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ | ±10 $T_c$ | ±6 $T_c$ |

The normative reference for this requirement is TS 38.133 [6] clause A.10.2.2.1.

### 10.2.2.1 EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA

#### 10.2.2.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

### 10.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a UL shared spectrum NR carrier.

### 10.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 10.2.2.0.1 and clause 10.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.10.2.2.1.

### 10.2.2.1.4 Test description

#### 10.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.2.2.1.4.1-1.

**Table 10.2.2.1.4.1-1: Supported test configurations for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Test Case ID | Description |
|---|---|
| 10.2.2.1.4.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.2.2.1.4.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 10.2.2.1.4.1-2

**Table 10.2.2.1.4.1-2: Initial conditions for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.2.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

**Table 10.2.2.1.4.1-3: General test parameters for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | Cell 1: 1<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>2 for NR PSCell |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | *For 30 kHz SCS* $N_{TA_new} = N_{TA_old} + 4096*T_c$<br>(based on equation in clause 4.2 of TS 38.213 [3]) |

| | | | |
|---|---|---|---|
| T1 | s | 5 | |
| T2 | s | 5 | |

1. Message contents are defined in clause 10.2.2.1.4.3.

2. There are one E-UTRAN carrier and one NR carrier cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on NR carrier. Cell 2 is subject to CCA. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

### 10.2.2.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell) subject to CCA. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 10.2.2.1.4.1-3 and Table 10.2.2.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 10.2.2.1.4.3.

2. Set the parameters according to values in Tables 10.2.2.1.4.1-3 and Table 10.2.2.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.2.2.1.5-1.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value of 39 as specified in Table 10.2.2.1.4.1-3.

7. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay should be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 10.2.2.0.1-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 10.2.2.0.1-1 to the signalled timing advance value compared to the timing of preceding uplink

transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

13. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

14. If any of the above Reconfiguration in Step 12 or 13 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 3-14 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.2.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 10.2.2.1.4.3-0: Common Exception messages for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.2.2.1.4.3-1: *srs-Config* setup for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | Config 1,2,4,5 |
| | 24 | | Config 3,6 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 2 | Once every 5 Slots | SCS15 |
| sl5 | 4 | Once every 5 Slots | SCS30 |

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.2.2.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where:

$k$ = 5 for Config 1, 2, 3, 4, 5, 6

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in Table 10.2.2.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90 %.

Table 10.2.2.1.5-1 and Table 10.2.2.1.5-2 define the primary level settings.

**Table 10.2.2.1.5-1: Cell specific test parameters for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| **Parameter** | | | **Unit** | **Test1** | |
|---|---|---|---|---|---|
| | | | | **T1** | **T2** |
| TDD configuration | | Config 1,2 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 | |
| DRX Cycle | | Config 1,2 | ms | Not Applicable | |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | |
| PDSCH Reference | | Config 1,2 | | SR.1.1 CCA | |
| CORESET Reference | | Config 1,2 | | CR.1.1 CCA | |
| TRS configuration | | Config 1,2 | | TRS.1.2 TDD | |
| OCNG Patterns | | Config 1,2 | | OP.1 | |
| SSB Configuration | Semi-static channel access | Config 1,2 | | SSB.1 CCA | |
| | Dynamic channel access | Config 1,2 | | SSB.2 CCA | |
| SMTC configuration | | Config 1,2 | | SMTC.1 FR1 | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 | |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1,2 | | 1 | |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1,2 | | 1 | |
| UL CCA probability $P_{CCA}$ | | Config 1,2 | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/30 kHz | -95 |
| | Config 3,6 | | -95 |
| $\hat{E}_s / I_{ot}$ | | dB | 3 |
| $\hat{E}_s / N_{oc}$ | | dB | 3 |
| Io Note3 | Config 1,2 | dBm/38.16MHz | -62.58 |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 5: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.2.2.1.5-2: Sounding Reference Symbol Configuration for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Field | | Value | Comment |
|---|---|---|---|
| c-SRS | Config 1,2 | 24 | Frequency hopping is disabled |
| b-SRS | | 0 | |
| b-hop | | 0 | |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 | |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5=4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting: SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 | |
| repetitionFactor | | n1 | |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 | |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

**Table 10.2.2.1.5-3: UE Timing Advance adjustment accuracy for EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA**

| Sub Carrier Spacing, SCS | 15 | 30 | 60 |
|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±344 $T_c$ | ±344 $T_c$ | ±216 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

# 10.3 Signalling characteristics

## 10.3.1 Radio link monitoring

### 10.3.1.0 General

The requirements in this section apply for radio link monitoring on a carrier frequency with CCA for the following cells:

- PCell in SA NR operation mode,
- PSCell in EN-DC operation mode.
- PSCell in NR-DC operation mode.

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out,CCA}$ and $Q_{in,CCA}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out,CCA}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out,CCA}$) as defined in Table 10.3.1.0-1. For SSB based radio link monitoring, $Q_{out_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.1.0.1-1.

The threshold $Q_{in,CCA}$ is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at $Q_{out,CCA}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 10.3.1.0-1. For SSB based radio link monitoring, $Q_{in_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.1.0.1-2.

The out-of-sync block error rate ($BLER_{out,CCA}$) and in-sync block error rate ($BLER_{in,CCA}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 10.3.1.0-1 as default. All requirements in clause 10.3.1.0 are applicable for BLER Configuration #0 in Table 10.3.1.0-1.

**Table 10.3.1.0-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out,CCA}$ | $BLER_{in,CCA}$ |
|---|---|---|
| 0 | 10% | 2% |

UE shall be able to monitor up to $N_{RLM}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number $L_{max}$ of SSBs per half frame according to TS 38.213 [8], where $N_{RLM}$ is specified in Table 10.3.1.0-2, and meet the requirements as specified in clause 10.3.1.0. UE is not required to meet the requirements in clause 10.3.1.0 if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 10.3.1.0-2: Maximum number of RLM-RS resources $N_{RLM}$**

| Carrier frequency range of PCell/PSCell | $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|---|---|---|
| FR1 | 8 | 4 |

In the requirements of clause 10.3.1.0, the term RLM-RS SSB occasion not available at the UE refers to when the RLM-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured RLM-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the RLM-RS SSB is considered as available at the UE.

The requirements in clause 10.3.1.0 apply for any *channelAccessMode* configuration as specified in TS 38.331, [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.1.

### 10.3.1.0.1 Minimum conformance requirements for SSB based Radio Link Monitoring under CCA

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually configured to be transmitted within UE active DL BWP during the entire evaluation period specified in clause 10.3.1.0.1.1 but occasionally may not be transmitted due to CCA operation.

**Table 10.3.1.0.1-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 4 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4 dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

**Table 10.3.1.0.1-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.1.

#### 10.3.1.0.1.1 Minimum requirement for SSB based Radio Link Monitoring under CCA

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,CCA}$ period becomes worse than the threshold $Q_{out_SSB,CCA}$ within $T_{Evaluate_out_SSB,CCA}$ evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,CCA}$ period becomes better than the threshold $Q_{in_SSB,CCA}$ within $T_{Evaluate_in_SSB,CCA}$ evaluation

period. During the in-sync evaluation procedure, layer 1 of the UE shall not send any in-sync indication for the cell to the higher layers when $L_{in}$ exceeds $L_{in,max}$, where $L_{in}$ and $L_{in,max}$ are defined in Table 10.3.1.0.1.1-1.

$T_{Evaluate_out_SSB,CCA}$ and $T_{Evaluate_in_SSB,CCA}$ are defined in Table 10.3.1.0.1.1-1 for FR1.

When concurrent gaps are configured,

- P value for an RLM-RS resource to be measured is defined as $N_{total}$ / $N_{outside_MG}$
- For a window W of duration max($T_{L1}$, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as serving cell, and starting at the beginning of any RLM-RS resource occasion:
  - $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions within the window, and
  - $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured,

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, and these GAPs are overlapping with some but not all occasions of the SSB RLM-RS resources; and
- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the SSB RLM-RS resources.

When a measurement gap is configured and the measurement gap is not NCSG,

- an RLM-RS resource is considered to be overlapped with the GAP f it overlaps a measurement gap occasion, and
- xRP = MGRP

Otherwise, when NCSG measurement gap is configured,

- an RLM-RS resource is considered to be overlapped with the GAP if it overlaps the VIL1 or VIL2 of NCSG, and
- xRP = VIRP

If the UE is configured with Pre-MG, an RLM-RS resource is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

When concurrent gaps are configured, an RLM-RS is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 38.133 [6] section 9.1.8.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and GAP configurations does not meet previous conditions.

**Table 10.3.1.0.1.1-1: Evaluation period $T_{Evaluate_out_SSB,CCA}$ and $T_{Evaluate_in_SSB,CCA}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB,CCA}$ (ms) | | $T_{Evaluate_in_SSB,CCA}$ (ms) |
|---|---|---|---|
| | RLM-RS SSB Es/Iot[Note4] ≥-7 dB | RLM-RS SSB Es/Iot[Note4] <-7 dB | |
| no DRX | Max(200, Ceil(17*P)*$T_{SSB}$) | Max(200, Ceil(24*P)*$T_{SSB}$) | Max(100, Ceil((5+$L_{in}$)*P)*$T_{SSB}$) |
| DRX cycle≤320 | Max(200, Ceil(1.5*15*P)*Max($T_{DRX}$,$T_{SSB}$)) | Max(200, Ceil(1.5*20*P)*Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(1.5*(5+$L_{in}$)*P)*Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 | Ceil(13*P)*$T_{DRX}$ | Ceil(16*P)*$T_{DRX}$ | Ceil((5+$L_{in}$)*P)*$T_{DRX}$ |
| NOTE 1: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | | |

NOTE 2: When DRX is not configured, $L_{in}$ is the number of RLM-RS SSB occasions which are not available at the UE during $T_{Evaluate_in_SSB,CCA}$, where $L_{in} \leq L_{in,max}$. When DRX is configured, $L_{in}$ is the number of DRX cycles in which at least one RLM-RS SSB occasion is not available at the UE during $T_{Evaluate_in_SSB,CCA}$, where $L_{in} \leq L_{in,max}$. The UE is not required to determine the availability of SSB occasions more frequent than
Once per Max(10ms, P * $T_{SSB}$) if no DRX is used,
Once per Max(10ms, Ceil(1.5 * P) * Max($T_{DRX}$, $T_{SSB}$)) if DRX cycle ≤ 320ms,
Once per P * $T_{DRX}$ if DRX cycle > 320ms.
NOTE 3: $L_{in,max}$=7 for Max($T_{DRX}$,$T_{SSB}$) ≤ 40 assuming $T_{DRX}$=0 for non-DRX case,
$L_{in,max}$=5 for 40<Max($T_{DRX}$,$T_{SSB}$)≤320,
$L_{in,max}$=3 for $T_{DRX}$>320.
NOTE 4: RLM-RS SSB Es/Iot is the averaged Es/Iot over the most recent previous out-of-sync evaluation period.

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.2.

#### 10.3.1.0.1.2 Measurement restrictions for SSB based RLM under CCA

The UE is required to be capable of measuring SSB for RLM without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for RLM.

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.3.

### 10.3.1.1 Requirements for determining UE in-sync or out-of-sync status

In the test cases specified in clause 10.3.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.1.

### 10.3.1.2 EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

#### 10.3.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 10.3.1.0

#### 10.3.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier, and supporting UL and SSB-based RLM on shared channel access.

#### 10.3.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 10.3.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 10.3.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.2.

#### 10.3.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 10.3.1.2.4.1-1. The test parameters are given in Tables 10.3.1.2.4.1-3, 10.3.1.2.5-1, and 10.3.1.2.5-2 below.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 10.3.1.2.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

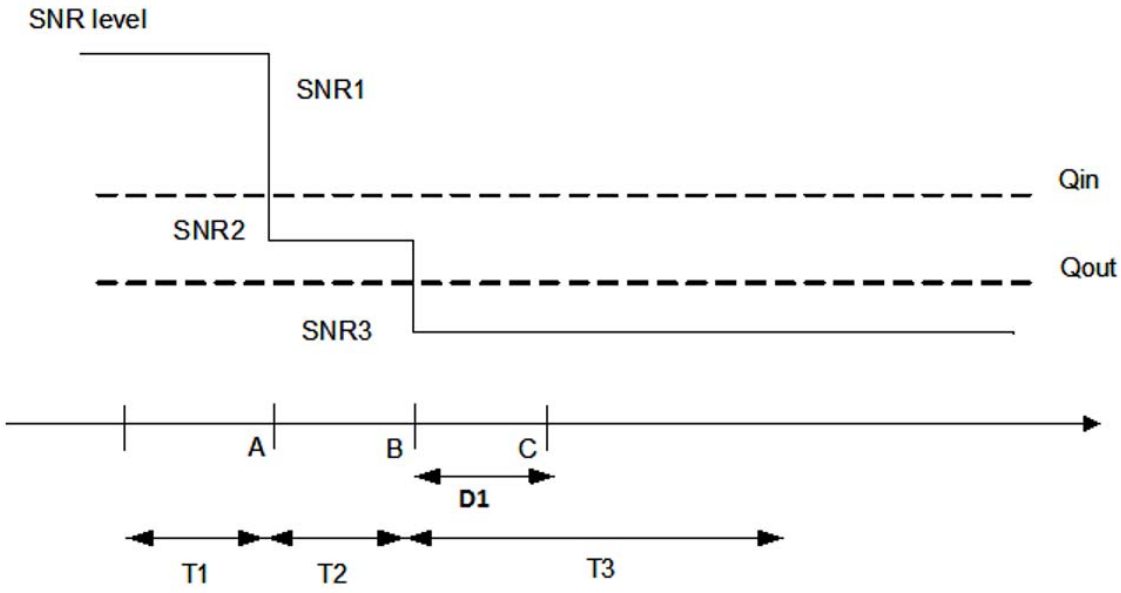



**Figure 10.3.1.2.4-1: SNR variation for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

#### 10.3.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.1.2.4.1-1.

**Table 10.3.1.2.4.1-1: Supported test configurations for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Configuration | Description |
|---|---|
| 10.3.1.2-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.1.2-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.1.2.4.1-2.

**Table 10.3.1.2.4.1-2: Initial conditions for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.3.1.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.

3. The test parameters are given in Table 10.3.1.2.4.1-3 below.

**Table 10.3.1.2.4.1-3: General test parameters for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| DL CCA model | | | As specified in clause D.7.2.1 |
| UL CCA model | | | As specified in clause D.7.2.2 |
| Duplex mode | Config 1,2 | | TDD |
| $BW_{channel}$ | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA |
| CORESET Reference Channel | Config 1,2 | | CR.1.1 CCA |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1,2 | | SSB.1 CCA |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1,2 | | SSB.2 CCA |
| DBT window configuration | Config 1,2 | | DBT.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 30 kHz |
| PRACH Configuration | Config 1,2 | | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| | DCI format | | 1-0 |

| | | | |
|---|---|---|---|
| Out-of-sync transmission parameters | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1,2 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.04 |
| T3 | | s | 1.04 |
| D1 | | s | 1 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: E-UTRAN is in non-DRX mode under test.<br>NOTE 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

### 10.3.1.2.4.2 Test Procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 10.3.1.2.4.1-4. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) configuring the UE for inter-frequency measurements with the corresponding gap pattern and periodic CSI reporting.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message).

4. Set the parameters according to T1 in Table 10.3.1.2.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 10.3.1.2.5-1. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.1.2.5-1

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.1.2.5-1

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power, according to section 10.3.1.1, in each uplink slot configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2), provided that such slot is not subject to CCA failure (as determined by $P_{CCA_UL}$ in Table 10.3.1.2.5-1), during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power, according to section 10.3.1.1, from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed to step 10.

8. When T3 expires the SS shall disable the DL and UL CCA model (i.e. PCCA_DL_i= PCCA_UL=1) and change the SNR value to T1 as specified in Table 10.3.1.2.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.3.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 10.3.1.2.4.3-1: Common Exception messages for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.3.1.2.4.3-2: *RLF-TimersAndConstants* for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 10.3.1.2.5 Test Requirement

Table 10.3.1.2.5-1 and Table 10.3.1.2.5-2 define the cell specific primary level settings including test tolerances and the measurement gap configuration for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA.

**Table 10.3.1.2.5-1: Cell-specific test parameters for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | | Unit | Test 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| DL CCA probability $P_{CCA_DL}$ | Note 6,8 | | | $P_{CCA_DL}$=0.9375 | | |
| | Note 7,8 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| UL CCA probability $P_{CCA_UL}$ | | | | 1 | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | | |
| EPRE ratio of PSS to SSS | | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | dB | | | |
| $SNR^{Note\ 3,4}$ on RLM-RS | | Config 1,2 | dB | 1.8 | -6.2 | -15.8 |
| SNR on other channels and signals | | Config 1,2 | dB | 1 | | |
| $N_{oc}$ | | Config 1,2 | dBm/ SCS | -95 | | |
| Propagation condition | | | | TDL-C 300 ns 100 Hz | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure 10.3.1.2.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is defined in section D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 10.3.1.2.5-2: Measurement gap configuration for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Field | Test 1 |
|---|---|
| | Value |
| *gapOffset* | 0 |

NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned.
NOTE 2: Ensure that RLM-RS is partially overlapped with measurement gap.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows.

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting, provided that such slots are not subject to CCA failure.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

## 10.3.1.3 EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

### 10.3.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 10.3.1.0.

### 10.3.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting UL and SSB-based RLM on shared channel access.

### 10.3.1.3.3 Minimum conformance requirements

The minimum requirements are specified in clause 10.3.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 10.3.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.3.

### 10.3.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table10.3.1.3.4.1-1. The test parameters are given in Tables10.3.1.3.4.1-3, and 10.3.1.3.5-1 below.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.1.3.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

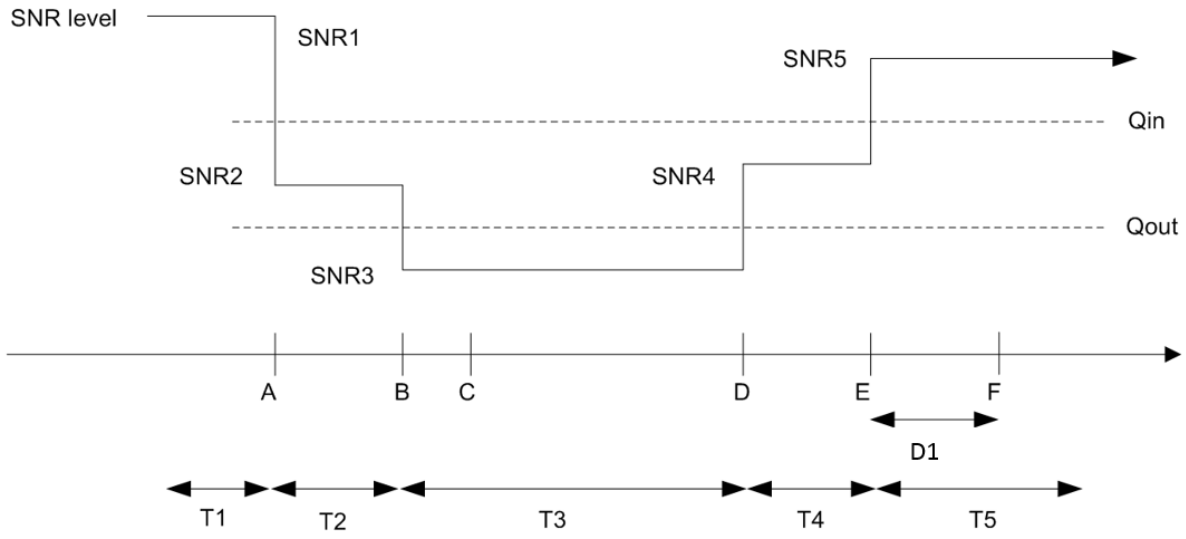



**Figure 10.3.1.3.4-1: SNR variation for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

### 10.3.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.1.3.4.1-1.

**Table 10.3.1.3.4.1-1: Supported test configurations for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Configuration | Description |
|---|---|
| 10.3.1.3-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.1.3-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.1.3.4.1-2.

**Table 10.3.1.3.4.1-2: Initial conditions for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.3.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The general test parameters are given in Table 10.3.1.3.4.1-4.

**Table 10.3.1.3.4.1-4: General test parameters for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active E-UTRA PCell | | | Cell 1 |
| E-UTRA RF Channel Number | | | 1 |
| Active PSCell | | | Cell 2 |
| RF Channel Number | | | 2 |
| DL CCA model | | | As specified in clause D.7.2.1 |
| UL CCA model | | | As specified in clause D.7.2.2 |
| Duplex mode | Config 1,2 | | TDD |
| $BW_{channel}$ | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 |
| TDD Configuration | Config 1,2 | | TDDConf.1.1 CCA |
| CORESET Reference Channel | Config 1,2 | | CR.1.1 CCA |

| | | | |
|---|---|---|---|
| SSB configuration for semi-static channel access[Note 3, 5] | Config 1,2 | | SSB.1 CCA |
| SSB configuration for dynamic channel access[Note 4,5] | Config 1,2 | | SSB.2 CCA |
| DBT window configuration | Config 1,2 | | DBT.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 30 kHz |
| PRACH Configuration | Config 1,2 | | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N/A |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1,2 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.52 |
| T4 | | s | 0.2 |
| T5 | | s | 2.04 |

| | | |
|---|---|---|
| D1 | s | 2 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.<br>NOTE 3: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 4: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | |

#### 10.3.1.3.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 10.3.1.3.4.1-4. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) to configure periodic CSI reporting.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message).

4. Set the parameters of NR Cell according to T1 in Table 10.3.1.3.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 10.3.1.3.5-1. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.1.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.1.2.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.1.3.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.1.3.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power, according to section 10.3.1.1, in each uplink slot configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2), provided that such slot is not subject to CCA failure (as determined by $P_{CCA_UL}$ in Table 10.3.1.3.5-1), during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall disable the DL and UL CCA model (i.e. PCCA_DL_i= PCCA_UL=1) and proceed with step 11 for the next iteration, or with step 10.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.3.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 10.3.1.3.4.3-1: Common Exception messages for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of [High] range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.3.1.3.4.3-2: *RLF-TimersAndConstants* for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

### 10.3.1.3.5 Test Requirement

Table 10.3.1.3.5-1 defines the cell specific primary level settings including test tolerances for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA.

**Table 10.3.1.3.5-1: Cell-specific test parameters for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability $P_{CCA_DL}$ | Note 6,8 | | $P_{CCA_DL}$=0.9375 | | | | |
| | Note 7,8 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | |
| UL CCA probability $P_{CCA_UL}$ | | | 1 | | | | |
| $L_{CCA_DL}$ | | | 7 | | | | |
| $W_{CCA_DL}$ | | ms | $T_{Evaluate_in_SSB,CCA}$ NOTE 9 | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1,2 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| SNR on other channels and signals | Config 1,2 | dB | 1 | | | | |
| $N_{oc}$ | Config 1,2 | dBm/ SCS | -95 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| NOTE 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows. |
| NOTE 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| NOTE 3: | SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows. |
| NOTE 4: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 10.3.1.3.4-1. |
| NOTE 5: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4A. |
| NOTE 6: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| NOTE 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| NOTE 8: | For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |
| NOTE 9: | As defined in Table 10.3.1.0.1.1-1. |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting, provided that such slots are not subject to CCA failure.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95 %.

### 10.3.1.4 Void

### 10.3.1.5 Void

## 10.3.2 Void

## 10.3.3 SCell activation and deactivation delay

### 10.3.3.0 Minimum Conformance Requirements

#### 10.3.3.0.1 SCell Activation Delay Requirement for Deactivated SCell under CCA

The requirements in this clause shall apply for the UE configured with one downlink SCell operating with CCA in EN-DC or in standalone NR carrier aggregation and when one SCell operating with CCA is being activated but none of the RRC parameters *CO-DurationPerCell-r16*, *SlotFormatIndicator*, and *CSI-RS-ValidationWith-DCI-r16* is configured and all of the CSI reporting resources for being-activated SCell are available.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot $n + (T_{HARQ} + T_{activation_time_withCCA} + T_{CSI_reporting_withCCA})/NR_slot_length$, where:

- $T_{HARQ}$ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures: $T_{HARQ}$ is extended to also include the time to all next HARQ feedback transmission and retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213 [8]; no extension of $T_{HARQ}$ due to UL CCA failures is allowed for Type 2C UL channel access procedure as defined in TS 37.213 [37].
  - $T_{activation_time_withCCA}$ is the SCell activation delay in millisecond.
    - If the SCell is known and belongs to FR1, $T_{activation_time_withCCA}$ is:

- $T_{FirstSSB} + L_1*T_{rs}$ + 5ms, if the measurement period of the SCell being activated is equal to or smaller than 2400ms.

- $T_{FirstSSB_MAX} + L_{2,1}*T_{SMTC_MAX} + (1 + L_{2,2})*T_{rs}$ + 5ms, if the measurement period of the SCell being activated is larger than 2400ms.

- If the SCell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2 dB is fulfilled and the SCell can be successfully detected in one attempt, $T_{activation_time_withCCA}$ is:

- $T_{FirstSSB_MAX} + (1 + L_{3,1})*T_{SMTC_MAX} + (2 + L_{3,2})*T_{rs}$ + 5ms.- If the SCell being activated belongs to FR2-2 and if there is at least one active serving cell on that FR2-2 band, if the UE supporting *scellWithoutSSB* is not provided with any SMTC for the target SCell, $T_{activation_time_withCCA}$ is 3 ms, provided

  - the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2-2 band.

- If the SCell being activated belongs to FR2-2 and if there is no active serving cell on that FR2-2 band provided that PCell or PSCell is in FR1 or in FR2-2:

  - If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time_withCCA}$ is:

    - 3ms + max($T_{uncertainty_MAC} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

  - If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

    - max($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC} + T_{RRC_delay} - T_{HARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

  - If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time_withCCA}$ is:

    - 6ms + $T_{FirstSSB_MAX}$ + (23+[$N*L_{4,1}$])*$T_{SMTC_MAX}$ + (12+[ $N*L_{4,2}$])*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + $T_{HARQ}$ + max($T_{uncertainty_MAC} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$).

  - If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time_withCCA}$ is:

    - 3ms + $T_{FirstSSB_MAX}$ + (23+[ $N*L_{5,1}$])*$T_{SMTC_MAX}$ + (12+[ $N*L_{5,2}$])*$T_{rs}$ + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max {($T_{HARQ} + T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC} + T_{RRC_delay}$)}.

  Where,

  $T_{SMTC_MAX}$:

  - In case of intra-band SCell activation, $T_{SMTC_MAX}$ is the longest SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot;

  - In case of inter-band SCell activation, $T_{SMTC_MAX}$ is the SMTC periodicity of SCell being activated;

  - $T_{SMTC_MAX}$ is bounded to a minimum value of 10ms.

  $T_{rs}$ is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves $T_{rs}$ is applied with $T_{rs}$ = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

$T_{FirstSSB}$: is the time to the end of the first complete configured SSB burst indicated by the SMTC after slot n + ($T_{HARQ}$+3ms)/*NR_slot_length*

$T_{FirstSSB_MAX}$: is the time to the end of first complete configured SSB burst indicated by the SMTC after slot n + ($T_{HARQ}$+3ms)/*NR_slot_length* when all active serving cells and SCells being activated or released have configured SSB bursts in the same slot for intra-band scenario. In case of inter-band SCell activation, $T_{FirstSSB_MAX}$ is the time to the end of the first complete configured SSB burst of the SCell being activated. In FR2-2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$L_1$ ($L_1 \leq L_{1,max}$) is the number of configured SMTC occasions not available at the UE. $L_{1,max} = 2$ if $T_{rs} \leq 40$ ms; otherwise $L_{1,max} = 1$.

$L_{2,1}$ ($L_{2,1} \leq L_{2,1,max}$) and $L_{3,1}$ ($L_{3,1} \leq L_{3,1,max}$) are the numbers of configured SMTC occasions not available at the UE, for a known and unknown SCell activation respectively,

in the SCell being activated, for inter-band scenario, or

in any of the SCells already activated or being activated provided their cell specific reference signals are configured in the same slot, for intra-band scenario

and $L_{2,1,max} = 2$ if $T_{SMTC_MAX} \leq 40$ ms; otherwise $L_{2,1,max} = 1$. $L_{3,1,max} = 2$ if $T_{SMTC_MAX} \leq 40$ ms; otherwise $L_{3,1,max} = 1$.

$L_{2,2}$ ($L_{2,2} \leq L_{2,2,max}$) and $L_{3,2}$ ($L_{3,2} \leq L_{3,2,max}$) are the number of configured SMTC occasions not available at the UE in the SCell being activated. $L_{2,2,max} = 2$ if $T_{rs} \leq 40$ ms; otherwise $L_{2,2,max} = 1$. $L_{3,2,max} = 2$ if $T_{rs} \leq 40$ ms; otherwise $L_{3,2,max} = 1$.

N = TBD for an FR2-2 unknown SCell activation.

$L_{4,1}$ ($L_{4,1} \leq L_{4,1,max}$) and $L_{5,1}$ ($L_{5,1} \leq L_{5,1,max}$) are the numbers of SMTC occasions groups not available at the UE, for an FR2-2 unknown SCell activation,

in the SCell being activated, for inter-band scenario, or

in any of the SCells already activated or being activated provided their cell specific reference signals are configured in the same slot, for intra-band scenario

and $L_{4,1,max} = 2$ if $T_{SMTC_MAX} \leq 40$ ms; otherwise $L_{4,1,max} = 1$. $L_{5,1,max} = 2$ if $T_{SMTC_MAX} \leq 40$ ms; otherwise $L_{5,1,max} = 1$.

$L_{4,2}$ ($L_{4,2} \leq L_{4,2,max}$) and $L_{5,2}$ ($L_{5,2} \leq L_{5,2,max}$) are the number of SMTC occasions groups not available at the UE in the FR2-2 unknown SCell being activated. $L_{4,2,max} = 2$ if $T_{rs} \leq 40$ ms; otherwise $L_{4,2,max} = 1$. $L_{5,2,max} = 2$ if $T_{rs} \leq 40$ ms; otherwise $L_{5,2,max} = 1$.

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

$T_{L1\text{-}RSRP,\ measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$ ms as defined in TS 38.133 [6] clause 9.5A.4.1 with the assumption of M=1.

$T_{L1\text{-}RSRP,\ report}$ is delay of acquiring CSI reporting resources.

$T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_SP}$ is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS38.331 [13].

Longer delays for RRM measurement requirements, and in case of FR2-2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.

$T_{CSI_reporting_withCCA} = T_{CSI_reporting} + T_{CSI_ReportingDelay}$ , where

$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

$T_{CSI_ReportingDelay}$ is the additional delay in transmission of CSI reporting due to UL CCA failures at the UE. If there are no uplink resources for reporting the valid CSI, then the UE shall use the next available opportunities for reporting the corresponding valid CSI as specified in TS 38.213 [8].

Upon exceeding any of the maximum numbers $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$ of SMTC occasions or CSI-RS occasions, respectively, not available at the UE, the UE shall abandon the SCell activation procedure.

SCell operating with CCA in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5 *measCycleSCell*, 5 DRX cycles) before the reception of the SCell activation command:

  - the UE has sent a valid measurement report for the SCell being activated and

  - the SSB measured remains detectable in the SMTC occasions available at the UE, according to the cell identification conditions specified in TS 38.133 [6] clause 9.2A and 9.3A.

- the SSB measured during the period equal to max(5 *measCycleSCell*, 5 DRX cycles) also remains detectable - the SSB measured during the period equal to max(5 *measCycleSCell*, 5 DRX cycles) also remains detectable in the SMTC occasions available at the UE during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] clause 9.2A and 9.3A.

Otherwise SCell operating with CCA in FR1 is unknown.

For the first SCell activation with CCA in FR2-2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class 1/5 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):

  - the UE has sent a valid L3-RSRP measurement report with SSB index

  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation

- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell with CCA in FR2-2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI

reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, $T_{SMTC_SCell}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. $T_{SMTC_MAX}$ follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

For intra-band CA, the starting point of an interruption window on SpCell or any activated SCell as specified 38.133 [6] in clause 8.2, shall not occur before slot n+1+ $\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot n+1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$, where $T_X$ is:

- $T_{FirstSSB}$, for known SCell activation when SCell measurement cycle is equal to or smaller than 160ms;
- $T_{FirstSSB_MAX} + L_{2,1} * T_{SMTC_MAX}$ for known SCell activation when SCell measurement cycle is greater than 160ms;
- $T_{FirstSSB_MAX} + L_{3,1} * T_{SMTC_MAX}$ for unknown SCell activation

For inter-band CA, the starting point of an interruption window on SpCell or any activated SCell as specified in TS 38.133 [6] clause 8.2, shall not occur before slot n+1+ $\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot n+1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$, where $T_X$ is:

- $T_{FirstSSB}$, for known SCell activation when SCell measurement cycle is equal to, or smaller than, 160ms.

For intra-band CA,

- While the SCell being activated is known with measurement cycle equal to or smaller than 160ms, no more than one interruption is allowed during SCell activation.
- While the SCell being activated is known with measurement cycle greater than 160ms, up to $1+L_{2,1}$ interruptions are allowed during SCell activation,
- While the SCell being activated is unknown, up to $1+L_{3,1}$ interruptions are allowed during SCell activation. When $L_{3,1}>0$, performance degradation may be expected on any activated intra-band victim cells during the SCell activation
- For a single interruption (L=0), interruption window length at SCell activation does not depend on DL CCA failures.

For inter-band CA,

- For any active cell in the same band with the SCell being activated, the interruption requirements (i.e. number of interruptions and starting point of an interruption) for intra-band CA apply.
- For any active cell outside the band with the SCell being activated, a single interruption applies

The number of interruptions and length of each interruption window may be different for different victim cells and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell. For a single interruption (L=0), the interruption window length at SCell activation does not depend on DL CCA failures.

Starting from slot $n + T_{HARQ} + 3$ ms where slot *n* is the slot where SCell activation command is received (as specified in clause 4.3 of TS 38.213 [8]) and until the SCell activation completion at UE, after at least one CSI-RS transmission occasion for the channel measurement and reporting (specified in clause 5.2.2.5 of TS 38.214 [9]), the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

The requirements in this section do not apply when *sCellDeactivationTimer* [13] is not configured and when $T_{activation_time_withCCA}$ exceeds 1280 ms.

The normative reference for this requirement is TS 38.133 [6] clause 8.3A.

#### 10.3.3.0.2 SCell Deactivation Delay Requirement for Activated SCell under CCA

The requirements in this clause shall apply for the UE configured with one downlink SCell operating with CCA in EN-DC or in standalone NR carrier aggregation.

Upon receiving SCell deactivation command in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n+(T_{HARQ}+3ms)/NR_slot_length$. The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133 [6] clause 8.2, shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* [13] in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{3ms}{NR\ slot\ length}$. The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133 [6] clause 8.2, shall not occur before slot n+1 and not occur after slot $n+1+\frac{3ms}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated. The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this section do not apply when *sCellDeactivationTimer* [13] is not configured and when SCell deactivation delay exceeds 1280 ms.

The normative reference for this requirement is TS 38.133 [6] clause 8.3A.

### 10.3.3.1 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle

#### 10.3.3.1.1 Test purpose

The purpose of this test is to verify that the SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

#### 10.3.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and 2DL CA in NR.

#### 10.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.3.3.0.1 and 10.3.3.0.2 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.3.1.

10.3.3.1.4 Test description

10.3.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell and SCell are shown in Table 10.3.3.1.4.1-1.

This test shall be tested using any of the test configurations in Table 10.3.3.1.4.1-1.

**Table 10.3.3.1.4.1-1: Supported test configurations for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description |
|---|---|
| 10.3.3.1-1 | PCC: LTE FDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.3.3.1-2 | PCC: LTE TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.3.1.4.1-2.

**Table 10.3.3.1.4.1-2: Initial conditions for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

**Table 10.3.3.1.4.1-3: General test parameters for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3 | Three radio channels (1, 2, 3) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1. |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every second subframe |
| SCell measurement cycle (*measCycleSCell*) | ms | 160 | |
| Cell 3 timing offset to Cell 2 | µs | 0 | |
| Time alignment error between Cell 3 and Cell 2 | µs | ≤ TAE as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time PCell and PSCell shall be known and the SCell configured and detected. |

| | | | |
|---|---|---|---|
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | $10 + 5 \cdot 2^{\mu_{DL}}$ | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]<br>$\mu_{DL}$ is the subcarrier spacing configuration for DL |

1. Message contents are defined in clause 10.3.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

### 10.3.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in E-UTRA, Cell 2 (PSCell) on radio channel 2 (PSCC) in NR, and Cell3 (SCell) on radio channel 3 (SCC) in NR. Before the test starts the UE is connected to Cell 1 and Cell 2, but is not aware of Cell 3, as the UE is only monitoring PCC and PSCC. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which UE receives an RRC message by which the SCell (Cell 3) becomes configured on radio channel 2 defines the start of time period T1. During T1, UE starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted *m*, defines the start of time period T2. The UE shall be able to report a valid CSI in PSCell for the activated SCell at latest in slot *m* + ($T_{HARQ}$+ $T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, as defined in TS 38.133 [6] clause 8.3A.2. The UE shall start reporting CSI in PSCell in first available uplink resource for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting following slot $m+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.2.

Time period T3 starts when the MAC message is received by at the UE antenna connector, in a slot # denoted *n*, The UE shall complete the deactivation at latest in slot $n+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$. Any PSCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.3.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 10.3.3.1.5-1 and A.6B.1.1. Propagation conditions are set according to Annex C clauses C.2.2. The SS shall enable DL and UL CCA model according to Table 10.3.3.1.5-1.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 10.3.3.1.4.3. NR RRCReconfiguration message is

contained in *RRCConnectionReconfiguration* and NR RRCReconfigurationComplete message is contained in *RRCConnectionReconfigurationComplete*.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC*. If the TE doesn't receive the MeasurementReport during T1, go to step 9.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{\mathrm{T_{HARQ}+3ms}+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting_withCCA}+T_X}{NR\ slot\ length}$ +if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time_withCCA}}+T_{\mathrm{CSI_Reporting_withCCA}}}{\mathrm{NR\ slot\ length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an RRCConnectionReconfigurationComplete message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an RRCConnectionReconfiguration message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G.2.7 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 10.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 10.3.3.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.3.3.1.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SCell | Table 10.3.3.1.4.3-5 | |
| measConfig | MeasConfig | Table 10.3.3.1.4.3-2A | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.1.4.3-2A: MeasConfig (Table 10.3.3.1.4.3-2)**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2<br>Table 10.3.3.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |

| | | | |
|---|---|---|---|
| reportConfigNR | ReportConfigNR | Table 10.3.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.1.4.3-3: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 10.3.3.1.4.3-4: ReportConfigNR**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.1.4.3-5: CellGroupConfig-SCell (Table 10.3.3.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 10.3.3.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 10.3.3.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.1.4.3-6: ServingCellConfig-SpCell (Table 10.3.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 10.3.3.1.4.3-7: ServingCellConfig-SCell (Table 10.3.3.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

### 10.3.3.1.5 Test requirements

Table 10.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 10.3.3.1.5-1: Cell specific test parameters for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1,2 | | TDD | | | TDD | | |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | 0.75 | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | | 0.75 | | |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | | | 0.87 | | |
| UL CCA probability for dynamic channel access | $P_{CCA_UL}$ | | 0.75 | | | 0.75 | | |
| $L_{CCA_DL}$ Note 8 | | | 2 | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | | $T_{activation_time_withCCA}$ | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1,2 | | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| Dedicated CORESET parameters | Config 1,2 | | CCR.1.3 CCA | | | CCR.1.3 CCA | | |

| | | | | |
|---|---|---|---|---|
| RMSI CORESET parameters | Config 1,2 | | CR.1.1 CCA | CR.1.1 CCA |
| OCNG Patterns Note1 | | | OP.1 | OP.1 |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 CCA | SSB.1 CCA |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.2 CCA | SSB.2 CCA |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| DBT window configuration | | | DBT.1 | DBT.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -101 | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -84 | -84 |
| Io Note3 | Config 1,2 | dBm/ 38.16MHz | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+ $T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA} = T_{FirstSSB} + L_1*T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PSCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X = T_{FirstSSB}$.

During T3, interruption on PSCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PSCell shall not be more than specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 10.3.3.2 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle

### 10.3.3.2.1 Test purpose

The purpose of this test is to verify that the SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

### 10.3.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting 2DL CA in NR.

### 10.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.3.3.0.1 and 10.3.3.0.2 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.3.2.

### 10.3.3.2.4 Test description

#### 10.3.3.2.4.1 Initial conditions

Same initial conditions as described in section 10.3.3.1.4.1 with following exception:

- The listed parameter values in Tables 10.3.3.2.4.1-3 will replace the values of corresponding parameters in Tables 10.3.3.1.4.1-3.

**Table 10.3.3.2.4.1-3: General test parameters for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (*measCycleSCell*) | ms | 640 | |

#### 10.3.3.2.4.2 Test procedure

Same test procedure as described in section 10.3.3.1.4.2.

#### 10.3.3.2.4.3 Message contents

Same message contents as described in section 10.3.3.1.4.3 with following exception:

- Table 10.3.3.1.4.3-3 is replaced by Table 10.3.3.2.4.3-1.

**Table 10.3.3.2.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

10.3.3.2.5 Test requirements

Table 10.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 10.3.3.2.5-1: Cell specific test parameters for EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1,2 | | TDD | | | TDD | | |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | 0.75 | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | | 0.75 | | |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | | | 0.87 | | |
| UL CCA probability for dynamic channel access | $P_{CCA_UL}$ | | 0.75 | | | 0.75 | | |
| $L_{CCA_DL}$ Note 8 | | | 2 | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | | $T_{activation_time_withCCA}$ | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1,2 | | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| Dedicated CORESET parameters | Config 1,2 | | CCR.1.3 CCA | | | CCR.1.3 CCA | | |
| RMSI CORESET parameters | Config 1,2 | | CR.1.1 CCA | | | CR.1.1 CCA | | |
| OCNG Patterns Note1 | | | OP.1 | | | OP.1 | | |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 CCA | | | SSB.1 CCA | | |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.2 CCA | | | SSB.2 CCA | | |
| SMTC configuration | | | SMTC.1 | | | SMTC.1 | | |
| DBT window configuration | | | DBT.1 | | | DBT.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | | | -104 | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -101 | | | -101 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | | 17 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | | | 17 | | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -84 | | | -84 | | |
| Io Note3 | Config 1,2 | dBm/ 38.16MHz | -52.87 | | | -52.87 | | |

| Propagation condition | - | AWGN |
|---|---|---|

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+ $T_{activation_time_withCCA}$ + $T_{CSI_reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA}$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$*$T_{SMTC_MAX}$ + (1 +$L_{2,2}$)*$T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PSCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$* $T_{SMTC_MAX}$.

During T3, interruption on PSCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PSCell shall not be more than specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 10.3.3.3 EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA

### 10.3.3.3.1 Test purpose

The purpose of this test is to verify that the SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements, when the when the SCell is unknown to the UE at the time of activation.

### 10.3.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting 2DL CA in NR.

### 10.3.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.3.3.0.1 and 10.3.3.0.2 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.3.3.

#### 10.3.3.3.4 Test description

##### 10.3.3.3.4.1 Initial conditions

Same initial conditions as described in section 10.3.3.1.4.1 with following exception:

- The listed parameter values in Tables 10.3.3.3.4.1-3 will replace the values of corresponding parameters in Tables 10.3.3.1.4.1-3.

**Table 10.3.3.3.4.1-3: General test parameters for EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| T1 | s | 0.1 | During this time period PCell and PSCell shall be known and the SCell configured, but not detected. |

##### 10.3.3.3.4.2 Test procedure

Same test procedure as described in section 10.3.3.1.4.2, except step 3 and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 10.3.3.3.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete. The SCell (Cell 3) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell3), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

- Step 3a is removed.

##### 10.3.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 10.3.3.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.3.3.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 10.3.3.3.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.3.4.3-3: CellGroupConfig (Table 10.3.3.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR SpCell | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 10.3.3.3.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 10.3.3.3.4.3-5 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.3.3.4.3-4: ServingCellConfig-SpCell (Table 4.5.3.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 10.3.3.3.4.3-5: ServingCellConfig-SCell (Table 10.3.3.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

### 10.3.3.3.5 Test requirements

Table 10.3.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 10.3.3.3.5-1: Cell specific test parameters for EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1,2 | | TDD | | | TDD | | |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1,2 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access[Note5,7] | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |

| | | | | |
|---|---|---|---|---|
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | 0.75 | 0.75 |
| | $P_{CCA_DL_2}$ | | 0.75 | 0.75 |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | 0.87 |
| UL CCA probability for dynamic channel access | $P_{CCA_UL}$ | | 0.75 | 0.75 |
| $L_{CCA_DL}$ Note 8 | | | 2 | 2 |
| $W_{CCA_DL}$ Note 8 | | | $T_{activation_time_withCCA}$ | $T_{activation_time_withCCA}$ |
| Initial downlink BWP configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Initial uplink BWP configuration | | | ULBWP.0.1 | ULBWP.0.1 |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | ULBWP.0.1 |
| TCI state | | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | Config 1,2 | | TRS.1.2 TDD | TRS.1.2 TDD |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 CCA | SR.1.1 CCA |
| Dedicated CORESET parameters | Config 1,2 | | CCR.1.3 CCA | CCR.1.3 CCA |
| RMSI CORESET parameters | Config 1,2 | | CR.1.1 CCA | CR.1.1 CCA |
| OCNG Patterns Note1 | | | OP.1 | OP.1 |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 CCA | SSB.1 CCA |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.2 CCA | SSB.2 CCA |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| DBT window configuration | | | DBT.1 | DBT.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -101 | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -84 | -84 |
| Io Note3 | Config 1,2 | dBm/ 38.16MHz | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+ $T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA} = T_{FirstSSB_MAX} + (1 + L_{3,1})*T_{SMTC_MAX} + (2 + L_{3,2})*T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PSCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X = T_{FirstSSB_MAX} + L_{3,1}* T_{SMTC_MAX.}$

During T3, interruption on PSCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PSCell shall not be more than specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 10.3.4 Beam failure detection and link recovery procedures

### 10.3.4.0 General

The requirements for link recovery procedure in the clause apply when CCA is used on a serving frequency on the downlink.

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set $\bar{q}_0$ as specified in TS 38.213 [8] in order to detect beam failure on:

- PCell in SA operation mode,
- PSCell in EN-DC operation mode.
- PSCell in NR-DC operation mode.

The RS resource configurations in the set $\bar{q}_0$ can be periodic SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 10.3.4.0.1 and 10.3.4.0.2 if UE does not have set $\bar{q}_0$.

On each RS resource configuration in the set $\bar{q}_0$, the UE shall estimate the radio link quality and compare it to the threshold $Q_{out_LR,CCA}$ for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold $Q_{out_LR,CCA}$ is defined as the level at which the downlink radio level link of a given resource configuration on set $\bar{q}_0$ cannot be reliably received and shall correspond to the $BLER_{out,CCA}$ = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.4.0.1-1.

Upon request the UE shall deliver configuration indexes from the set $\bar{q}_1$ as specified in TS 38.213 [8] , to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold $Q_{in_LR,CCA}$, which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the $Q_{in_LR,CCA}$ threshold to the L1-RSRP measurement obtained from an SSB. The RS resource configurations in the set $\bar{q}_1$ can be periodic SSBs. UE is not required to perform candidate beam detection outside the active DL BWP.

In the requirements of this clause, the term CBD-RS SSB occasions not available at the UE refers to when the CBD-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured CBD-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the CBD-RS SSB is considered as available at the UE.

The requirements in this clause apply for any *channelAccessMode* configuration as specified in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.1.

### 10.3.4.0.1 Minimum conformance requirements for SSB based Beam Failure Detection under CCA

The requirements in this clause apply for each SSB resource in the set $\bar{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 10.3.4.0.1, but occasionally may not be transmitted due to CCA operation.

**Table 10.3.4.0.1-1: PDCCH transmission parameters for beam failure instance under CCA**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.

#### 10.3.4.0.1.1 Minimum requirement for SSB based Beam Failure Detection under CCA

UE shall be able to evaluate whether the downlink radio link quality on the configured BFD-RS SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB_CCA}$ ms period becomes worse than the threshold $Q_{out_LR_SSB,CCA}$ within $T_{Evaluate_BFD_SSB_CCA}$ ms period.

The value of $T_{Evaluate_BFD_SSB_CCA}$ is defined in Table 10.3.4.0.1.1-1 for FR1.

When concurrent gaps are configured,

- P value for a BFD-RS resource to be measured is defined as $N_{total}$ / $N_{outside_MG}$
- For a window W of duration max($T_{L1}$, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as serving cell, and starting at the beginning of any BFD-RS resource occasion:
  - $N_{total}$ is the total number of BFD-RS resource occasions within the window, including those overlapped with measurement gap occasions within the window, and
  - $N_{outside_MG}$ is the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured,
  - $P = \frac{1}{1-\frac{T_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the BFD-RS SSB.
  - P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the BFD-RS SSB.
- When a measurement gap is configured and the measurement gap is not NCSG,

- a BFD-RS resource is considered to be overlapped with the GAP if it overlaps a measurement gap occasion, and
- xRP = MGRP

- Otherwise, when NCSG measurement gap is configured,
  - a BFD-RS resource is considered to be overlapped with the GAP if it overlaps the VIL1 or VIL2 of NCSG, and
  - xRP = VIRP

- When concurrent gaps are configured, a BFD-RS is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 38.133 [6] section 9.1.8.

Longer evaluation period would be expected if the combination of BFD-RS SSB resource, SMTC occasion and GAP configurations does not meet pervious conditions.

**Table 10.3.4.0.1-1: Evaluation period $T_{Evaluate_BFD_SSB_CCA}$ for FR1**

| Configuration | $T_{Evaluate_BFD_SSB_CCA}$ (ms) | |
|---|---|---|
| | BFD-RS SSB Es/Iot Note2 ≥ -7 dB | BFD-RS SSB Es/Iot Note2 < -7 dB |
| no DRX | Max(50, Ceil((10 × P) × $T_{SSB}$)) | Max(50, Ceil((12 × P) × $T_{SSB}$)) |
| DRX cycle ≤ 320ms | Max(50, Ceil(1.5 × 8 × P) × Max($T_{DRX}$,$T_{SSB}$)) | Max(50, Ceil(1.5 × 10 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320ms | Ceil(7 × P) × $T_{DRX}$ | Ceil(8 × P) × $T_{DRX}$ |
| Note 1: $T_{SSB}$ is the periodicity of SSB in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length.<br>Note 2: BFD-RS SSB Es/Iot is the averaged BFD-RS SSB Es/Iot over the most recent previous evaluation period. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.2.

#### 10.3.4.0.1.2 Measurement restriction for SSB based Beam Failure Detection under CCA

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for BFD measurement.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.3.

### 10.3.4.0.2 Void

### 10.3.4.0.3 Scheduling availability of UE during beam failure detection under CCA

#### 10.3.4.0.3.1 Scheduling availability of UE performing beam failure detection under CCA with a same subcarrier spacing as PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 4.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.7.1.

### 10.3.4.0.4 Scheduling availability of UE during candidate beam detection under CCA

#### 10.3.4.0.4.1 Scheduling availability of UE performing L1-RSRP measurement under CCA with a same subcarrier spacing as PDSCH/PDCCH on FR1

In this clause, the same requirements apply as in Clause 4.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.8.1.

### 10.3.4.1 EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode

#### 10.3.4.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 10.3.4.0.1.

#### 10.3.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting UL and SSB-based RLM and link recovery on shared channel access.

#### 10.3.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.4.1.

#### 10.3.4.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.4.1.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 10.3.4.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

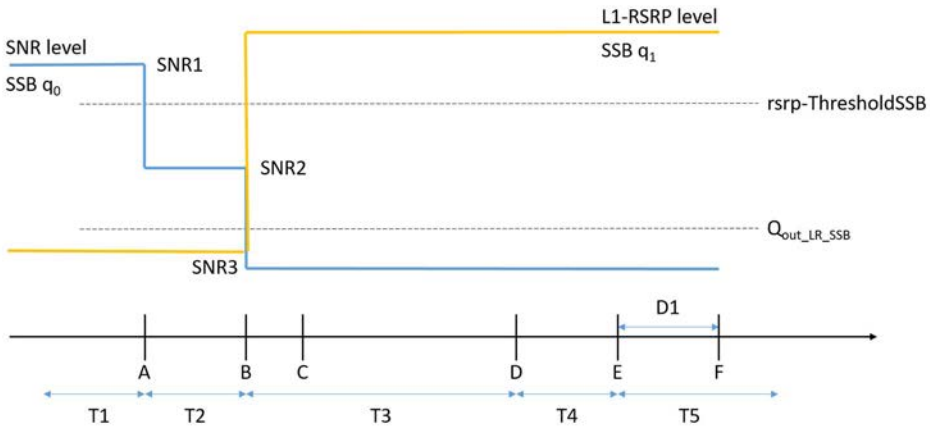



**Figure 10.3.4.1.4-1: SNR and L1-RSRP variation for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

#### 10.3.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.4.1.4.1-1.

**Table 10.3.4.1.4.1-1: Supported test configurations for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Configuration | Description |
|---|---|
| 10.3.4.1-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.3.4.1-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.4.1.4.1-2.

**Table 10.3.4.1.4.1-2: Initial conditions for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.3.4.1.4.1-3.
2. Message contents are defined in clause 10.3.4.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 10.3.4.1.4.1-3: General test parameters for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| DL CCA model | | | As specified in D.7.2.1 | |
| UL CCA model | | | As specified in D.7.2.2 | |
| Duplex mode | Config 1, 2 | | TDD | |
| BWchannel | Config 1, 2 | MHz | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 | |

| | | | | |
|---|---|---|---|---|
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | |
| CORESET Reference Channel | Config 1, 2 | | CR.1.1 CCA | |
| SSB Configuration | Config 1, 2 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access | |
| DBT Window Configuration | Config 1, 2 | | DBT.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 30 kHz | |
| PRACH Configuration | Config 1, 2 | | Table A.7.1A.2-1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| *gapOffset* | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see TS 38.321 [12], clause 5.17 |
| beamFailureDetectionTimer | | | pbfd4 | see TS 38.321 [12], clause 5.17 |

| | | | | |
|---|---|---|---|---|
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0,1 | |
| T310 timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.93 | |
| T3 | | s | 0.52 | |
| T4 | | s | 0 | |
| T5 | | s | 0.45 | |
| D1 | | s | 0.41 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. | | | | |

#### 10.3.4.1.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embedded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement with the corresponding gap pattern.

3. The UE sends an RRCReconfigurationComplete (embedded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 10.3.4.1.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 10.3.4.1.5-1. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.4.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.4.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.4.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.4.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH), provided that such slot is not subject to CCA failure (as determined by $P_{CCA_UL}$ in Table 10.3.4.1.5-1), during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one.

10. The SS shall first attempt to release and add the PSCell, by disabling the CCA model (i.e. PCCA_DL_i= PCCA_UL=1) and then proceeding with step 1. Otherwise, the UE is switched OFF/ON, then proceed with step 1.

11. Repeat steps 2-10 for all subtests until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.3.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.4.1.4.3-1: Common Exception messages for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition BFD<br>Table H.3.5-4<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 10.3.4.1.4.3-2: PDCCH *Search Space* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.4.1.4.3-3: *RLF-TimersAndConstants* for EN-D FR1 C Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 10.3.4.1.4.3-4: *PDCCH-Config* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 10.3.4.1.4.3-5: *ControlResourceSet* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

### 10.3.4.1.5 Test requirements

Tables 10.3.4.1.4.1-3 and 10.3.4.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode

**Table 10.3.4.1.5-1: Cell specific test parameters for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability $P_{CCA,DL}$ | Note 10, 12 | | 1.0 | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| | Note 11, 12 | | 1.0/1.0 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA,UL}$ | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| $L_{CCA_DL}$ | | | N/A | 7 | | | |
| $W_{CCA_DL}$ | | ms | N/A | $T_{Evaluate_CBD_SSB_CCA}$ Note 13 | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1, 2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1, 2 | dBm/SCS | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 10.3.4.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.
Note 12: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
Note 13: As defined in TS 38.133 [6] Table 8.5A.5.2-1.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1, provided that such slots are not subject to CCA failure.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1, provided that such slots are not subject to CCA failure.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### 10.3.4.2 EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode

#### 10.3.4.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 10.3.4.0.1.

#### 10.3.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier, and supporting UL and SSB-based RLM and link recovery on shared channel access.

#### 10.3.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.4.2.

#### 10.3.4.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.4.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set $q_0$ in the active PSCell to emulate SSB based beam failure. Figure 10.3.4.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

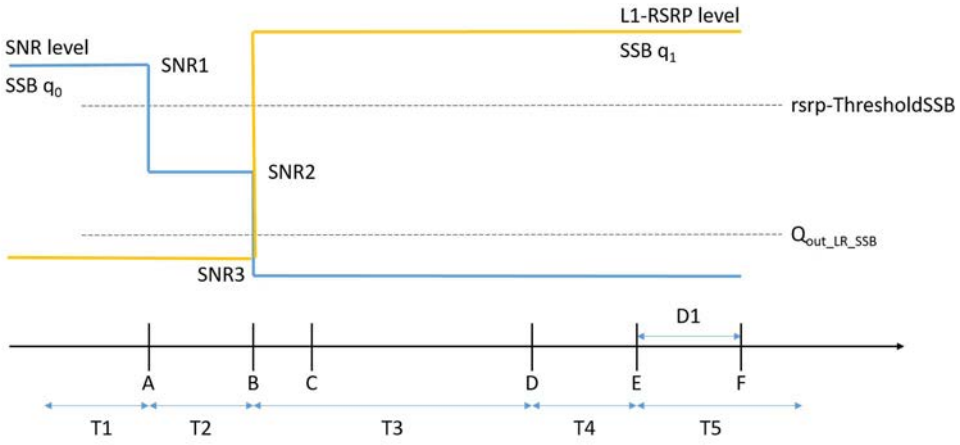



**Figure 10.3.4.2.4-1: SNR and L1-RSRP variation for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

#### 10.3.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.4.2.4.1-1.

**Table 10.3.4.2.4.1-1: Supported test configurations for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Configuration | Description |
|---|---|
| 10.3.4.2-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.3.4.2-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.4.2.4.1-2.

**Table 10.3.4.2.4.1-2: Initial conditions for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.3.4.2.4.1-3.
2. Message contents are defined in clause 10.3.4.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 10.3.4.2.4.1-3: General test parameters for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PSCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| DL CCA model | | | As specified in D.7.2.1 | |
| UL CCA model | | | As specified in D.7.2.2 | |
| Duplex mode | Config 1, 2 | | TDD | |
| BWchannel | Config 1, 2 | MHz | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 | |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | |
| CORESET Reference Channel | Config 1, 2 | | CR.1.1 CCA | |
| SSB Configuration | Config 1, 2 | | SSB.3 CCA for semi-static channel access SSB.4 CCA for dynamic channel access | |
| DBT Window Configuration | Config 1, 2 | | DBT.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 30 kHz | |

| | | | | |
|---|---|---|---|---|
| PRACH Configuration | Config 1, 2 | | Table A.7.1A.2-1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | Table A.5-1 |
| Gap pattern ID | | | N.A. | |
| *gapOffset* | | | N.A. | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | *Config 1, 2* | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0,1 | |
| T310 timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 9.01 | |
| T3 | | s | 5.16 | |
| T4 | | s | 0 | |
| T5 | | s | 3.89 | |
| D1 | | s | 3.85 | |

| |
|---|
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: E-UTRAN is in non-DRX mode under test. |

#### 10.3.4.2.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. No inter-frequency gap is configured on the UE. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 10.3.4.2.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 10.3.4.2.5-1. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.4.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.4.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.4.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.4.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH), provided that such slot is not subject to CCA failure (as determined by $P_{CCA_UL}$ in Table 10.3.4.2.5-1), during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

8. The SS shall first attempt to release and add the PSCell, by disabling the CCA model (i.e. PCCA_DL_i= PCCA_UL=1) and then proceeding with step 1. Otherwise, the UE is switched OFF/ON, then proceed with step 1.

9. Repeat steps 2-8 for all subtests until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.3.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.4.2.4.3-1: Common Exception messages for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.4-5 with Condition BFD<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 10.3.4.2.4.3-2: PDCCH *Search Space* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.4.2.4.3-3: *RLF-TimersAndConstants* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 10.3.4.2.4.3-4: *PDCCH-Config* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |

| | | | |
|---|---|---|---|
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 10.3.4.2.4.3-5: *ControlResourceSet* for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

10.3.4.2.5 Test requirements

Tables 10.3.4.2.4.1-3 and 10.3.4.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode.

**Table 10.3.4.2.5-1: Cell specific test parameters for EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability $P_{CCA,DL}$ | Note 10, 12 | | 1.0 | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| | Note 11, 12 | | 1.0/1.0 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA,UL}$ | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1, 2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1, 2 | dBm/SCS | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 10.3.4.2.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A. |
| Note 10: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 11: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |
| Note 12: | For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1, provided that such slots are not subject to CCA failure.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1, provided that such slots are not subject to CCA failure.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 3850 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 10.3.5 Active BWP switching

### 10.3.5.1 EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA

#### 10.3.5.1.1 Test purpose

The purpose of this test is to verify the UL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6.4.

#### 10.3.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 on shared channel access, and UL LBT detection and recovery.

#### 10.3.5.1.3 Minimum conformance requirements

Upon detection of consistent UL CCA failure is slot#n in SpCell when UE detects *lbt-FailureInstanceMaxCount* number of CCA failure within *lbt-FailureDetectionTimer*, the UE shall switch the active UL BWP to an UL BWP configured with PRACH occasion and for which consistent CCA failure has not been triggered as defined in TS 38.321 [12] clause 5.21. The UE shall be ready to transmit PRACH on the new UL BWP of the SpCell on the first UL slot occurs right after slot $n+T_{BWPswitchDelay}+1$, where $T_{BWPswitchDelay}$ is defined in TS 38.133 [6] Table 8.6.2-1. The UE shall

finish the UL BWP switch within the time duration $T_{BWPswitchDelay}$ depending on UE capability *bwp-SwitchingDelay* [13].

Note: Additional delay in acquiring the first available RACH occasion will be derived in a way similar to that in handover in TS 38.133 [6] clause 6.1B.1.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ on the SpCell in the UL BWP switch. The UE is not required to follow the requirements defined in this clause when performing a UL BWP switch between the UL BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

The normative reference for this requirement is TS 38.133 [6] clause 8.6.4.

#### 10.3.5.1.4 Test description

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in 10.3.5.1.4.1-3. Cell-specific parameters of E-UTRA PCell are specified in Table A.6B-1 and Cell-specific parameters of NR PSCell is specified in Table 10.3.5.1.5-1. SRS configuration used in the test is specified in Table 10.3.5.1.5-2.

The UE shall be configured with PRACH configuration on UL BWP on which the UE shall switch after the consistent UL LBT failure detection.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1 and Cell 2 on radio channel 2.
- UE is configured with 2 different UE-specific downlink and uplink bandwidth parts on Cell 2: DL BWP-1, DL BWP-2, UL BWP-1 and UL BWP-2 before starting the test. DL BWP-1 and DL BWP-2 always include bandwidth of the initial DL BWP and SSB. UL BWP-1 and UL BWP-2 always include bandwidth of the SRS.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is DL BWP-1.
- UE is indicated in *firstActiveUplinkBWP-Id* that the active UL BWP is UL BWP-1.
- UE is configured with *LBT-FailureRecoveryConfig* parameters for Cell 2.

The cell has constant signal levels throughout the test. The test consists of 2 successive time periods, with durations of T1 and T2, respectively.

During T1,

- Time period T1 starts when the UE has received the SRS configuration for periodic SRS transmission on active UL BWP-1.
- The UE shall perform UL CCA before SRS transmission.
- The parameter UL CCA probability $P_{CCA}$ is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

During T2,

- T2 starts when the UE detects consistent UL LBT failures i.e. when total number of UL LBT failures in Cell 2 on active UL BWP-1 exceeds *lbt-FailureInstanceMaxCount* during *lbt-FailureDetectionTimer*.
- The UE upon detected consistent UL LBT failure starts the LBT recovery mechanism, which requires the UE to switch to active UL BWP-2 in Cell 2 and to send PRACH in the active UL BWP-2.
- Staring from T2, the UE shall be able to send PRACH in the active UL BWP-2 within the delay specified in TS 38.133 [6] clause 8.6.4.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 10.3.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.5.1.4.1-1.

**Table 10.3.5.1.4.1-1: Supported test configurations for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Config | Description |
|---|---|
| 10.3.5.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.5.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.5.1.4.1-2.

**Table 10.3.5.1.4.1-2: Initial conditions for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable Ues without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 10.3.5.1.4.1-3.
2. Message contents are defined in clause 10.3.5.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) with CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is configured according to clause C.1.2 and C.1.3.

**Table 10.3.5.1.4.1-3: General test parameters for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| *lbt-FailureDetectionTimer* | ms | 80 | Parameter configured by IE: *LBT-FailureRecoveryConfig* [13] |
| *lbt-FailureInstanceMaxCount* | | 4 | Parameter configured by IE: *LBT-FailureRecoveryConfig* [13] |
| T1 | s | 0.1 | During T1 consistent LBT failure is detected on active UL BWP-1 |
| T2 | s | 0.1 | During T2 UE sends PRACH on active UL BWP-2 |

#### 10.3.5.1.4.2 Test procedure

All cells have constant signal levels throughout the test. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 10.3.5.1.4.1-3 and 10.3.5.1-5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, and as the active UL BWP using *firstActiveUplinkBWP-Id* according to Table 10.3.5.1.4.3-2. UE is configured with *LBT-FailureRecoverConfig* parameters for Cell 2 according to Table 10.3.5.1.4.3-5, PRACH configuration on UL BWP-2 according to Table 10.3.5.1.4.3-4 and periodic SRS transmissions on UL BWP-1 according to Tables 10.3.5.1.4.3-4 and 10.3.5.1.5-2.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.3.5.1.5-1. T1 starts.

5. During T1 the UE shall perform UL CCA before each SRS transmission. The parameter UL CCA probability $P_{CCA}$ is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

6. When T1 expires T2 starts. The SS shall change the UL CCA probability $P_{CCA}$ to 1 during T2. This will make the SS to not occupy the channel anymore.

7. The UE shall attempt to recover the link by transmitting PRACH on UL BWP-2. If the UE transmits PRACH on UL BWP-2 within 21.5ms from the start of T2 (for UE capable of *bwp-SwitchingDelay type1*) or within 23ms from the start of T2 (for UE capable of *bwp-SwitchingDelay type2*), then the number of successful tests is increased by one. If the UE does not transmit PRACH on UL BWP-2 during the required time, the number of failures is increased by one.

8. The SS shall first attempt to release and add the PSCell, by disabling the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) and then ensuring the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5, then proceed with step 2. Otherwise, the UE is switched OFF/ON, then proceed with step 1.

9. Repeat steps 2-8 for until the confidence level according to Annex G clause G.2.7 is achieved.

### 10.3.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.5.1.4.3-1: Common Exception messages for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.3.5.1.4.3-1A: *RRCReconfiguration* (Step3) for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---|---|---|
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 10.3.5.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.1.4.3-1B: *CellGroupConfig* (Table 10.3.5.1.4.3-1A) for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 10.3.5.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 10.3.5.1.4.3-2: *ServingCellConfig* (Table 10.3.5.1.4.3-1B) for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 10.3.5.1.4.3-3 | BWP1 |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 10.3.5.1.4.3-3 | BWP2 |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |

| | | | |
|---|---|---|---|
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 10.3.5.1.4.3-4 | BWP1 |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 10.3.5.1.4.3-4 | BWP2 |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.1.4.3-3: *BWP-Downlink* (Table 10.3.5.1.4.3-2) for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| } | | | |
| } | | | |

**Table 10.3.5.1.4.3-4: *BWP-Uplink* (Table 10.3.5.1.4.3-2) for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| rach-ConfigCommon CHOICE { | | | |
| setup | RACH-ConfigCommon | Table A.7.1A.1-1 | BWP2 |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| srs-Config CHOICE { | | | BWP1 |
| setup | SRS-Config | Table 10.3.5.1.5-2 | |
| } | | | |
| lbt-FailureRecoveryConfig-r16 CHOICE { | | | BWP2 |
| setup | LBT-FailureRecoveryConfig-r16 | Table 10.3.5.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.1.4.3-5: *LBT-FailureRecoveryConfig* for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-64A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LBT-FailureRecoveryConfig-r16 ::= SEQUENCE { | | | |
| lbt-FailureInstanceMaxCount-r16 | n4 | | |
| lbt-FailureDetectionTimer-r16 | ms80 | | |

| | | | |
|---|---|---|---|
| } | | | |

10.3.5.1.5 Test requirements

Tables 10.3.5.1.5-1 and 10.3.5.1.5-2 define the primary level settings including test tolerances for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC.

**Table 10.3.5.1.5-1: NR Cell specific test parameters for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Parameter | | | Unit | Cell 2 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| TDD configuration | | Config 1, 2 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1, 2 | | 40 MHz: $N_{RB,c}$ = 106 | |
| DL CCA model | | Config 1, 2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1, 2 | | As specified in clause D.7.2.2 | |
| Active BWP ID | | Config 1, 2 | | 1, 2 | |
| Initial DL BWP Configuration | | Config 1, 2 | | DLBWP.0.2 Note 4 | |
| Active DL BWP-1 Configuration | | Config 1, 2 | | DLBWP.1.1 Note 4 | |
| Active DL BWP-2 Configuration | | Config 1, 2 | | DLBWP.1.3 Note 4 | |
| Initial UL BWP Configuration | | Config 1, 2 | | ULBWP.0.2 Note 4 | |
| Active UL BWP-1 Configuration | | Config 1, 2 | | ULBWP.1.1 Note 4 | |
| Active UL BWP-2 Configuration | | Config 1, 2 | | ULBWP.1.3 Note 4 | |
| PDSCH Reference measurement channel | | Config 1, 2 | | SR.1.1 CCA | |
| RMSI CORESET parameters | | Config 1, 2 | | CR.1.1 CCA | |
| Dedicated CORESET parameters | | Config 1, 2 | | CCR.1.1 CCA | |
| OCNG Patterns | | Config 1, 2 | | OP.1 | |
| SSB Configuration | Semi- static channel access | Config 1, 2 | | SSB.1 CCA | |
| | Dynamic channel access | Config 1, 2 | | SSB.2 CCA | |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 FR1 | |
| Correlation Matrix and Antenna Configuration | | Config 1, 2 | | 1x2 Low | |
| TRS Configuration | | Config 1, 2 | | TRS.1.2 TDD | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1, 2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1, 2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1, 2 | | 1 | 1 |
| UL CCA probability ($P_{CCA_UL}$) | | Config 1, 2 | | 0 | 1 |
| PRACH configuration | | Config 1, 2 | | N/A | Table A.7.1A.1-1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | Config 1, 2 | dBm/SCS | -101 | |
| SS-RSRP Note 3 | | Config 1, 2 | dBm/SCS | -84 | |
| $\hat{E}_s/I_{ot}$ | | Config 1, 2 | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | Config 1, 2 | dB | 17 | |
| Io Note3 | | Config 1, 2 | dBm/ 38.16MHz | -52.86 | |
| Propagation Condition | | | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |
| Note 5: | Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in section D.7.2. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

**Table 10.3.5.1.5-2: Sounding Reference Symbol Configuration for EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA in EN-DC**

| Field | Value | Comment |
|---|---|---|
| *c-SRS* | 24 | Frequency hopping is disabled |
| *b-SRS* | 0 | |
| *b-hop* | 0 | |
| *freqDomainPosition* | 0 | Frequency domain position of SRS |
| *freqDomainShift* | 0 | |
| *groupOrSequenceHopping* | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | sl5=4 for SCS 30kHz | Once every 5 slots |
| *pathlossReferenceRS* | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| *usage* | Codebook | Codebook based UL transmission |
| *startPosition* | 0 | resourceMapping setting: SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | n1 | |
| *repetitionFactor* | n1 | |
| *combOffset-n2* | 0 | transmissionComb setting |
| *cyclicShift-n2* | 0 | |
| *nrofSRS-Ports* | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

The UE capable of *bwp-SwitchingDelay type1* [13] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PSCell) less than 21.5 ms from the beginning of time period T1.

The UE capable of *bwp-SwitchingDelay type2* [13] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PSCell) less than 23 ms from the beginning of time period T1.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The above delay is calculated as follows:'

The active UL BWP switch delay from UL BWP-1 to UL BWP-2 can be expressed as:

$$T_{BWPswitchDelay} * T_{slot} + 1 * T_{slot} + (1 + L_3) * T_{SSB,RO} + 10 \text{ ms}$$

Where:

- $T_{BWPswitchDelay}$ = 1 ms (2 slots) and 2.5 ms (5 slots) for *bwp-SwitchingDelay* [13] *type1* and *type2* UE capabilities according to 38.133 [6] clause 8.6.4.
- $T_{slot}$ = It is the slot length. It is 0.5 ms for 30 kHz.
- L3 = It is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. L3= 0 during T2 since $P_{CCA}$ = 1.

- $T_{SSB,RO}$ = 10 ms according to FR1 PRACH configuration 1.

This gives a total of 21.5 ms and 23 ms for *type1* and *type2* UE respectively.

## 10.3.5.2 DCI-based and Timer-based Active BWP Switch

### 10.3.5.2.0 Minimum conformance requirements

#### 10.3.5.2.0.1 Minimum conformance requirements for DCI-based and timer-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n. Where,

- Y=0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.

- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, $T_{BWPswitchDelay}$ + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change. If both scheduling cell and scheduled cell are in FR2-2, Y shall follow the SCS of 120 kHz.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 10.3.5.2.0.1-1.

**Table 10.3.5.2.0.1-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

Provided the UE does not have the required activated TCI-state(s) information to receive PDCCH/ PDSCH and to transmit PUSCH/PUCCH/SRS in the new BWP, the UE shall use old TCI-state(s) before the BWP switch until a new MAC CE updating the required activated TCI-state(s) information is received after the BWP switch.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP as specified in TS 38.321 [12], UE shall be able to complete active BWP switching within the time duration of

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is receiveds, or

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X + Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where

- $T_{BWPswitchDelay}$ is defined in Table 10.3.5.2.0.1-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs;

- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs. If both scheduling cell and scheduled cell are in FR2-2, X shall follow the SCS of 120 kHz.

- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 10.3.5.2.0.1-3, the UE is allowed to cause interruption of up to X slots to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 10.3.5.2.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 10.3.5.2.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ +Y as defined in TS 38.133 [6] clause 8.6.2A.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 10.3.5.2.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 10.3.5.2.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 10.3.5.2.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2B.1 when BWP switch occurs on multiple CCs simultaneously or $T_{MultipleBWPswitchDelayTotal}$ as defined in TS 38.133 [6] clause 8.6.2B.2 when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving

changes in any of the parameters listed in Table 10.3.5.2.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 10.3.5.2.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 10.3.5.2.0.1-2. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ defined in TS 38.133 [6] clause 8.6.3 when BWP switch occurs on a single CC. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ + $D_{RRC}$*(N-1) as defined in TS 38.133 [6] clause 8.6.3A when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures [12], the UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 10.3.5.2.0.1-3 if the UE is not capable of per-FR gap, or if the UL BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 10.3.5.2.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 10.3.5.2.0.1-2. The starting time of interruption is only allowed within the UL BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during UL BWP switch involving other parameter change.

**Table 10.3.5.2.0.1-2: interruption length X**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| Note1: void | | |

**Table 10.3.5.2.0.1-3: Parameters which cause interruption other than SCS**

| Parameters | Comment |
|---|---|
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* | |
| *maxMIMO-Layers-r16* | |

DCI-based or timer-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

Uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell may cause an interruption on PCell or on activated SCell(s) in the MCG.

The starting time of interruption due to DCI-based or timer-based downlink BWP and/or uplink BWP switching or due to uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 of TS 38.133 [6].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2, 8.2.1.2.7 and TS 36.133 [23] clause 7.32.2.7.

## 10.3.5.2.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA

### 10.3.5.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6 with NR PSCell under CCA, and interruption requirement for E-UTRA victim cell defined in TS 36.133 [23] clause 7.32.2.7.

### 10.3.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 on shared channel access.

#### 10.3.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.5.2.1.

#### 10.3.5.2.1.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and PSCell (Cell 2) with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2). The test parameters for the two cells are given in Table 10.3.5.2.1.4.1-1 and 10.3.5.2.1.4.1-3 below.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.3.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.5.2.1.4.1-1.

**Table 10.3.5.2.1.4.1-1: Supported test configurations for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Config | Description |
|---|---|
| 10.3.5.2.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.5.2.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: A UE which fulfils the requirements in test case 10.3.5.2.2 can skip the test cases in 10.3.5.2.1.<br>Note 3: The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.5.2.1.4.1-2.

**Table 10.3.5.2.1.4.1-2: Initial conditions for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 10.3.5.2.1.4.1-3.

2. Message contents are defined in clause 10.3.5.2.1.4.3.

3. The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) with CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is configured according to clause C.1.2 and C.1.3.

4. By step 4 of the test procedure:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

**Table 10.3.5.2.1.4.1-3: General test parameters for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and PSCell |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| *bwp-InactivityTimer* | ms | 200 | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 10.3.5.2.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or bwp-InactivityTimer timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

"k" is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 10.3.5.2.1.4.1-3 and 10.3.5.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth

parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 10.3.5.2.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.3.5.2.1.5-1.

5. The SS shall send a DCI format 1_1 command for PSCell DL BWP switch.

6. The UE shall receive the DCI format 1_1 command in PSCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$); and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+ 1 subframe + k); and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PSCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PSCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PSCell:

   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$); and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+ 1 subframe + k); and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

9. Repeat steps 5-8 until the confidence level according to Annex G clause G.2.7 is achieved. If all subtests pass, the test passes. If one subtest fails, the test fails.

### 10.3.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.5.2.1.4.3-1: Common Exception messages for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.3.5.2.1.4.3-1A: *RRCReconfiguration* (Step3) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 10.3.5.2.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-1B: *CellGroupConfig* (Table 10.3.5.2.1.4.3-1A) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 10.3.5.2.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-2: *ServingCellConfig* (Table 10.3.5.2.1.4.3-1B) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 10.3.5.2.1.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 10.3.5.2.1.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |

| | | | |
|---|---|---|---|
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 10.3.5.2.1.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 10.3.5.2.1.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-3: *BWP-Downlink* (Table 10.3.5.2.1.4.3-2) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 10.3.5.2.1.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-4: *BWP-Uplink* (Table 10.3.5.2.1.4.3-2) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-5: *PDSCH-TimeDomainResourceAllocationList* (Table 10.3.5.2.1.4.3-6) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 10.3.5.2.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 10.3.5.2.1.4.3-6: *PDSCH-ConfigCommon* (Table 10.3.5.2.1.4.3-3) for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 10.3.5.2.1.4.3-5 | |
| } | | | |

10.3.5.2.1.5 Test requirements

Tables 10.3.5.2.1.4.1-3 and 10.3.5.2.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA.

**Table 10.3.5.2.1.5-1: NR Cell specific test parameters for EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR1 |

| | | | | |
|---|---|---|---|---|
| Duplex mode | | Config 1,2 | | TDD |
| TDD configuration | | Config 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | | Config 1,2 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | | 1, 2 |
| Initial DL BWP Configuration | | Config 1,2 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | | Config 1,2 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | | Config 1,2 | | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | | Config 1,2 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | | Config 1,2 | | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | | Config 1,2 | | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | | Config 1,2 | | SR.1.1 CCA |
| RMSI CORESET parameters | | Config 1,2 | | CR.1.1 CCA |
| Dedicated CORESET parameters | | Config 1,2 | | CCR.1.1 CCA |
| OCNG Patterns | | Config 1,2 | | OP.1 |
| SSB Configuration | Semi- static channel access | Config 1,2 | | SSB.1 CCA |
| | Dynamic channel access | Config 1,2 | | SSB.2 CCA |
| SMTC Configuration | | Config 1,2 | | SMTC.1 |
| TRS Configuration | | Config 1,2 | | TRS.1.2 TDD |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1,2 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1,2 | | 1 |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 |
| Correlation Matrix and Antenna Configuration | | | | 1x2 Low |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1,2 | dBm/SCS | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -84 |
| $\hat{E}_s/I_{ot}$ | | Config 1,2 | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | Config 1,2 | dB | 17 |
| Io Note3 | | Config 1,2 | dBm/38.16MHz | -59 |
| Propagation Condition | | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Note 5: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, $k1$ is the timing between DL data receiving and acknowledgement as specified in TS 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

k1 is the timing between DL data receiving and acknowledgement as specified in [12].

### 10.3.5.2.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA

#### 10.3.5.2.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6 with NR PSCell and SCell under CCA, and interruption requirements for NR victim cell defined in TS 38.133 [6] clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [23].

#### 10.3.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA on shared channel access.

#### 10.3.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.5.2.2.

#### 10.3.5.2.2.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and PSCell (Cell 2) on one NR carrier and NR SCell (Cell 3) on the other NR carrier with CCA transmitting SSBs in DBT windows according to DL CCA model. The test parameters for the three cells are given in Table 10.3.5.2.2.4.1-1 and 10.3.5.2.2.4.1-3 below.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.3.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 10.3.5.2.2.4.1-1. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

**Table 10.3.5.2.2.4.1-1: Supported test configurations for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Config | Description |
|---|---|
| 10.3.5.2.2-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.5.2.2-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: A UE which fulfils the requirements in test case 10.3.5.2.2 can skip the test cases in 10.3.5.2.1.<br>Note 3: NR configuration is the same for PSCell and SCells.<br>Note 4: The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.5.2.2.4.1-2.

**Table 10.3.5.2.2.4.1-2: Initial conditions for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 10.3.5.2.2.4.1-3.
2. Message contents are defined in clause 10.3.5.2.2.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Annex A.6B. Cell 2 and Cell 3 are configured according to clauses C.1.2 and C.1.3.

4. By step 4 of the test procedure:

   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
   - UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
   - UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
   - UE is configured with a *bwp-InactivityTimer* timer value for SCell.

**Table 10.3.5.2.2.4.1-3: General test parameters for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3 | Two NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |

| | | | |
|---|---|---|---|
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| CP length | | Normal | |
| DRX | | OFF | |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | µs | 3 | Synchronous cells |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

#### 10.3.5.2.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.1.2.7-1.

*k* is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

$k_1$ is the timing between NR DL data receiving and acknowledgement as specified in TS 38.214 [9].

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 10.3.5.2.2.4.1-3 and 10.3.5.2.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 3. This message also configures 2 different UE-specific bandwidth parts for Cell 3, BWP-1 and BWP-2,which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id* in SCell, and BWP-0 as the active DL BWP using *firstActiveDownlinkBWP-Id* in PSCell, according to Table 10.3.5.2.2.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.3.5.2.2.5-1.

5. The SS shall send a DCI format 1_1 command for SCell DL BWP switch.

6. The UE shall receive the DCI format 1_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

a) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$); and

b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+ 1 subframe + $k$); and

c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+ Interruption length + $k_1$); and

d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.

Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. If the UE sends valid ACK/NACK for the SCell on PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1, on SCell:

   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+ 1 subframe + $k$); and

   b) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$); and

   c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+ Interruption length + $k_1$); and

   d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and

   e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1. Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

9. Repeat steps 5-8 until the confidence level according to Annex G clause G.2.7 is achieved. If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 10.3.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.5.2.2.4.3-1: Common Exception messages for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access. |

**Table 10.3.5.2.2.4.3-1A: *RRCReconfiguration* (Step 3) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| secondaryCellGroup | CellGroupConfig | Table 10.3.5.2.2.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.2.4.3-1B: *CellGroupConfig* (Table 10.3.5.2.2.4.3-1A) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig | Table 10.3.5.2.2.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.2.4.3-2: *ServingCellConfig* (Table 10.3.5.2.2.4.3-1B) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 10.3.5.2.2.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 10.3.5.2.2.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |

**Table 10.3.5.2.2.4.3-3: *BWP-Downlink* (Table 10.3.5.2.2.4.3-2) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |

| | | | |
|---|---|---|---|
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 10.3.5.2.2.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.2.2.4.3-4: *PDSCH-TimeDomainResourceAllocationList* (Table 10.3.5.2.2.4.3-5) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 10.3.5.2.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 10.3.5.2.2.4.3-5: *PDSCH-ConfigCommon* (Table 10.3.5.2.2.4.3-3) for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 10.3.5.2.2.4.3-4 | |
| } | | | |

### 10.3.5.2.2.5 Test requirements

Tables 10.3.5.2.2.4.1-3 and 10.3.5.2.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA.

**Table 10.3.5.2.2.5-1: NR Cell specific test parameters for EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC under CCA**

| Parameter | | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Frequency Range | | | | FR1 | |
| Duplex mode | | Config 1,2 | | TDD | |
| TDD configuration | | Config 1,2 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1,2 | | 40 MHz: $N_{RB,c}$ = 106 | |
| Active BWP ID | | | | 1, 2 | 0 |
| Initial BWP Configuration | | Config 1,2 | | DLBWP.0.2 | DLBWP.0.2 |
| Active BWP-0 Configuration | | Config 1,2 | | NA | DLBWP.0.2 |
| Active BWP-1 Configuration | | Config 1,2 | | DLBWP.1.3 | NA |
| Active BWP-2 Configuration | | Config 1,2 | | DLBWP.1.1 | NA |
| PDSCH Reference measurement channel | | Config 1,2 | | SR.1.1 CCA | |
| RMSI CORESET parameters | | Config 1,2 | | CR.1.1 CCA | |
| Dedicated CORESET parameters | | Config 1,2 | | CCR.1.1 CCA | |
| OCNG Patterns | | Config 1,2 | | OP.1 | |
| SSB Configuration | Semi- static channel access | Config 1,2 | | SSB.1 CCA | |
| | Dynamic channel access | Config 1,2 | | SSB.2 CCA | |
| SMTC Configuration | | Config 1,2 | | SMTC.1 | |
| TRS Configuration | | Config 1,2 | | TRS.1.2 TDD | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1,2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1,2 | | 1 | 1 |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 | 1 |
| Correlation Matrix and Antenna Configuration | | | | 1x2 | |
| Propagation Condition | | | | AWGN | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note 2 | | Config 1,2 | dBm/SCS | -101 | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -84 | -84 |
| $\hat{E}_s/I_{ot}$ | | Config 1,2 | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | Config 1,2 | dB | 17 | 17 |
| Io Note3 | | Config 1,2 | dBm/38.16MHz | -59 | -59 |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |
| Note 5: | Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after slot ($j+T_{BWPswitchDelay}+k11$).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [23].

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

k1 is the timing between DL data receiving and acknowledgement as specified in [12].

## 10.3.5.3 RRC-based Active BWP Switch

### 10.3.5.3.0 Minimum conformance requirements

#### 10.3.5.3.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where:

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

NR Slot length is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

### 10.3.5.3.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA

#### 10.3.5.3.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch under CCA defined in TS 38.133 [6] clause 8.6.3.

#### 10.3.5.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards supporting EN-DC, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs on shared channel access.

#### 10.3.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.5.3.1.

#### 10.3.5.3.1.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and PSCell (Cell 2) with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2). The test parameters for the two cells are given in Table 10.3.5.3.1.4.1-1 and 10.3.5.3.1.4.1-3 below.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.3.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.5.3.1.4.1-1.

**Table 10.3.5.3.1.4.1-1: Supported test configurations for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Config | Description |
|---|---|
| 10.3.5.3.1-1 | LTE FDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.3.5.3.1-2 | LTE TDD,<br>With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE supporting EN-DC with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.5.3.1.4.1-2.

**Table 10.3.5.3.1.4.1-2: Initial conditions for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.3.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 10.3.5.3.1.4.1-3.
2. Message contents are defined in clause 10.3.5.3.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 are configured according to clause C.1.2 and C.1.3.
4. By step 4 of the test procedure:
   - UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell

**Table 10.3.5.3.1.4.1-3: General test parameters for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active PSCell | | Cell 2 | PSCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | µs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 | |

### 10.3.5.3.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the RRCConnectionReconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 10.3.5.3.1.4.1-3 and 10.3.5.3.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 10.3.5.3.1.5-1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.3.5.3.1.5-1.

5. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 10.3.5.3.1.5-1. T1 starts.

6. The UE shall receive the *RRCConnectionReconfiguration* in PSCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration:

7 If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot $i+X+k_1$ then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where,

   - X = 52 for test configuration 10.3.5.3.1-1 and 10.3.5.3.1-2;

8. After the SS receives the ACK/NACK in step 5) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$). If either of the reconfiguration in step 6 or step 7 fails, switch off and on the UE and go to step 1.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

### 10.3.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.5.3.1.4.3-1: Common Exception messages for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 10.3.5.3.1.4.3-1A: *RRCReconfiguration* (Step 3, Step 5) EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 10.3.5.3.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.3.5.3.1.4.3-1B: *CellGroupConfig* (Table 10.3.5.3.1.4.3-1A) EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PSCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 10.3.5.3.1.4.3-1C | |
| } | | | |
| } | | | |

**Table 10.3.5.3.1.4.3-1C: *ServingCellConfig* (Table 10.3.5.3.1.4.3-1B) EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 10.3.5.3.1.4.3-1D | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |

| | | | |
|---|---|---|---|
| release | NULL | | |
| } | | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 10.3.5.3.1.4.3-1E | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 10.3.5.3.1.4.3-1D: *BWP-Downlink* (Table 10.3.5.3.1.4.3-1C) EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 10.3.5.3.1.4.3-1E: *BWP-Uplink* (Table 10.3.5.3.1.4.3-1C) EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

### 10.3.5.3.1.5 Test requirements

Tables 10.3.5.3.1.4.1-3 and 10.3.5.3.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA.

**Table 10.3.5.3.1.5-1: NR Cell specific test parameters for EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC under CCA**

| **Parameter** | | **Unit** | **Cell 2** |
|---|---|---|---|
| **Frequency Range** | | | **FR1** |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | Config 1,2 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1,2 | | DLBWP.0.2 |
| Initial UL BWP Configuration | Config 1,2 | | ULBWP.0.2 |

| | | | | |
|---|---|---|---|---|
| Initial Condition | Active DL BWP-1 Configuration | Config 1,2 | | DLBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | Config 1,2 | | DLBWP.1.1 |
| Initial UL BWP Configuration | | Config 1,2 | | ULBWP.0.2 |
| Active UL BWP-1 Configuration | | Config 1,2 | | ULBWP.1.3 |
| Active UL BWP-2 Configuration | | Config 1,2 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1,2 | | SR.1.1 CCA |
| RMSI CORESET parameters | | Config 1,2 | | CR.1.1 CCA |
| Dedicated CORESET parameters | | Config 1,2 | | CCR.1.1 CCA |
| OCNG Patterns | | Config 1,2 | | OP.1 |
| SSB Configuration | Semi- static channel access | Config 1,2 | | SSB.1 CCA |
| | Dynamic channel access | Config 1,2 | | SSB.2 CCA |
| SMTC Configuration | | Config 1,2 | | SMTC.1 |
| TRS Configuration | | Config 1,2 | | TRS.1.2 TDD |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1,2 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1,2 | | 1 |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1,2 | | 1 |
| Antenna Configuration | | | | 1x2 |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1,2 | dBm/SCS | -101 |
| SS-RSRP Note 3 | | Config 1,2 | dBm/SCS | -84 |
| $\hat{E}_s/I_{ot}$ | | Config 1,2 | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | Config 1,2 | dB | 17 |
| Io Note3 | | Config 1,2 | dBm/38.16MHz | -59 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Note 5: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

During T1, the UE shall be ready for the reception of uplink grant on PSCell from the first DL slot occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$, and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k_1$

Where,

$T_{RRCprocessingDelay}$ = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{BWPSwitchDelayRRC}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 1ms for SCS = 15kHz, and NR slot length = 0.5 ms for SCS = 30kHz.

*k1* is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} =$

26 slots, for SCS = 15kHz,

52 slots, for SCS = 30kHz.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 10.3.6 PSCell addition and release delay

### 10.3.6.0 Minimum conformance requirements

#### 10.3.6.0.1 NR PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving NR PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards NR PSCell no later than in subframe $n + T_{\text{config PSCell_withCCA}}$:

Where:

$T_{\text{config_PSCell_withCCA}} = T_{\text{RRC_delay}} + T_{\text{processing}} + T_{\text{search_withCCA}} + T_{\Delta\text{_withCCA}} + T_{\text{PSCell_DU_withCCA}} + 2$ ms

$T_{\text{RRC_delay}}$ is the RRC procedure delay as specified in TS 36.331 [29].

$T_{\text{processing}}$ is the software processing time needed by UE, including RF warm up period. $T_{\text{processing}} = 20$ ms.

$T_{\text{search_withCCA}}$ is the time for AGC settling and PSS/SSS detection.

- If the target cell is known, then $T_{\text{search_withCCA}} = 0$ ms. If the target cell is an unknown cell and the target cell Es/Iot $\geq$ -2 dB, then $T_{\text{search_withCCA}} = (3 + L_1)*$ Trs ms where $L_1$ is the number of SMTC occasions not available at the UE for AGC settling and PSS/SSS detection.

$T_{\Delta\text{_withCCA}}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta\text{_withCCA}} = (1+ L_2)*$Trs ms for a known or for an unknown PSCell where $L_2$ is the number of SMTC occasions not available at the UE for fine time tracking and acquiring full timing information.

$T_{\text{PSCell_DU_withCCA}}$ is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell:

$T_{\text{PSCell_DU_withCCA}} = (1+L_3)\times T_{\text{SSB,RO}} + 10$ ms; where:

- $L_3$ is the consecutive number of SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37].

- $T_{\text{SSB,RO}}$ is the SSB to PRACH occasion association period as defined in the table 8.1-1 of TS 38.213 [8].

- The value of L3 is limited by *PREAMBLE_TRANSMISSION_COUNTER*, which is increased when PRACH occasion is unavailable for PRACH transmission due to UL CCA failure as specified in TS 38.321 [12]. The UE behaviour when *PREAMBLE_TRANSMISSION_COUNTER* reaches the *preambleTransMax* is specified in TS 38.321 [12].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing. If UE is not provided SMTC configuration or measurement object on this frequency: the requirement in this clause is applied with Trs =5 ms assuming the SSB transmission periodicity is 5ms, and there is no requirement if the SSB transmission periodicity is not 5 ms.

NOTE 1: The PSCell addition delay including the potential extensions caused by $L_1$, $L_2$ and $L_3$ is limited by the T304 timer TS 38.331 [13].

The NR PSCell operating with CCA is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the NR PSCell configuration command:

- the UE has sent a valid measurement report for the NR PSCell being configured and
- One of the SSBs measured from the NR PSCell being configured remains detectable according to the cell identification conditions in the SMTC occasions available at the UE, as specified in section 9.3A of TS 38.133 [6],
- One of the SSBs measured from NR PSCell being configured also remains detectable during the NR PSCell configuration delay according to the cell identification conditions in the SMTC occasions available at the UE, as specified in section 9.3A of TS 38.133 [6].

otherwise it is unknown. The PCell interruption specified in TS 36.133 [23] section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29]

The normative reference for this requirement is TS 36.133 [23] clause 7.31A.2.

#### 10.3.6.0.2 NR PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is:

- configured with PCell, and
- configured with NR PSCell operating with CCA, and
- may also be configured with one or more SCells, and
- may also be configured with one or more NR SCells operating with CCA.

Upon receiving NR PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 36.331 [29] no later than in subframe $n+ T_{RRC_delay}$:

Where

$T_{RRC_delay}$ is the RRC procedure delay as specified in TS 36.331 [29].

The PCell interruption specified in TS 36.133 [23] section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

The normative reference for this requirement is TS 36.133 [23] clause 7.31A.3.

### 10.3.6.1 EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA

#### 10.3.6.1.1 Test purpose

This test is to verify that the NR PSCell addition and release delays on the carrier under CCA are within the requirements defined in TS 36.133 [23] clause 7.31A.2.

#### 10.3.6.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 onwards, supporting EN-DC, RRM measurements, and UL with a shared spectrum NR carrier.

#### 10.3.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.6.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.6.1.

#### 10.3.6.1.4 Test description

The test consists of five successive time periods with duration of T1, T2, T3, T4, T5 and T6 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. The point in time at which the RRC message to release measurement gap is transmitted from the test system defines the start of period T3. During T3, after measurement gap is released, the test system transmits the RRC message to the UE to add PSCell on radio channel 2.

The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

The test system shall observe the periodic reporting of CSI for PSCell during T5. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T5.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T5, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T6.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.3.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.6.1.4.1-1.

**Table 10.3.6.1.4.1-1: Test configurations for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA**

| Configuration | Description |
|---|---|
| 10.3.6.1-1 | LTE FDD,<br>With CCA: NR SCS 30 kHz, BW 40 MHz, TDD |
| 10.3.6.1-2 | LTE TDD,<br>With CCA: NR SCS 30 kHz, BW 40 MHz, TDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 10.3.6.1.4.1-2.

**Table 10.3.6.1.4.1-2: Initial conditions for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 4.5.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.3.6.1.4.1-3.
2. Message contents are defined in clause 10.3.6.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

**Table 10.3.6.1.4.1-3: General test parameters for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell on the carrier under CCA |
| Initial | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour cell | | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | | Cell1 | PCell on RF channel number 1. |
| | Neighbour Cell | | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| | Threshold RSRP | dBm | -96 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in TS 38.133 [6] clause 9.1.11.1 into account plus margin. Value includes Test Tolerance analysis. |
| | Time to Trigger | s | 0 | |
| DRX | | | OFF | Continuous monitoring of primary cell |
| DL CCA model | Dynamic channel access Note 1, 3 | | | As specified in clause D.7.2.1 |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | | As specified in clause D.7.2.2 |
| | Semi-static channel access Note 2,3 | | | |
| Measurement gap pattern Id | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | | | FR1 PRACH configuration 2 | Captured in A.7.1 |
| CQI/PMI periodicity and offset configuration index on cell2 | | | 2ms | CQI reporting for PSCell every uplink subframe |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T304 | | ms | 500 | |
| $L_{CCA_DL}$ | | | 5 | |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | ≥ $T_{identify_irat_cca_without_index}$ | $T_{identify_irat_cca_without_index}$ is defined in TS 36.133 [23] clause 8.1.2.4.21A and 8.1.2.4.22A. During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 3 | During this time the test system transmit the RRC messages to release measurement gap and add the PSCell |

| | | | |
|---|---|---|---|
| T4 | s | ≥ $T_{config_PSCell_withCCA}$ | During this time the UE adds the PSCell. $T_{config_PSCell_withCCA}$ is defined in TS 36.133 [23] clause 7.31A.2 |
| T5 | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T6 | s | 0.5 | During this time the UE releases the PSCell. |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

#### 10.3.6.1.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and PSCell (Cell 2) with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2). The test parameters for the two cells are given in Table 10.3.6.1.4.1-1 and 10.3.6.1.4.1-3.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall set the parameters according to Table 10.3.6.1.5-1 as appropriate. The SS shall enable DL and UL CCA model according to Table 10.3.6.1.5-1. T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration message* with event B1 configured.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall set T2 parameters according to Table 10.3.6.1.5-1 as appropriate. T2 starts.
6. The UE shall transmit a *MeasurementReport* message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2. Otherwise proceed with step 19.
7. The SS shall transmit an *RRCConnectionReconfiguration* message to release measurement gap. T3 starts.
8. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
9. During T3 the SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). T4 starts from the instant when the SS sends the last TTI containing the RRC message.
10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
11. The UE shall send a PRACH to PSCell during T4. The UE shall send PRACH no later than 82ms from the start of T4, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.
12. T5 starts.
13. During T5 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.
14. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T6 starts from the instant when the SS sends the last TTI containing the RRC message.
15. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

17. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

18. If the UE is not switched off, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including *PagingRecord* with *UE-Identity*) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 20, otherwise switches off the UE.

19. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

20. Repeat step 2-19 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.3.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.3.6.1.4.3-1: Common exception messages for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 for step 3<br>Table H.3.4-1 for step 6.<br>Table H.3.4-4 with condition INTER-RAT NR and EVENT B1<br>Table H.3.4-5 with condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.3.6.1-1, 10.3.6.1-2 | Table H.3.4-6 with condition SMTC.1 and SSB.2 FR1 |

#### 10.3.6.1.5 Test requirements

Tables 10.3.6.1.4.1-3 and 10.3.6.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA.

**Table 10.3.6.1.5-1: Cell Specific Parameters for EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA**

| Parameter | Unit | Config | Test | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| $P_{CCA_DL}$ for dynamic channel access Note 5,7 | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | | |
| $P_{CCA_DL}$ for semi-static channel access Note 6,7 | - | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 | | | | | |
| $P_{CCA_UL}$ for dynamic channel access Note 5,7 | - | 1 | 1 | | | | | |
| $P_{CCA_UL}$ for semi-static channel access Note 6,7 | - | 1 | 1 | | | | | |
| E-UTRA RF Channel Number | | 1,2 | 1 | | | | | |
| NR RF Channel Number | | 1,2 | 2 | | | | | |
| TDD configuration | | 1,2 | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | | 1,2 | 40: $N_{RB,c}$ = 106 | | | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | | | |

| | | | | |
|---|---|---|---|---|
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | |
| PDSCH Reference | | 1,2 | SR1.1 CCA | |
| RMSI CORESET Reference | | 1,2 | CR1.1 CCA | |
| Dedicated CORESET Reference | | 1,2 | CCR1.1 CCA | |
| OCNG Patterns | | 1,2 | OP.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| SMTC configuration | | 1,2 | SMTC.1 | |
| TRS Configuration | | 1,2 | TRS.1.2 TDD | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2 | N/A | -88.6 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | N/A | -85.6 |
| $\hat{E}_s/I_{ot}$ | | 1,2 | -infinity | 0 |
| $\hat{E}_s/N_{oc}$ | | 1,2 | -infinity | 0 |
| SS-RSRP Note3 | dBm/SCS | 1,2 | -infinity | -85.6 |
| Io Note3 | dBm/38.1MHz | 1,2 | N/A | -51.53 |
| Propagation condition | | 1,2 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall transmit the PRACH to PSCell at latest $T_{config_PSCell_withCCA}$ Note1 into T4.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T5.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T5

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T6.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31A.2 of TS 36.133 [23]:

$$T_{config_PSCell_withCCA} = T_{RRC_delay} + T_{processing} + T_{search_withCCA} + T_{\Delta_withCCA} + T_{PSCell_DU_withCCA} + 2 \text{ ms}$$

Where:

$T_{RRC_delay}$ = 20 ms

$T_{processing}$ = 20 ms

$T_{search_withCCA}$ = 0

$T_{\Delta_withCCA}$ = (1+ $L_2$)*20 ms

$T_{PSCell_DU_withCCA}$ = 20 ms.

$L_2$ is the number of SMTC occasions not available at the UE for fine time tracking and acquiring full timing information, where $L_2 \leq L_{CCA_DL}$.

# 10.4 Measurement procedures

## 10.4.1 Intra-frequency measurements

### 10.4.1.0 Minimum conformance requirements

#### 10.4.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

##### 10.4.1.0.1.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_CCA}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index_CCA}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index_CCA}$.

$$T_{identify_intra_without_index_CCA} = (T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA}) \text{ ms}$$

$$T_{identify_intra_with_index\ CCA} = (T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA} + T_{SSB_time_index_intra_CCA}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_CCA}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.1.1-1, 10.4.1.0.1.1-3 (deactivated SCell) .

$T_{SSB_time_index_intra_CCA}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.1.0.1.1-2 or 10.4.1.0.1.1-4 (deactivated SCell).

$T_{SSB_measurement_period_intra_CCA}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1, 10.4.1.0.1.2-2 (deactivated SCell). $CSSF_{intra}$: it is a carrier specific scaling factor and is determined

- according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

- $M_{pss/sss_sync_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36.

- $M_{meas_period_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{meas_period_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_w/o_gaps\ CCA}$ = 36.

- $M_{SSB_index_intra_CCA}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra\ CCA}$ = 72 samples. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra\ CCA}$ = 48 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_intra\ CCA}$ = 48 samples.

  N: is the UE Rx beam sweeping scaling factor. N = 12.

  When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

  When intra-frequency SMTC is partially overlapping with measurent gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2-2,

$K_{layer1_measurement}$=TBD

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.1.1-1, Table 10.4.1.0.1.1-2, Table 10.4.1.0.1.1-3, Table 10.4.1.0.1.1-4, Table 10.4.1.0.1.1-5 and Table 10.4.1.0.1.1-6 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.1.1-1, Table 10.4.1.0.1.1-2, Table 10.4.1.0.1.1-3, Table 10.4.1.0.1.1-4, Table 10.4.1.0.1.1-5 and Table 10.4.1.0.1.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3.

**Table 10.4.1.0.1.1-1: Time period for PSS/SSS detection (FR1)**

| Condition | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | max( 600ms, ceil((5+$L_{PSS/SSS}$) x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x (5+$L_{PSS/SSS}$) x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil((5+$L_{PSS/SSS}$) x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When DRX is not configured, $L_{PSS/SSS}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS}$< $L_{PSS/SSS,max}$. When DRX is configured, $L_{PSS/SSS}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS}$< $L_{PSS/SSS,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |
| NOTE 3: $L_{PSS/SSS,max}$ =7 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,max}$ =5 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{PSS/SSS,max}$ = 3 for DRX cycle>320ms. | |
| NOTE 4: Upon exceeding $L_{PSS/SSS,max}$, the UE is not required to meet the requirements for PSS/SSS detection. | |

**Table 10.4.1.0.1.1-2: Time period for time index detection (FR1)**

| Condition | $T_{SSB_time_index_intra_CCA}$ |
|---|---|

| | |
|---|---|
| No DRX | max(120ms, ceil((3+$L_{ind}$) x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x (3+$L_{ind}$) x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil((3+$L_{ind}$) x $K_p$) x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When DRX is not configured, $L_{ind}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When DRX is configured, $L_{ind}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |
| NOTE 3: $L_{ind,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,max}$ =2 for DRX cycle>320ms. | |
| NOTE 4: Upon exceeding $L_{ind,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure. | |

**Table 10.4.1.0.1.1-3: Time period for PSS/SSS detection, deactivated SCell (FR1)**

| Condition | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | (5 + $L_{PSS/SSS,deact}$) x *measCycleSCell* x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | (5 + $L_{PSS/SSS,\ deact}$) x max(*measCycleSCell*, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle>320ms | (5 + $L_{PSS/SSS,\ deact}$) x max(*measCycleSCell*, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When DRX is not configured, $L_{PSS/SSS,\ deact}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$. When DRX is configured, $L_{PSS/SSS,\ deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$.When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |
| NOTE 2: $L_{PSS/SSS,\ deact,max,}$ = 7 for Max(DRX cycle, *measCycleSCell*)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,\ deact,max}$ = 5 for 40ms<Max(DRX cycle, *measCycleSCell*)≤320ms, $L_{PSS/SSS,\ deact,max}$ = 3 for DRX cycle>320ms. | |
| NOTE 3: Upon exceeding $L_{PSS/SSS,\ deact,max,}$, the UE is not required to meet the requirements for PSS/SSS detection. | |

**Table 10.4.1.0.1.1-4: Time period for time index detection, deactivated SCell (FR1)**

| Condition | $T_{SSB_time_index_intra_CCA}$ |
|---|---|
| No DRX | (3+$L_{ind,deact}$) x *measCycleSCell* x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | (3+$L_{ind,deact}$) x max(*measCycleSCell*, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle>320ms | (3+$L_{ind,deact}$) x max(*measCycleSCell*, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When DRX is not configured, $L_{ind,deact}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} < L_{ind,deact,max}$. When DRX is configured, $L_{ind,deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} < L_{ind,deact,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |
| NOTE 2: $L_{ind,deact,max,}$ = 5 for Max(DRX cycle, *measCycleSCell*)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,deact,max}$ = 3 for 40ms<Max(DRX cycle, *measCycleSCell*)≤320ms, $L_{ind,deact,max}$ = 2 for DRX cycle>320ms. | |
| NOTE 3: Upon exceeding $L_{ind,deact,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure. | |

**Table 10.4.1.0.1.1-5: Time period for PSS/SSS detection, (FR2-2)**

| Condition | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | max(600ms, ceil(($M_{pss/sss_sync_w/o_gaps_CCA}$ x $K_{FR}$ + N x $L_{PSS/SSS}$) x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x ($M_{pss/sss_sync_w/o_gaps_CCA}$ x $K_{FR}$ + N x $L_{PSS/SSS}$) x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(($M_{pss/sss_sync_w/o_gaps_CCA}$ x $K_{FR}$ + N x $L_{PSS/SSS}$) x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$ |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

NOTE 2: When DRX is not configured, $L_{PSS/SSS}$ is the number of SMTC occasion groups not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS} < L_{PSS/SSS,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{PSS/SSS}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS} < L_{PSS/SSS,max}$. [A [DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle.

NOTE 3: $L_{PSS/SSS,max}$ =[7] for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,max}$ =[5] for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{PSS/SSS,max}$ = [3] for DRX cycle>320ms.

NOTE 4: Upon exceeding $L_{PSS/SSS,max}$, the UE is not required to meet the requirements for PSS/SSS detection.

NOTE 5: $K_{FR}$ is a scaling factor depending on the frequency range and SSB SCS. $K_{FR}$ = 1 if the SCS of the SSB of the cell being detected is 120 kHz, $K_{FR}$ = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and $K_{FR}$= 3 if the SCS of the SSB of the cell being detected is 960 kHz.

**Table 10.4.1.0.1.1-6: Time period for PSS/SSS detection, deactivated SCell (FR2-2)**

| DRX cycle | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | Ceil(($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ + N x $L_{PSS/SSS,deact}$) x $K_p$) x *measCycleSCell* x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | Ceil(($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ + N x $L_{PSS/SSS,deact}$) x $K_p$) x max(*measCycleSCell*, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle> 320ms | Ceil(($M_{pss/sss_sync_w/o_gaps}$ x $K_{FR}$ + N x $L_{PSS/SSS,deact}$) x $K_p$) x max(*measCycleSCell*, DRX cycle) x $CSSF_{intra}$ |

NOTE 1: When DRX is not configured, $L_{PSS/SSS,\ deact}$ is the number of SMTC occasions groups not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{PSS/SSS,\ deact}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$.When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle.

NOTE 2: $L_{PSS/SSS,\ deact,max,}$ = [7] for Max(DRX cycle, *measCycleSCell*)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,\ deact,max}$ = [5] for 40ms<Max(DRX cycle, *measCycleSCell*)≤320ms, $L_{PSS/SSS,\ deact,max}$ = [3] for DRX cycle>320ms.

NOTE 3: Upon exceeding $L_{PSS/SSS,\ deact,max,}$, the UE is not required to meet the requirements for PSS/SSS detection.

NOTE 4: Void

NOTE 5: $K_{FR}$ is a scaling factor depending on the frequency range and SSB SCS. $K_{FR}$ = 1 if the SCS of the SSB of the cell being detected is 120 kHz, $K_{FR}$ = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and $K_{FR}$= 3 if the SCS of the SSB of the cell being detected is 960 kHz.

**Table 10.4.1.0.1.1-7: Time period for time index detection (FR2-2)**

| DRX cycle | $T_{SSB_time_index_intra_CCA}$ |
|---|---|
| No DRX | Max(200ms, ceil(($M_{SSB_index_intra_CCA} + N \times L_{ind}) \times K_p$) $\times$ SMTC period) $\times CSSF_{intra}$ |
| DRX cycle≤ 320ms | Max(200ms, ceil(1.5 $\times$ (($M_{SSB_index_intra} + N \times L_{ind}) \times K_p$) $\times$ Max(SMTC period, DRX cycle)) $\times CSSF_{intra}$ |
| DRX cycle> 320ms | ceil(($M_{SSB_index_intra} + N \times L_{ind}) \times K_p$) $\times$ DRX cycle $\times CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When DRX is not configured, $L_{ind}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When DRX is configured, $L_{ind}$ is the number of DRX cycles groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. | |
| NOTE 3: $L_{ind,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,max}$ =2 for DRX cycle>320ms. | |
| NOTE 4: Upon exceeding $L_{ind,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure. | |

**Table 10.4.1.0.1.1-8: Time period for time index detection, deactivated SCell (FR2-2)**

| DRX cycle | $T_{SSB_time_index_intra_CCA}$ |
|---|---|
| No DRX | Max(200ms, ceil(($M_{SSB_index_intra_CCA} + N \times L_{ind,deact}) \times K_p$) $\times$ SMTC period) $\times CSSF_{intra}$ |
| DRX cycle≤ 320ms | Max(200ms, ceil(1.5 $\times$ (($M_{SSB_index_intra} + N \times L_{ind,deact}$) $\times K_p$) $\times$ Max(SMTC period, DRX cycle)) $\times CSSF_{intra}$ |
| DRX cycle> 320ms | ceil(($M_{SSB_index_intra} + N \times L_{ind,deact}) \times K_p$) $\times$ DRX cycle $\times CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 2: When DRX is not configured, Lind,deact is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} \leq L_{ind,deact,max}$. When DRX is configured, $L_{ind,deact}$ is the number of DRX cycles groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} \leq L_{ind,deact,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. | |
| NOTE 3: $L_{ind,deact,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,deact,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,deact,max}$ =2 for DRX cycle>320ms. | |
| NOTE 4: Upon exceeding $L_{ind,deact,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.1.

### 10.4.1.0.1.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 10.4.1.0.1.2-1, 10.4.1.0.1.2-2 (deactivated SCell).

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 10.4.1.0.1.2-1, Table 10.4.1.0.1.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

**Table 10.4.1.0.1.2-1: Measurement period for intra-frequency measurements without gaps (FR1)**

| Condition | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | max(200ms, ceil((5+$L_{meas}$) x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x (5+$L_{meas}$) x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil((5+$L_{meas}$) x $K_p$ ) x DRX cycle x $CSSF_{intra}$ |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

NOTE 2: When DRX is not configured, $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. When DRX is configured, $L_{meas}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.

NOTE 3: $L_{meas,max}$ = 7 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,max}$ = 5 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{meas,max}$ = 3 for DRX cycle>320ms.

NOTE 4: Upon exceeding $L_{meas,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.

**Table 10.4.1.0.1.2-2: Measurement period for intra-frequency measurements without gaps, deactivated SCell (FR1)**

| Condition | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | (5+$L_{meas,deact}$) x *measCycleSCell* x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | (5+$L_{meas,\ deact}$) x max(*measCycleSCell*, 1.5xDRX cycle) x $CSSF_{intra}$ |
| DRX cycle>320ms | (5+$L_{meas,\ deact}$) x max(*measCycleSCell*, DRX cycle) x $CSSF_{intra}$ |

NOTE 1: When DRX is not configured, $L_{meas,deact}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,\ ,deact\ ,max}$. When DRX is configured, $L_{meas,deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,\ ,deact\ ,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.

NOTE 2: $L_{meas,\ ,deact\ ,max,}$ = 7 for Max(DRX cycle, *measCycleSCell*)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,\ ,deact\ ,max}$ = 5 for 40ms<Max(DRX cycle, *measCycleSCell*)≤320ms, $L_{meas,\ ,deact\ ,max}$ = 3 for DRX cycle>320ms.

NOTE 3: Upon exceeding $L_{meas,deact,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.

**Table 10.4.1.0.1.2-3: Measurement period for intra-frequency measurements without gaps (FR2-2)**

| DRX cycle | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | max(400ms, ceil(($M_{meas_period_w/o_gaps_CCA}$ + N x $L_{meas}$) x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x ($M_{meas_period_w/o_gaps_CCA}$ + N x $L_{meas}$) x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(($M_{meas_period_w/o_gaps_CCA}$ + N x $L_{meas}$) x $K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra}$ |

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

NOTE 2: When DRX is not configured, $L_{meas}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{meas}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. . [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least

| | |
|---|---|
| | one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. |
| NOTE 3: | $L_{meas,max}$ = [7] for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,max}$ = [5] for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{meas,max}$ = [3] for DRX cycle>320ms. |
| NOTE 4: | Upon exceeding $L_{meas,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure. |

**Table 10.4.1.0.1.2-4: Measurement period for intra-frequency measurements without gaps, deactivated SCell (FR2-2)**

| DRX cycle | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | $Ceil((M_{meas_period_w/o_gaps_CCA} + N \times L_{meas,deact}) \times K_p) \times$ *measCycleSCell* $\times CSSF_{intra}$ |
| DRX cycle≤ 320ms | $Ceil((M_{meas_period_w/o_gaps_CCA} + N \times L_{meas,deact}) \times K_p) \times$ max(*measCycleSCell*, 1.5xDRX cycle) $\times CSSF_{intra}$ |
| DRX cycle> 320ms | $Ceil((M_{meas_period_w/o_gaps_CCA} + N \times L_{meas,deact}) \times K_p) \times$ max(*measCycleSCell*, DRX cycle) $\times CSSF_{intra}$ |

| | |
|---|---|
| NOTE 1: | When DRX is not configured, $L_{meas,deact}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,,deact,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{meas,deact}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,,deact,max}$. [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. |
| NOTE 2: | $L_{meas,,deact,max,}$ = [7] for Max(DRX cycle, *measCycleSCell*)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,,deact,max}$ = [5] for 40ms<Max(DRX cycle, *measCycleSCell*)≤320ms, $L_{meas,,deact,max}$ = [3] for DRX cycle>320ms. |
| NOTE 3: | Upon exceeding $L_{meas,deact,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure. |

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.2.

### 10.4.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

#### 10.4.1.0.2.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_CCA}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index_CCA}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index\ CCA}$.

$$T_{identify_intra_without_index\ CCA} = T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA} \text{ ms}$$

$$T_{identify_intra_with_index_CCA} = T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA} + T_{SSB_time_index_intra_CCA}$$

Where:

$T_{PSS/SSS_sync_intra_CCA}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.2.1-1.

$T_{SSB_time_index_intra_CCA}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.1.0.2.1-2.

$T_{SSB_measurement_period_intra_CCA}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.2.2-1 or 10.4.1.0.2.1-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36.

$M_{meas_period_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{meas_period_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_w/o_gaps\ CCA}$ = 36.

- $M_{SSB_index_intra_CCA}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra\ CCA}$ = 72 samples. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra\ CCA}$ = 48 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_intra\ CCA}$ = 48 samples.

N: is the UE Rx beam sweeping scaling factor. N = 12.

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.1-1, Table 10.4.1.0.2.1-2 and Table 10.4.1.0.2.1-3 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.1-1, Table 10.4.1.0.2.1-2 and Table 10.4.1.0.2.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3.

**Table 10.4.1.0.2.1-1: Time period for PSS/SSS detection (FR1)**

| Condition | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | max(600ms, (5+$L_{PSS/SSS,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x (5+$L_{PSS/SSS,gaps}$)) x max(DRX cycle, MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle>320ms | (5+$L_{PSS/SSS,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When DRX is not configured, $L_{PSS/SSS,gaps}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$. When DRX is configured, $L_{PSS/SSS,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |
| NOTE 2: $L_{PSS/SSS,gaps,max,}$ =7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,gaps,max}$ =5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{PSS/SSS,gaps,max}$ =3 for DRX cycle>320ms. | |
| NOTE 3: Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the requirements for PSS/SSS detection. | |

**Table 10.4.1.0.2.1-2: Time period for time index detection (FR1)**

| Condition | $T_{SSB_time_index_intra_CCA}$ |
|---|---|
| No DRX | max(120ms, (3+$L_{ind,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil(1.5x (3+$L_{ind,gaps}$)) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$) |
| DRX cycle>320ms | (3+$L_{ind,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. When DRX is configured, $L_{ind,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$. | |

| | |
|---|---|
| NOTE 2: | $L_{ind,gaps,max,}$ = 5 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,gaps,max}$ = 3 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{ind,gaps,max}$ = 2 for DRX cycle>320ms. |
| NOTE 3: | Upon exceeding $L_{ind,gaps,max}$ over the $T_{SSB_time_index_intra_CCA}$ period of time, the UE has to restart the time index detection procedure. |

**Table 10.4.1.0.2.1-3: Time period for PSS/SSS detection (FR2-2)**

| DRX cycle | $T_{PSS/SSS_sync_intra_CCA}$ |
|---|---|
| No DRX | max(600ms, ($M_{pss/sss_sync_with_gaps_CCA}$ x $K_{FR}$ + N x $L_{ind,gaps}$ ) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x ($M_{pss/sss_sync_with_gaps_CCA}$ x $K_{FR}$ + N x $L_{ind,gaps}$ )) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ($M_{pss/sss_sync_with_gaps_CCA}$ x $K_{FR}$ + N x $L_{ind,gaps}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |
| NOTE 1: | When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{ind,gaps}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$.[A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. |
| NOTE 2: | $L_{ind,gaps,max,}$ = [5] for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,gaps,max}$ = [3] for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{ind,gaps,max}$ = [2] for DRX cycle>320ms. |
| NOTE 3: | Upon exceeding $L_{ind,gaps,max}$ over the $T_{SSB_time_index_intra_CCA}$ period of time, the UE has to restart the time index detection procedure. |
| NOTE 4: | $K_{FR}$ is a scaling factor depending on the frequency range and SSB SCS. $K_{FR}$ = 1 if the SCS of the SSB of the cell being detected is 120 kHz, $K_{FR}$ = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and $K_{FR}$ = 3 if the SCS of the SSB of the cell being detected is 960 kHz. |

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.1.

### 10.4.1.0.2.2 Intra-frequency measurement period

The measurement period for intra-frequency measurements with gaps is as shown in table 10.4.1.0.2.2-1.

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.2-1 and 10.4.1.0.2.2-2 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 10.4.1.0.2.2-1 and 10.4.1.0.2.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in TS 38.133 [6] clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

**Table 10.4.1.0.2.2-1: Measurement period for intra-frequency measurements with gaps (FR1)**

| Condition | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | max(200ms, (5+$L_{meas,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x (5+$L_{meas,gaps}$)) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | (5+$L_{meas,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$ |

NOTE 1: When DRX is not configured, $L_{meas,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. When DRX is configured, $L_{meas,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.
NOTE 2: $L_{meas,gaps,max}$ = 7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,gaps,max}$ = 5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{meas,gaps,max}$ = 3 for DRX cycle>320ms.
NOTE 3: Upon exceeding $L_{meas,gaps,max}$ over the $T_{SSB_measurement_period_intra_CCA}$ period of time, the UE has to restart the measurement procedure.

**Table 10.4.1.0.2.2-2: Measurement period for intra-frequency measurements with gaps (FR2-2)**

| DRX cycle | $T_{SSB_measurement_period_intra_CCA}$ |
|---|---|
| No DRX | max(400ms, ($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$ ) x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x ($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$ )) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$ |
| DRX cycle>320ms | ($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$ ) x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

NOTE 1: When DRX is not configured, $L_{meas,gaps}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{meas,gaps}$ is the number of DRX cycle groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP.
NOTE 2: $L_{meas,gaps,max}$ = 7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,gaps,max}$ = 5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{meas,gaps,max}$ = 3 for DRX cycle>320ms.
NOTE 3: Upon exceeding $L_{meas,gaps,max}$ over the $T_{SSB_measurement_period_intra_CCA}$ period of time, the UE has to restart the measurement procedure.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.2.

### 10.4.1.0.3 Minimum conformance requitements for intra-frequency RSSI and channel occupancy measurements

#### 10.4.1.0.3.1 Intra-frequency RSSI measurements

An RSSI measurement is defined as an intra-frequency measurement provided that the RSSI measurement bandwidth is fully contained within the current carrier bandwidth of the UE.

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [10] on one or more serving carriers operating with CCA, TS 37.213 [37], if the carrier(s) are indicated by higher layers [13], and report the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [13] occurring with a configured RSSI measurement timing configuration periodicity [13], *rmtc-Periodicity*.

The UE can perform RSSI measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

For performing intra-frequency RSSI measurement in FR2-2, UE shall assume the configured RSSI measurement resources are QCL-ed with TypeD to the DL RS associated with the TCI state provided in the RMTC configuration. If no TCI state is provided in the RMTC configuration, UE shall assume the configured RSSI measurement resources are

QCL-ed with TypeD to one of the latest received PDSCH and the latest monitored CORESET in the active BWP of the current carrier in FR2-2.

For RSSI measurement in FR2-2 with SCS of 480 kHz or 960 kHz, the RSSI measurement results shall be derived based on symbols configured by RMTC except for the first symbol and the last symbol in RMTC, and there is no requirement when *measDurationSymbols* is configured as 1.

The measurement period for intra-frequency RSSI measurements without measurement gaps is as shown in Table 10.4.1.0.3.1-1 and Table 10.4.1.0.3.1-2, for FR1, and in TS 38.133 [6] Table 9.2A.7.4-1 and 38.133 [6] Table 9.2A.7.5-1 for FR2-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 10.4.1.0.3.1-3, for FR1 and in Table 10.4.1.0.3.1-6 for FR2-2.

**Table 10.4.1.0.3.1-1: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are overlapping (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{outside_gap,\ i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap. | |

**Table 10.4.1.0.3.1-2: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are not overlapping (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$**rmtc-Periodicity*) |
| DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$*max(*rmtc-Periodicity*, DRXcycle length)) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $N_{intra\text{-}MO}$ is defined as the number of measurement objects that can be measured without gaps | |

**Table 10.4.1.0.3.1-3: Measurement period for intra-frequency RSSI measurements with measurement gaps (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle length) x $CSSF_{intra}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

**Table 10.4.1.0.3.1-4: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are overlapping (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{outside_gap,\ i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap. | |

**Table 10.4.1.0.3.1-5: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are not overlapping (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$**rmtc-Periodicity*) |
| DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$*max(*rmtc-Periodicity*, DRX cycle)) |

| |
|---|
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 |
| NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps |

**Table 10.4.1.0.3.1-6: Measurement period for intra-frequency RSSI measurements with measurement gaps (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{intra}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this clause shall meet the RSSI measurement accuracy requirement in TS 38.133 [6] clause 10.1.34.1. The reported RSSI measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in TS 38.133 [6] clause 10.1.34.3.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.1.

### 10.4.1.0.3.2 Intra-frequency channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more serving carrier frequencies indicated by higher layers [13], based on RSSI samples provided by the physical layer.

The UE can perform channel occupancy measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

The measurement period for intra-frequency channel occupancy measurements without measurement gap is as shown in Table 10.4.1.0.3.2-1 and Table 10.4.1.0.3.1-2 for FR1, and in Table 10.4.1.0.3.2-4 and Table 10.4.1.0.3.1-5 for FR2-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 10.4.1.0.3.2-3 for FR1, and in Table 10.4.1.0.3.2-6 for FR2-2 .

**Table 10.4.1.0.3.2-1: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are overlapping (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: $CSSF_{outside_gap,i}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap. | |

**Table 10.4.1.0.3.2-2: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are not overlapping (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInt*erval, $N_{intra-MO}$**rmtc-Periodicity*) |
| DRX | max(*reportInt*erval, $N_{intra-MO}$*max(*rmtc-Periodicity*, DRXcycle length)) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps | |

**Table 10.4.1.0.3.2-3: Measurement period for intra-frequency Channel Occupancy measurements with measurement gaps (FR1)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle length) x $CSSF_{intra}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

**Table 10.4.1.0.3.2-4: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are overlapping (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{outside_gap,\ i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap. | |

**Table 10.4.1.0.3.2-5: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are not overlapping (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$**rmtc-Periodicity*) |
| DRX | max(*reportInt*erval, $N_{intra\text{-}MO}$*max(*rmtc-Periodicity*, DRX cycle)) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $N_{intra\text{-}MO}$ is defined as the number of measurement objects that can be measured without gaps | |

**Table 10.4.1.0.3.2-6: Measurement period for intra-frequency Channel Occupancy measurements with measurement gaps (FR2-2)**

| Condition NOTE1,2 | $T_{RSSI_measurement_period_intra_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{intra}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1<br>NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The channel occupancy measurement performed and reported according to this clause shall meet the channel occupancy measurement accuracy requirements in TS 38.133 [6] clause 10.1.35.1. The reported channel occupancy measurement values contained in measurement reports shall be based on the measurement reporting range specified in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.2.

### 10.4.1.1 EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

#### 10.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.1.1 and 10.4.1.0.1.2.

#### 10.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting intra-frequency measurements on shared channel access.

#### 10.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.1.

#### 10.4.1.1.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.1.4.1-1 and 10.4.1.1.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

##### 10.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.1.4.1-1.

**Table 10.4.1.1.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Configuration | Description |
|---|---|
| 10.4.1.1-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.1.1-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.1.4.1-2.

**Table 10.4.1.1.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.1.1.4.1-3.
2. Message contents are defined in clause 10.4.1.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 10.4.1.1.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | |
| NR RF Channel Number | | Config 1,2 | 1, 2 | |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell | | Config 1,2 | NR cell 3 | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 5 | |

### 10.4.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 with the corresponding offset according to Table 10.4.1.1.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.1.1.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 842ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.1.1.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset set as per Table 10.4.1.1.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

#### 10.4.1.1.5 Test requirements

Tables 10.4.1.1.4.1-3 and 10.4.1.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA.

**Table 10.4.1.1.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 2 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Pattern | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | DBT.1 | | DBT.1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_intra_cca}$ | | $T_{PSS/SSS_sync_intra_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91 | -89.8 | -Infinity | -88 |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1,2 | 4 | -2.59 | -Infinity | 0.65 |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1,2 | 4 | 5.2 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -54.25 | -58.49 | -54.25 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.1.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.1.2 Void

## 10.4.1.3 Void

## 10.4.1.4 EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

### 10.4.1.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.2.1 and 10.4.1.0.2.2.

### 10.4.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier, supporting intra-freq measurements on shared channel access and long DRX.

### 10.4.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.4.

### 10.4.1.4.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.4.4.1-1 and 10.4.1.4.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is

indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern #0 and DRX are configured on the UE.

#### 10.4.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.4.4.1-1.

**Table 10.4.1.4.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA**

| Configuration | Description |
|---|---|
| 10.4.1.4-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.1.4-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.4.4.1-2.

**Table 10.4.1.4.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.1.4.4.1-3.
2. Message contents are defined in clause 10.4.1.4.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 10.4.1.4.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | |
| NR RF Channel Number | | Config 1,2 | 1, 2 | |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell | | Config 1,2 | NR cell 3 | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | |
| Measurement gap type | | Config 1,2 | Per-UE gaps | |

| | | | | |
|---|---|---|---|---|
| Measurement gap repitition periodicity | ms | Config 1,2 | 40 | |
| Measurement gap length | ms | Config 1,2 | 6 | |
| Measurement gap offset | ms | Config 1,2 | 39 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 5 | |

#### 10.4.1.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.1.4.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with gap configuration and event A3 offset according to Table 10.4.1.4.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.1.1.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 842ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit

*RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.1.4.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset set as per Table 10.4.1.4.4.1-3<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset 39<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.7-1 with condition DRX.1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

#### 10.4.1.4.5 Test requirements

Tables 10.4.1.4.4.1-3 and 10.4.1.4.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA.

**Table 10.4.1.4.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 2 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Pattern | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | DBT.1 | | DBT.1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_intra_cca}$ | | $T_{PSS/SSS_sync_intra_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91 | -89.8 | -Infinity | -88 |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1,2 | 4 | -2.59 | -Infinity | 0.65 |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1,2 | 4 | 5.2 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -54.25 | -58.49 | -54.25 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.1.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2 Inter-frequency measurements

### 10.4.2.0 Minimum conformance requirements

#### 10.4.2.0.1 Minimum conformance requirements for inter-frequency measurements

##### 10.4.2.0.1.1 Inter-frequency cell identification

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_cca_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell, in carrier frequencies with CCA, within $T_{identify_inter_cca_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block, in carrier frequencies with CCA, of an already detected cell within $T_{identify_inter_cca_without_index}$.

$$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})\ ms$$

$$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})\ ms$$

Where:

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in Table 10.4.2.0.1.1-1 and Table 10.4.2.0.1.1-3.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in Table 10.4.2.0.1.1-2 and Table 10.4.2.0.1.1-4.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in Table 10.4.2.0.1.2-1 and 10.4.2.0.1.2-2.

$CSSF_{inter}$ : it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_inter_CCA}$: For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_inter\ CCA}$ = 96. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_inter\ CCA}$ = 60. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_inter\ CCA}$ = 60.

$M_{SSB_index_inter_CCA}$: For a UE supporting FR2-2 power class 2 or 3, $M_{SSB_index_inter\ CCA}$ = 48 samples. For a UE supporting FR2 power class 1, $M_{SSB_index_inter\ CCA}$ = 72 samples

$M_{meas_period_inter_CCA}$: For a UE supporting FR2-2 power class 1, $M_{meas_period_inter\ CCA}$ = 96. For a UE supporting FR2-2 power class 2, $M_{meas_period_inter\ CCA}$ = 60. For a UE supporting FR2-2 power class 3, $M_{meas_period_inter\ CCA}$ = 60

**Table 10.4.2.0.1.1-1: Time period for PSS/SSS detection (FR1)**

| Condition NOTE1,2,3,4 | $T_{PSS/SSS_sync_inter_cca}$ |
|---|---|
| No DRX | max(600ms, (8+$L_{PSS/SSS,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | max(600ms, ceil((8+$L_{PSS/SSS,gaps}$)x1.5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle > 320ms | (8+$L_{PSS/SSS,gaps}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 38.133 [6] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: When DRX is not configured, $L_{PSS/SSS,gaps}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_inter_cca}$, for PSS/SSS detection, where $L_{PSS/SSS,gaps} \le L_{PSS/SSS,gaps,max}$. When DRX is configured, $L_{PSS/SSS,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_inter_cca}$, for PSS/SSS detection, where $L_{PSS/SSS,gaps} \le L_{PSS/SSS,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{inter}$. | |
| NOTE 4: $L_{PSS/SSS,gaps,max}$ = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms $L_{PSS/SSS,gaps,max}$ = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{PSS/SSS,gaps,max}$ = 5 for DRX cycle > 320 ms. | |

Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 10.4.2.0.1.1-2: Time period for time index detection (FR1)**

| Condition NOTE1,2,3,4 | $T_{SSB_time_index_inter_cca}$ |
|---|---|
| No DRX | max(120ms, (3+ $L_{ind,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | max(120ms, ceil((3+ $L_{ind,gaps}$) x 1.5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle > 320ms | (3 + $L_{ind,gaps}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 38.133 [6] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_inter_cca}$ for time index identification, where $L_{ind,gaps} \le L_{ind,gaps,max}$. When DRX is configured, $L_{ind,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_inter_cca}$ for time index identification, where $L_{ind,gaps} \le L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{inter}$. | |
| NOTE 4: $L_{ind,gaps,max}$ = 5 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{ind,gaps,max}$ = 3 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{ind,gaps,max}$ = 2 for DRX cycle > 320 ms. | |

The UE shall restart the time index detection upon exceeding $L_{ind,gaps,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 10.4.2.0.1.1-3: Time period for PSS/SSS detection, (FR2-2)**

| Condition NOTE | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | Max(600ms, ceil($M_{pss/sss_sync_inter_CCA}$+ [$N_{RxBeam}$] x $L_{PSS/SSS,gaps}$))× Max(MGRP, SMTC period)) × $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | Max(600ms, ceil(1.5 × $M_{pss/sss_sync_inter_CCA}$+ [$N_{RxBeam}$] x $L_{PSS/SSS,gaps}$)) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ |
| DRX cycle > 320ms | Ceil($M_{pss/sss_sync_inter_CCA}$+ [$N_{RxBeam}$] x $L_{PSS/SSS,gaps}$)× DRX cycle × $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |
| NOTE 3: When DRX is not configured, $L_{PSS/SSS,gaps}$ is the number of SMTC occasion groups not available at the UE during $T_{PSS/SSS_sync_inter_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$. A SMTC occasion group consists of $N_{RxBeam}$ consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{PSS/SSS}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_inter_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$ . [A DRX occasion group consists of $N_{RxBeam}$ consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. | |
| NOTE 4: $L_{PSS/SSS,gaps}$ = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms $L_{PSS/SSS,gaps}$ = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{PSS/SSS,gaps}$ = 5 for DRX cycle > 320 ms | |

Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 10.4.2.0.1.1-4: Time period for time index detection (FR2-2)**

| Condition NOTE1,2,3,4 | $T_{SSB_time_index_inter_cca}$ |
|---|---|
| No DRX | max(120ms, ceil($M_{SSB_index_inter_CCA}$ + [$N_{RxBeam}$] x $L_{ind,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | max(120ms, ceil($M_{SSB_index_inter_CCA}$ + [$N_{RxBeam}$] x $L_{ind,gaps}$) x 1.5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle > 320ms | ceil($M_{SSB_index_inter_CCA}$ + [$N_{RxBeam}$] x $L_{ind,gaps}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_inter_cca}$, for time index identification, where $L_{ind,gaps} ≤ L_{ind,gaps,max}$. When DRX is configured, $L_{ind,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_inter_cca}$, for time index identification, where $L_{ind,gaps} ≤ L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{inter}$. | |
| NOTE 3: $L_{ind,gaps,max}$ = [5] for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{ind,gaps,max}$ = [3] for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{ind,gaps,max}$ = [2] for DRX cycle > 320 ms. | |

The UE shall restart the time index detection upon exceeding $L_{ind,gaps,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.4.

### 10.4.2.0.1.2 Inter-frequency measurements

When measurement gaps are provided for inter-frequency measurements in carrier frequencies with CCA, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.28, 10.1.30 and 10.1.32, respectively, as shown in Table 10.4.2.0.1.2-1:

**Table 10.4.2.0.1.2-1: Measurement period for inter-frequency measurements with gaps**

| Condition NOTE1,2,3,4 | $T_{SSB_measurement_period_inter_cca}$ |
|---|---|
| No DRX | max(200ms, (8+ $L_{meas}$) x max(MGRP, SMTC period)) x $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | max(200ms, ceil((8+ $L_{meas}$) x 1.5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle > 320ms | (8+ $L_{meas}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 38.133 [6] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: When DRX is not configured, $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_NR_cca}$, for inter-frequency measurements with gaps, where $L_{meas} \leq L_{meas,max}$. When DRX is configured, $L_{meas}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_NR_cca}$, for inter-frequency measurements with gaps, where $L_{meas} \leq L_{meas,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{inter}$. | |
| NOTE 4: $L_{meas,max}$ = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{meas,max}$ = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{meas,max}$ = 5 for DRX cycle > 320 ms. | |

The UE shall restart the measurement upon exceeding $L_{meas,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

The UE shall stop the measurement attempts on the SSB of a cell and perform the detection procedure again, like for any other SSB, when the following conditions are met:

- $L_{meas} > L_{meas,max}$, and
- The time period of unsuccessful measurement attempts exceeds the maximum time required for the cell to remain known as defined in TS 38.133 [6] clause 9.3A.6.3.

**Table 10.4.2.0.1.2-2: Measurement period for inter-frequency measurements with gaps (FR2-2)**

| Condition NOTE1,2,3,4 | $T_{SSB_measurement_period_inter_cca}$ |
|---|---|
| No DRX | max(200ms, ceil($M_{meas_period_inter_CCA}$ + [$N_{RxBeam}$] x $L_{meas,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{inter}$ |
| DRX cycle ≤ 320ms | max(200ms, ceil($M_{meas_period_inter_CCA}$ + [$N_{RxBeam}$] x $L_{meas,gaps}$) x 1.5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ |
| DRX cycle > 320ms | ceil($M_{meas_period_inter_CCA}$ + [$N_{RxBeam}$] x $L_{meas,gaps}$) x DRX cycle x $CSSF_{inter}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1 | |
| NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 38.133 [6] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |
| NOTE 3: When DRX is not configured, $L_{meas,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_inter_cca}$, for inter-frequency measurements with gaps, where $L_{meas,gaps} \leq L_{meas,gaps,max}$. When DRX is configured, $L_{meas,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_NR_cca}$, for inter-frequency measurements with gaps, where $L_{meas,gaps} \leq L_{meas,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{inter}$. | |
| NOTE 4: $L_{meas,gaps,max}$ = [12] for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{meas,gaps,max}$ = [8] for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{meas,gaps,max}$ = [5] for DRX cycle > 320 ms. | |

The UE shall restart the measurement upon exceeding $L_{meas,gap,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.5.

#### 10.4.2.0.1.3 Inter-frequency RSSI measurements

An RSSI measurement is defined as an inter-frequency measurement provided that the RSSI measurement bandwidth is not contained within the current carrier bandwidth of the UE.

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [10] on one or more inter-frequency carriers operating with CCA, TS 37.213 [37], if the carrier(s) are indicated by higher layers [13], and report the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [13] occurring with a configured RSSI measurement timing configuration periodicity [13], *rmtc-Periodicity*. The requirements apply if *rmtc-SubframeOffset* [13] is configured.

For performing inter-frequency RSSI measurement in FR2-2,

- If a UE has serving cell in FR2-2,
  - If the TCI state is provided in RMTC configuration of FR2-2, the UE shall assume the configured RSSI measurement resources are QCL-ed with TypeD to the DL RS associated with the TCI state provided in the RMTC configuration. The UE does not expect to be configured with an explicit TCI-state in RMTC-Config with a reference serving cell in FR1 or FR2-1. If no TCI state is provided in the RMTC configuration, the UE shall assume the configured RSSI measurement resources are QCL-ed with TypeD to one of the latest received PDSCH and the latest monitored CORESET in the active BWP of a serving carrier in FR2-2.
- If a UE has no serving cell in FR2-2,
  - The UE does not expect that a TCI state is provided in RMTC configuration. It is up to UE implementation how to determine the spatial domain filter for the inter-frequency RSSI measurement in FR2-2, and no requirements are defined.

For RSSI measurement in FR2-2 with SCS of 480 kHz or 960 kHz, the RSSI measurement results shall be derived based on symbols configured by RMTC except for the first symbol and the last symbol in RMTC, and there is no requirements when *measDurationSymbols* is configured as 1.

**Table 10.4.2.0.1.3-1: Measurement period for inter-frequency RSSI measurements with gaps**

| Condition NOTE1,2,3,4 | $T_{RSSI_measurement_period_inter_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{inter}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{inter}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{inter}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency RSSI measurements. The RSSI measurement duration and the measurement gap shall be aligned, and the following additional condition shall be fulfilled:

- Entire RSSI measurement duration is contained in the measurement gap.

The RSSI measurement performed and reported according to this clause shall meet the RSSI measurement accuracy requirement in TS 38.133 [6] Clause 10.1.34.2. The reported RSSI measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in TS 38.133 [6] Clause 10.1.34.3.

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.8.

#### 10.4.2.0.2 Minimum conformance requirements for channel occupancy measurements

##### 10.4.2.0.2.1 Channel occupancy measurement reporting

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers [13], based on RSSI samples provided by the physical layer. The requirements apply if *rmtc-SubframeOffset* [13] is configured.

**Table 10.4.2.0.2.1-1: Measurement period for inter-frequency Channel Occupancy measurements with gaps**

| Condition NOTE1,2,3,4 | $T_{CO_measurement_period_inter_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{inter}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{inter}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: $CSSF_{inter}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps. | |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency channel occupancy measurements. The RSSI measurement duration used for channel occupancy measurement and the measurement gap shall be aligned, and the following additional condition shall be fulfilled:

- Entire RSSI measurement duration is contained in the measurement gap.

The channel occupancy measurement performed and reported according to this clause shall meet the channel occupancy measurement accuracy requirements in TS 38.133 [6] Clause 10.1.35.2. The reported channel occupancy measurement values contained in measurement reports shall be based on the measurement reporting range specified in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.9.

### 10.4.2.1 Void

### 10.4.2.2 Void

### 10.4.2.3 EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used

#### 10.4.2.3.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in non-DRX without SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

#### 10.4.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier.

#### 10.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.3.

#### 10.4.2.3.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test configurations and parameters are given in Tables 10.4.2.3.4.1-1, 10.4.2.3.4.1-2, and 10.4.2.3.4.1-3.

In this test 1 measurement gap pattern configuration # 0 as defined in Table 10.4.2.3.4.1-3 is provided.

##### 10.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.3.4.1-1.

**Table 10.4.2.3.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.2.3-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.3-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.3.4.1-2.

**Table 10.4.2.3.4.1-2: Initial conditions for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.3.4.1-3.
2. Message contents are defined in clause 10.4.2.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.3.4.1-3: General test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| Neighbour cell | | Config 1,2 | NR cell 3 | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 1.7 | |

#### 10.4.2.3.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.3.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.3.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1602 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.3.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.2.3-1 and 10.4.2.3-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

#### 10.4.2.3.5 Test requirements

Table 10.4.2.3.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used.

**Table 10.4.2.3.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | As defined in A.12.1-1 | | As defined in A.12.1-1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -90.99 | -90.99 | -Infinity | -87.99 |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in Table 10.4.2.0.1.1-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table Table 10.4.2.0.1.2-1.

MGRP = 40 ms

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.4 EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used

### 10.4.2.4.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier, and long DRX cycle.

### 10.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.4.

### 10.4.2.4.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.4.4.1-1, 10.4.2.4.4.1-2, 10.4.2.4.4.1-3, 10.4.2.4.5-2 and 10.4.2.4.5-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 10.4.2.4.4.1-3 is provided.

#### 10.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.4.4.1-1.

**Table 10.4.2.4.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.2.4-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.4-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.4.4.1-2.

**Table 10.4.2.4.4.1-2: Initial conditions for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.4.4.1-3.
2. Message contents are defined in clause 10.4.2.4.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.4.4.1-3: General test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | | |
| A3-Offset | dB | Config 1,2 | -6 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 2.5 | 17 | |

#### 10.4.2.4.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 10.4.2.4.5-1.
3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.4.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.4.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for Test 1 or 16642 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.
10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.
11. Repeat steps 1-10 for each Test in Tables 10.4.2.4.4.1-3 and 10.4.2.4.5-1 as appropriate.

#### 10.4.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.4.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.2.4-1 and 10.4.2.4-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

### 10.4.2.4.5 Test requirements

Table 10.4.2.4.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used.

**Table 10.4.2.4.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T12 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | As defined in A.12.1-1 | | As defined in A.12.1-1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -90.99 | -90.99 | -Infinity | -87.99 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 10.4.2.4.5-2: DRX-Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |

| | | | |
|---|---|---|---|
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 10.4.2.4.5-3: *TimeAlignmentTimer* Configuration for EN-DC FR1 vent triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 the UE is not required to report SSB time index. $T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

For test 1 DRX cycle = 40 ms and for test 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.5 EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used

### 10.4.2.5.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in non-DRX with SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier.

### 10.4.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.5.

#### 10.4.2.5.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.5.4.1-1, 10.4.2.5.4.1-2, and 10.4.2.5.4.1-3.

In this test 1 measurement gap pattern configuration # 0 as defined in Table 10.4.2.5.4.1-3 is provided.

#### 10.4.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.5.4.1-1.

**Table 10.4.2.5.5.1-1: Supported test configurations for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.2.5-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.5-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.5.4.1-2.

**Table 10.4.2.5.4.1-2: Initial conditions for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.5.4.1-3.
2. Message contents are defined in clause 10.4.2.5.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.5.4.1-3: General test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |

| | | | | |
|---|---|---|---|---|
| Neighbour cell | | Config 1,2 | NR cell 3 | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 2 | |

#### 10.4.2.5.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.5.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.5.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.5.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.5.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.2.5-1 and 10.4.2.5-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

#### 10.4.2.5.5 Test requirements

Table 10.4.2.5.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used.

**Table 10.4.2.5.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | As defined in A.12.1-1 | | As defined in A.12.1-1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -90.99 | -90.99 | -Infinity | -87.99 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.2.0.1.1-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.6 EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used

### 10.4.2.6.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier, and long DRX cycle.

### 10.4.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.6.

### 10.4.2.6.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.6.4.1-1, 10.4.2.6.4.1-2, 10.4.2.6.4.1-3, 10.4.2.6.5-2 and 10.4.2.6.5-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 10.4.2.6.4.1-3 is provided.

#### 10.4.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.6.4.1-1.

**Table 10.4.2.6.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.2.6-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.6-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

| Note 1: The UE is only required to be tested in one of the supported test configurations |
|---|

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.6.4.1-2.

**Table 10.4.2.6.4.1-2: Initial conditions for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.6.4.1-3.
2. Message contents are defined in clause 10.4.2.6.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.6.4.1-3: General test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cell | | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 with CCA (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 with CCA is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1,2 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | | |
| A3-Offset | dB | Config 1,2 | -6 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | |

| | | | | | |
|---|---|---|---|---|---|
| T2 | s | Config 1,2 | 3 | 20 | |

### 10.4.2.6.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.6.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.6.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.6.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2882 ms for Test 1 or 19842 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

11. Repeat steps 1-10 for each Test in Tables 10.4.2.6.4.1-3 and 10.4.2.6.5-1 as appropriate.

### 10.4.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.6.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.2.6-1 and 10.4.2.6-2 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4 |

### 10.4.2.6.5 Test requirements

Table 10.4.2.6.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used.

**Table 10.4.2.6.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | | Config 1,2 | TDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | | Config 1,2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| Initial DL BWP | | | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference | | | Config 1,2 | SR.1.1 CCA | | - | |
| CORESET Reference Channel | | | Config 1,2 | CR.1.1 CCA | | - | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2 | As defined in A.12.1-1 | | As defined in A.12.1-1 | |
| SMTC configuration | | | Config 1,2 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH | | kHz | Config 1,2 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2 | 2 | | 2 | |
| $W_{CCA_DL}$ | | ms | Config 1,2 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -90.99 | -90.99 | -Infinity | -87.99 |
| $\hat{E}_s / I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s / N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/38.16MHz | Config 1,2 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 10.4.2.6.5-2: DRX-Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |

| | | | |
|---|---|---|---|
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 10.4.2.6.5-3: *TimeAlignmentTimer* Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_}$from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_}$from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 the UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.2.0.1.1-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

For tests 1 DRX cycle = 40 ms and for tests 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.7 EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used

### 10.4.2.7.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in non-DRX without SSB time index detection. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.7.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier.

### 10.4.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.7.

### 10.4.2.7.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.7.4.1-1, 10.4.2.7.4.1-2, and 10.4.2.7.4.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table 10.4.2.7.4.1-3 is provided

#### 10.4.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.7.4.1-1.

**Table 10.4.2.73.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.2.7-1 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.7-2 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.7-3 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.7-4 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.7-5 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.7-6 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.7.4.1-2.

**Table 10.4.2.7.4.1-2: Initial conditions for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.7.4.1-3.
2. Message contents are defined in clause 10.4.2.7.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different

frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.7.4.1-3: General test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 1,2,3,4,5,6 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 1.7 | |

### 10.4.2.7.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.7.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.7.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.7.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1602 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.
10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.7.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Test Configuration 10.4.2.7-1, 10.4.2.7-2, 10.4.2.7-4 and 10.4.2.7-5 | Table H.3.4-6 with Condition SSB.1 FR1 |
| Test Configuration 10.4.2.7-3, 10.4.2.7-6, | Table H.3.4-6 with Condition SSB.2 FR1 |
| Specific message contents exceptions for Test Configuration 10.4.2.7-2, 10.4.2.7-3, 10.4.2.7-5 and 10.4.2.7-6<br>Test Configuration 10.4.2.7-1 and 10.4.2.7-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br><br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

### 10.4.2.7.5 Test requirements

Table 10.4.2.7.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used

**Table 10.4.2.7.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell without SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | | Config 1,4 | TDD | | FDD | |
| | | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | | Config 1,4 | TDDConf.1.1 CCA | | NA | |
| | | | Config 2,5 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | | Config 3,6 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| Initial DL BWP | | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2,3,4,5,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,4 | SR.1.1 CCA | | SR.1.1 FDD | |
| | | | Config 2,5 | SR.1.1 CCA | | SR.1.1 TDD | |
| | | | Config 3,6 | SR.1.1 CCA | | SR.2.1 TDD | |
| CORESET Reference Channel | | | Config 1,4 | CR.1.1 CCA | | CR.1.1 FDD | |
| | | | Config 2,5 | CR.1.1 CCA | | CR.1.1 TDD | |
| | | | Config 3,6 | CR.1.1 CCA | | CR.2.1 TDD | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,4 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.1 CCA | | SSB.2 FR1 | |
| | Dynamic channel access Note 6,7 | | Config 1,4 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3,4,5,6 | As defined in A.12.1-1 | | Not applicable | |
| SMTC configuration | | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2,4,5 | 30 | | 15 | |
| | | | Config 3,6 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL}$=0.9375 | | Not applicable | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | Not applicable | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |
| $L_{CCA_DL}$ | | | Config 1,2,3,4,5,6 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3,4,5,6 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3,4,5,6 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2,4,5 | -98 | | -95 | |
| | | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -88 |
| | | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36 MHz | NR Config 1,2,4,5 | -64.59 | -64.59 | -63.94 | -56.15 |
| | | dBm/38.16MHz | NR Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3,4,5,6 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.8 EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used

### 10.4.2.8.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier, and long DRX cycle.

### 10.4.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.8.

### 10.4.2.8.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.8.4.1-1, 10.4.2.8.4.1-2, 10.4.2.8.4.1-3, 10.4.2.8.5-2 and 10.4.2.8.5-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 10.4.2.8.4.1-3 is provided.

#### 10.4.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.8.4.1-1.

**Table 10.4.2.8.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.2.8-1 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.8-2 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.8-3 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.8-4 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.8-5 | E-UTRAN cell: LTE TDD |

| | |
|---|---|
| | NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.8-6 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.8.4.1-2.

**Table 10.4.2.8.4.1-2: Initial conditions for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.8.4.1-3.
2. Message contents are defined in clause 10.4.2.8.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.8.4.1-3: General test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |

| | | | | | |
|---|---|---|---|---|---|
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 3 ms | | Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 2.5 | 17 | |

### 10.4.2.8.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.8.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.8.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.8.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for Test 1 or 16642 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

11. Repeat steps 1-10 for each Test in Tables 10.4.2.8.4.1-3 and 10.4.2.8.5-1 as appropriate.

### 10.4.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.8.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Test Configuration 10.4.2.8-1, 10.4.2.8-2, 10.4.2.8-4 and 10.4.2.8-5 | Table H.3.4-6 with Condition SSB.1 FR1 |
| Test Configuration 10.4.2.8-3, 10.4.2.8-6, | Table H.3.4-6 with Condition SSB.2 FR1 |
| Specific message contents exceptions for Test Configuration 10.4.2.8-2, 10.4.2.8-3, 10.4.2.8-5 and 10.4.2.8-6<br>Test Configuration 10.4.2.8-1 and 10.4.2.8-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br><br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

### 10.4.2.8.5 Test requirements

Table 10.4.2.8.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used.

**Table 10.4.2.8.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | TDD | | FDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | Config 1,4 | TDDConf.1.1 CCA | | NA | |
| | | Config 2,5 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |

| | | | | | |
|---|---|---|---|---|---|
| TRS configuration | | | Config 1,2,3,4,5,6 | TRS.1.2 TDD | NA |
| OCNG Patterns | | | Config 1,2,3,4,5,6 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1,4 | SR.1.1 CCA | SR.1.1 FDD |
| | | | Config 2,5 | SR.1.1 CCA | SR.1.1 TDD |
| | | | Config 3,6 | SR.1.1 CCA | SR.2.1 TDD |
| CORESET Reference Channel | | | Config 1,4 | CR.1.1 CCA | CR.1.1 FDD |
| | | | Config 2,5 | CR.1.1 CCA | CR.1.1 TDD |
| | | | Config 3,6 | CR.1.1 CCA | CR.2.1 TDD |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,4 | SSB.1 CCA | SSB.1 FR1 |
| | | | Config 2,5 | SSB.1 CCA | SSB.1 FR1 |
| | | | Config 3,6 | SSB.1 CCA | SSB.2 FR1 |
| | Dynamic channel access Note 6,7 | | Config 1,4 | SSB.2 CCA | SSB.1 FR1 |
| | | | Config 2,5 | SSB.2 CCA | SSB.1 FR1 |
| | | | Config 3,6 | SSB.2 CCA | SSB.2 FR1 |
| DBT window configuration | | | Config 1,2,3,4,5,6 | As defined in A.12.1-1 | Not applicable |
| SMTC configuration | | | Config 1,4 | SMTC.2 | SMTC.5 |
| | | | Config 2,3,5,6 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2,4,5 | 30 | 15 |
| | | | Config 3,6 | 30 | 30 |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL}$=0.9375 | Not applicable |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | Not applicable |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | Not applicable |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | Not applicable |
| $L_{CCA_DL}$ | | | Config 1,2,3,4,5,6 | 5 | 5 |
| $W_{CCA_DL}$ | | ms | Config 1,2,3,4,5,6 | $T_{PSS/SSS_sync_inter_cca}$ | $T_{PSS/SSS_sync_inter_cca}$ |
| EPRE ratio of PSS to SSS | | | Config 1,2,3,4,5,6 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3,4,5,6 | -98 | -98 |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2,4,5 | -98 | -95 |
| | | | Config 3,6 | -95 | -95 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -88 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | NR Config 1,2,4,5 | -64.59 | -64.59 | -63.94 | -56.15 |
| | dBm/38.16MHz | NR Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 10.4.2.8.5-2: DRX-Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 10.4.2.8.5-3: *TimeAlignmentTimer* Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell without SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 the UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

For test 1 DRX cycle = 40 ms and for test 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.9 EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used

### 10.4.2.9.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in non-DRX with SSB time index detection. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier.

### 10.4.2.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.9.

### 10.4.2.9.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.9.4.1-1, 10.4.2.9.4.1-2, and 10.4.2.9.4.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table 10.4.2.9.4.1-3 is provided

#### 10.4.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.9.4.1-1.

**Table 10.4.2.9.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event-triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.2.9-1 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.9-2 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.9-3 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.9-4 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.9-5 | E-UTRAN cell: LTE TDD |

| | |
|---|---|
| | NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mod |
| 10.4.2.9-6 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.9.4.1-2.

**Table 10.4.2.9.4.1-2: Initial conditions for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.9.4.1-3.
2. Message contents are defined in clause 10.4.2.9.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.9.4.1-3: General test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |
| CP length | | Config 1,2,3,4,5,6 | Normal | |

| | | | | |
|---|---|---|---|---|
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | OFF | DRX is not used |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 1,2,3,4,5,6 | 3 μs | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |
| T2 | s | Config 1,2,3,4,5,6 | 2 | |

#### 10.4.2.9.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 10.4.2.9.5-1.
3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.9.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.9.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.
10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.9.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Test Configuration 10.4.2.9-1, 10.4.2.9-2, 10.4.2.9-4 and 10.4.2.9-5 | Table H.3.4-6 with Condition SSB.1 FR1 |
| Test Configuration 10.4.2.9-3, 10.4.2.9-6, | Table H.3.4-6 with Condition SSB.2 FR1 |
| Specific message contents exceptions for Test Configuration 10.4.2.9-2, 10.4.2.9-3, 10.4.2.9-5 and 10.4.2.9-6<br>Test Configuration 10.4.2.9-1 and 10.4.2.9-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br><br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

## 10.4.2.9.5 Test requirements

Table 10.4.2.9.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used.

**Table 10.4.2.9.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | Config 1,4 | TDD | | FDD | |
| | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | Config 1,4 | TDDConf.1.1 CCA | | NA | |
| | | Config 2,5 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | Config 3,6 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| Initial DL BWP | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration | | Config 1,2,3,4,5,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,4 | SR.1.1 CCA | | SR.1.1 FDD | |
| | | Config 2,5 | SR.1.1 CCA | | SR.1.1 TDD | |
| | | Config 3,6 | SR.1.1 CCA | | SR.2.1 TDD | |
| CORESET Reference Channel | | Config 1,4 | CR.1.1 CCA | | CR.1.1 FDD | |
| | | Config 2,5 | CR.1.1 CCA | | CR.1.1 TDD | |
| | | Config 3,6 | CR.1.1 CCA | | CR.2.1 TDD | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,4 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.1 CCA | | SSB.2 FR1 | |
| | Dynamic channel access Note 6,7 | | Config 1,4 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3,4,5,6 | As defined in A.12.1-1 | | Not applicable | |
| SMTC configuration | | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2,4,5 | 30 | | 15 | |
| | | | Config 3,6 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL}$=0.9375 | | Not applicable | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | Not applicable | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |
| $L_{CCA_DL}$ | | | Config 1,2,3,4,5,6 | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3,4,5,6 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3,4,5,6 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2,4,5 | -98 | | -95 | |
| | | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -88 |
| | | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36 MHz | NR Config 1,2,4,5 | -64.59 | -64.59 | -63.94 | -56.15 |
| | | dBm/38.16MHz | NR Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |

| Propagation Condition | | Config 1,2,3,4,5,6 | AWGN |
|---|---|---|---|

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.2.0.1.1-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.2.10 EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used

### 10.4.2.10.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection and with CCA. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clauses 10.4.2.0.1.1 and 10.4.2.0.1.2.

### 10.4.2.10.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and RRM measurements with a shared spectrum NR carrier, and long DRX cycle.

### 10.4.2.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.2.10.

### 10.4.2.10.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters and configurations are given in Tables 10.4.2.10.4.1-1, 10.4.2.10.4.1-2, 10.4.2.10.4.1-3, 10.4.2.10.5-2 and 10.4.2.10.5-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 10.4.2.10.4.1-3 is provided

#### 10.4.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.2.10.4.1-1.

**Table 10.4.2.10.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.2.10-1 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.10-2 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.10-3 | E-UTRAN cell: LTE FDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.10-4 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.2.10-5 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode,<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mod |
| 10.4.2.10-6 | E-UTRAN cell: LTE TDD<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.2.10.4.1-2.

**Table 10.4.2.10.4.1-2: Initial conditions for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.2.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.2.10.4.1-3.
2. Message contents are defined in clause 10.4.2.10.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.2.10.4.1-3: General test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequency is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. NR RF channel 1 is with CCA. |
| Active cell | | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PSCell) | | LTE Cell 1 is on E-UTRA RF channel number 1.<br>NR Cell 2 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2,3,4,5,6 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2,3,4,5,6 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3,4,5,6 | 9 | | |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | |
| CP length | | Config 1,2,3,4,5,6 | Normal | | |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | |
| Filter coefficient | | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3,4,5,6 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between PCell and PSCell | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,2,3,4,5,6 | 3 ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 1,2,3,4,5,6 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 3 | 20 | |

### 10.4.2.10.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.2.10.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured on Cell 1.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.2.10.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.2.10.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2882 ms for Test 1 or [9842 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and proceeds with step 1. Otherwise proceed with step 2 for the next iteration.
10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.
11. Repeat steps 1-10 for each Test in Tables 10.4.2.10.4.1-3 and 10.4.2.10.5-1 as appropriate.

#### 10.4.2.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.2.10.4.3-1: Common Exception messages for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 9<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Test Configuration 10.4.2.10-1, 10.4.2.10-2, 10.4.2.10-4 and 10.4.2.10-5 | Table H.3.4-6 with Condition SSB.1 FR1 |
| Test Configuration 10.4.2.10-3, 10.4.2.10-6, | Table H.3.4-6 with Condition SSB.2 FR1 |
| Specific message contents exceptions for Test Configuration 10.4.2.10-2, 10.4.2.10-3, 10.4.2.10-5 and 10.4.2.10-6<br>Test Configuration 10.4.2.10-1 and 10.4.2.10-4 | Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4<br><br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

10.4.2.10.5 Test requirements

Table 10.4.2.10.5-1 defines the primary level settings including test tolerances for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used.

**Table 10.4.2.10.5-1: Cell specific test parameters for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode | | | Config 1,4 | TDD | | FDD | |
| | | | Config 2,3,5,6 | TDD | | TDD | |
| $BW_{channel}$ | | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2,4,5 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| TDD configuration | | | Config 1,4 | TDDConf.1.1 CCA | | NA | |
| | | | Config 2,5 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | | Config 3,6 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| Initial DL BWP | | | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP | | | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP | | | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP | | | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2,3,4,5,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,4 | SR.1.1 CCA | | SR.1.1 FDD | |
| | | | Config 2,5 | SR.1.1 CCA | | SR.1.1 TDD | |
| | | | Config 3,6 | SR.1.1 CCA | | SR.2.1 TDD | |
| CORESET Reference Channel | | | Config 1,4 | CR.1.1 CCA | | CR.1.1 FDD | |
| | | | Config 2,5 | CR.1.1 CCA | | CR.1.1 TDD | |
| | | | Config 3,6 | CR.1.1 CCA | | CR.2.1 TDD | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,4 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.1 CCA | | SSB.2 FR1 | |
| | Dynamic channel access Note 6,7 | | Config 1,4 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 2,5 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3,6 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3,4,5,6 | As defined in A.12.1-1 | | Not applicable | |
| SMTC configuration | | | Config 1,4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2,4,5 | 30 | | 15 | |
| | | | Config 3,6 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL}$=0.9375 | | Not applicable | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | Not applicable | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1,2,3,4,5,6 | $P_{CCA_UL}$=1 | | Not applicable | |
| $L_{CCA_DL}$ | | | Config 1,2,3,4,5,6 | 2 | | 2 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3,4,5,6 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3,4,5,6 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2,4,5 | -98 | | -95 | |
| | | | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -88 |
| | | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36 MHz | NR Config 1,2,4,5 | -64.59 | -64.59 | -63.94 | -56.15 |
| | | dBm/38.16MHz | NR Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3,4,5,6 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 10.4.2.10.5-2: DRX-Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |

| | | | |
|---|---|---|---|
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 10.4.2.10.5-3: *TimeAlignmentTimer* Configuration for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_}$from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_}$from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 the UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.2.0.1.1-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.2.0.1.1-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.2.0.1.2-1.

MGRP = 40 ms.

For test 1 DRX cycle = 40 ms and for test 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 10.4.3 L1-RSRP measurement for beam reporting under CCA

## 10.4.3.0 Minimum conformance requirements

### 10.4.3.0.1 Minimum conformance requitements for SSB-based L1-RSRP measurement for beam reporting under CCA

#### 10.4.3.0.1.1 SSB-based L1-RSRP Reporting under CCA

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource under CCA for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$ is defined in Table 10.4.3.0.1.1-1 for FR1,

where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

For FR1,

- $P=\frac{1}{1-\frac{T_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the SSB.

Where:

$T_{SSB}$ = ssb-periodicityServingCell

$T_{SMTCperiod}$ = the configured SMTC period or SMTC2 period if configured

If the high layer in TS 38.331 [13] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

UE shall report RSRP_0 (Not valid) if $L_1 > L_{1max}$, where L1 and $L1_{max}$ are defined in Table 10.4.3.0.1.1-1.

**Table 10.4.3.0.1.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}((M+L1)*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*(M+L1)*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}((M+L1)*P)*T_{DRX}$ |
| Note 1: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |
| Note 2: L1=0 if higher layer parameter timeRestrictionForChannelMeasurement is configured. Otherwise, when DRX is not configured L1 is the number of SSBs not available at the UE during $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$, and when DRX is configured L1 is the number of DRX cycles in which at least one SSB is not available at the UE during $T_{L1\text{-}RSRP_Measurement_Period_SSB_CCA}$, where $L1 \le L1_{max}$. The UE is not required to determine the availability of SSB occasions more frequent than<br>Once per $\max(T_{Report}, P * T_{SSB})$ if no DRX is used,<br>Once per $\max(T_{Report}, \text{Ceil}(1.5 * P) * \max(T_{DRX}, T_{SSB}))$ if DRX cycle ≤ 320ms,<br>Once per $P * T_{DRX}$ if DRX cycle > 320ms. | |
| Note 3: $L1_{max}$ =7 for $\max(T_{DRX},T_{SSB}) \le 40$ms assuming $T_{DRX}$=0 for non-DRX,<br>$L1_{max}$ =5 for 40ms < $\max(T_{DRX}, T_{SSB}) \le 320$ms,<br>$L1_{max}$ =3 for $T_{DRX}$ > 320ms. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to TS 38.133 [6] clause 10.1.33 for FR1 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1.33 for FR1. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] Table 10.1.6.1-2.

During EN-DC operation, for FR1, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected if the UE is capable of per-FR gap, or an additional delay can be expected.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.33 for FR1.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [9].

The UE is required to be capable of measuring SSB for L1-RSRP without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

When the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure SSB for L1-RSRP measurement.

The normative reference for this requirement is TS 38.133 [6] clause 9.5A.3.1, 9.5A.4.1 and 9.5A.5.1.

## 10.4.3.1 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used

### 10.4.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is not used. This test will partly verify the L1-RSRP measurement requirements in clause 10.4.3.0.1.1.

### 10.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements and UL with a shared spectrum NR carrier.

### 10.4.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.3.1.

### 10.4.3.1.4 Test description

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in Table A.6B.1-1. The test configurations and parameters for the Cell 2 are given in Table 10.4.3.1.4.1-1 and Table 10.4.3.1.4.1-2 below respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 10.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.3.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 10.4.3.1.4.1-2. Test environment parameters are given in Table 10.4.3.1.4.1-3.

**Table 10.4.3.1.4.1-1: Supported test configurations for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used**

| Config | Description |
|---|---|
| 10.4.3.1-1 | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 10.4.3.1-2 | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 10.4.3.1.4.1-2: General test parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1,2 | | freq1 |
| DL CCA model | 1,2 | | As specified in D.7.2.1 |
| UL CCA model | 1,2 | | As specified in D.7.2.2 |
| Duplex mode | 1,2 | | TDD |
| TDD Configuration | 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,2 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.1.1 CCA |
| SSB configuration | 1,2 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1,2 | | OP.1 |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1,2 | | DBT.1 |
| TRS Configuration | 1,2 | | TRS.1.2 TDD |
| DRX configuration | 1,2 | | Off |
| *reportConfigType* | 1,2 | | periodic |
| *reportQuantity* | 1,2 | | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1,2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with | | | |

| |
|---|
| downlink transmission burst and is not transmitted during the muted slots or during DBT window. |

**Table 10.4.3.1.4.1-3: Test Environment parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.4.3.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Table A.6B.1-1. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements.

### 10.4.3.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 10.4.3.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 10.4.3.1.4.1-2.

2. Set the parameters according to T1 in Table 10.4.3.1.5-1. The SS shall enable DL and UL CCA model according to Table 10.4.3.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 10.4.3.1.5-1. T2 starts.

5. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 682 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 10.4.3.1.5-2) and the relative L1-RSRP requirement for SSB#0 in Table 10.4.3.1.5-3. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 10.4.3.1.5-2 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 10.4.3.1.5-3 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any of the reconfiguration at steps 7 or 8 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.3.1.4.3-1: Common Exception messages for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 10.4.3.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

10.4.3.1.5 Test requirement

Table 10.4.3.1.5-1 defines the primary level settings for all tests for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used.

**Table 10.4.3.1.5-1: SSB specific test parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1,2 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1,2 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1,2 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1,2 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1,2 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1,2 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 10.4.3.1.5-2 and relative accuracy requirement in Table 10.4.3.1.5-3. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

**Table 10.4.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |

| | | |
|---|---|---|
| Highest reported value (SSB#1) | - | 78 |

**Table 10.4.3.1.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.3.2 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used

### 10.4.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is used. This test will partly verify the L1-RSRP measurement requirements in clause 10.4.3.0.1.1.

### 10.4.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements, UL with a shared spectrum NR carrier and long DRX cycle.

### 10.4.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.3.2.

### 10.4.3.2.4 Test description

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in Table A.6B.1-1. The test configurations and parameters for the Cell 2 are given in Table 10.4.3.2.4.1-1 and Table 10.4.3.2.4.1-2 below respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 10.4.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 10.4.3.2.4.1-2. Test environment parameters are given in Table 10.4.3.2.4.1-3.

**Table 10.4.3.2.4.1-1: Supported test configurations for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used**

| Config | Description |
|---|---|
| 10.4.3.2-1 | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.3.2-2 | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 10.4.3.2.4.1-2: General test parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1,2 | | freq1 |
| DL CCA model | 1,2 | | As specified in D.7.2.1 |
| UL CCA model | 1,2 | | As specified in D.7.2.2 |
| Duplex mode | 1,2 | | TDD |
| TDD Configuration | 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,2 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.1.1 CCA |
| SSB configuration | 1,2 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1,2 | | OP.1 |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1,2 | | DBT.1 |
| TRS Configuration | 1,2 | | TRS.1.2 TDD |
| DRX configuration | 1,2 | | DRX.3 |
| *reportConfigType* | 1,2 | | periodic |
| *reportQuantity* | 1,2 | | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1,2 | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

**Table 10.4.3.2.4.1-3: Test Environment parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.4.3.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Table A.6B.1-1. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 10.4.3.2.4.1-2.

### 10.4.3.2.4.2 Test procedure

Same test procedure as in subclause 10.4.3.1.4.2 with tables 10.4.3.1.4.1-2 and 10.4.3.1.5-1 replaced by tables 10.4.3.2.4.1-2 and 10.4.3.2.5-1.

### 10.4.3.2.4.3 Message contents

Same message content as in subclause 10.4.3.1.4.3 with the following exception:

**Table 10.4.3.2.4.3-1: Common Exception messages for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

### 10.4.3.2.5 Test requirement

Table 10.4.3.2.5-1 defines the primary level settings for all tests for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used.

**Table 10.4.3.2.5-1: SSB specific test parameters for EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1,2 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,7 | 1,2 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1,2 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1,2 | dBm/15kHz | -94.65 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1,2 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1,2 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 10.4.3.2.5-2 and relative accuracy requirement in Table 10.4.3.2.5-3. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

**Table 10.4.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 10.4.3.2.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.3.3 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used

### 10.4.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is not used. This test will partly verify the L1-RSRP measurement requirements in clause 10.4.3.0.1.1.

#### 10.4.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements and UL with a shared spectrum NR carrier.

#### 10.4.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.3.3.

#### 10.4.3.3.4 Test description

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in Table A.6B.1-1. The test configurations and parameters for the Cell 2 and Cell 3 are given in Table 10.4.3.3.4.1-1 and Table 10.4.3.3.4.1-2 below respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 10.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.3.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 10.4.3.3.4.1-2. Test environment parameters are given in Table 10.4.3.3.4.1-3.

**Table 10.4.3.3.4.1-1: Supported test configurations for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used**

| Config | Description |
|---|---|
| 10.4.3.3-1 | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.3.3-2 | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 10.4.3.3.4.1-2: General test parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| Active PSCell | 1,2 | | Cell 2 |
| Active SCell | 1,2 | | Cell 3 |
| RF Channel Number | 1,2 | | 1: Cell 2<br>2: Cell 3 |
| DL CCA model | 1,2 | | As specified in D.7.2.1 |
| UL CCA model | 1,2 | | As specified in D.7.2.2 |
| Duplex mode | 1,2 | | TDD |
| TDD Configuration | 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,2 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.1.1 CCA |
| SSB configuration | 1,2 | | SSB.3 CCA for semi-static channel access |

| | | | |
|---|---|---|---|
| | | | SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1,2 | | OP.1 |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1,2 | | DBT.1 |
| TRS Configuration | 1,2 | | TRS.1.2 TDD |
| DRX configuration | 1,2 | | Off |
| *reportConfigType* | 1,2 | | periodic |
| *reportQuantity* | 1,2 | | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1,2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

**Table 10.4.3.3.4.1-3: Test Environment parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.4.3.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Table A.6B.1-1. Cell 2 is NR FR1 PSCell and Cell3 is the NR FR1 SCell. Cell 3 is the target for SSB based L1-RSRP measurements. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

#### 10.4.3.3.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 10.4.3.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode On, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 10.4.3.3.4.1-2.

2. Set the parameters according to T1 in Table 10.4.3.3.5-1. The SS shall enable DL and UL CCA model according to Table 10.4.3.3.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 10.4.3.3.5-1. T2 starts.

5. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 682 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 10.4.3.3.5-2) and the relative L1-RSRP requirement for SSB#0 in Table 10.4.3.3.5-3. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 10.4.3.3.5-2 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 10.4.3.3.5-3 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.3.3.4.3-1: Common Exception messages for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 10.4.3.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 10.4.3.3.5 Test requirement

Table 10.4.3.3.5-1 defines the primary level settings for all tests for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used.

**Table 10.4.3.3.5-1: SSB specific test parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1, 2 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,7 | 1, 2 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1, 2 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1, 2 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1, 2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.

Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 10.4.3.3.5-2 and relative accuracy requirement in Table 10.4.3.3.5-3. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

**Table 10.4.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 10.4.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.3.4 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used

### 10.4.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is used. This test will partly verify the L1-RSRP measurement requirements in clause 10.4.3.0.1.1.

#### 10.4.3.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements, UL with a shared spectrum NR carrier and long DRX cycle.

#### 10.4.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.3.4.

#### 10.4.3.4.4 Test description

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in Table A.6B.1-1. The test configurations and parameters for the Cell 2 are given in Table 10.4.3.4.4.1-1 and Table 10.4.3.4.4.1-2 below respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.4.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.3.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 10.4.3.4.4.1-2. Test environment parameters are given in Table 10.4.3.4.4.1-3.

**Table 10.4.3.2.4.1-1: Supported test configurations for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used**

| Config | Description |
|---|---|
| 10.4.3.4-1 | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.3.4-2 | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 10.4.3.4.4.1-2: General test parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| Active PSCell | 1,2 | | Cell 2 |
| Active SCell | 1,2 | | Cell 3 |
| RF Channel Number | 1,2 | | 1: Cell 2<br>2: Cell 3 |
| DL CCA model | 1,2 | | As specified in D.7.2.1 |
| UL CCA model | 1,2 | | As specified in D.7.2.2 |
| Duplex mode | 1,2 | | TDD |
| TDD Configuration | 1,2 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1,2 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,2 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.1.1 CCA |
| SSB configuration | 1,2 | | SSB.3 CCA for semi-static channel access |

| | | | |
|---|---|---|---|
| | | | SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1,2 | | OP.1 |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1,2 | | DBT.1 |
| TRS Configuration | 1,2 | | TRS.1.2 TDD |
| DRX configuration | 1,2 | | DRX.3 |
| *reportConfigType* | 1,2 | | periodic |
| *reportQuantity* | 1,2 | | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS | 1,2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1,2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

**Table 10.4.3.4.4.1-3: Test Environment parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.4.3.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Table A.6B.1-1. Cell 2 is NR FR1 PSCell and Cell3 is the NR FR1 SCell. Cell 3 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 10.4.3.4.4.1-2.

10.4.3.4.4.2 Test procedure

Same test procedure as in subclause 10.4.3.3.4.2 with tables 10.4.3.3.4.1-2 and 10.4.3.3.5-1 replaced by tables 10.4.3.4.4.1-2 and 10.4.3.4.5-1.

### 10.4.3.4.4.3 Message contents

Same message content as in subclause 10.4.3.4.4.3 with the following exception:

**Table 10.4.3.4.4.3-1: Common Exception messages for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

### 10.4.3.4.5 Test requirement

Table 10.4.3.4.5-1 defines the primary level settings for all tests for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used.

**Table 10.4.3.4.5-1: SSB specific test parameters for EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1, 2 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,7 | 1, 2 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1, 2 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1, 2 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1, 2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.

Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 10.4.3.4.5-2 and relative accuracy requirement in Table 10.4.3.4.5-3. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

**Table 10.4.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 10.4.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.4 E-UTRAN-NR inter-RAT measurements on NR carrier frequency under CCA

### 10.4.4.0 Minimum conformance requirements

#### 10.4.4.0.1 Minimum conformance requitements for E-UTRAN FDD – NR measurements when CCA is used

Requirements in this clause shall apply for NR capable UE, when NR is in carrier frequencies with CCA and not configured with EN-DC.

The UE shall be able to identify new RAT E-UTRAN FDD-NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

In the requirements of clause 10.4.4.0.1, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the *N* candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period, where:

- For the cell detection procedure: *N* is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and

- For other procedures in clause 10.4.4.0.1: *N* are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise N is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.

10.4.4.0.1.1 Identification of a new NR cell

When measurement gaps are scheduled, the UE shall be able to identify a new detectable cell within $T_{identify_irat_cca_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT frequency cell within $T_{identify_irat_cca_with_index}$. The UE shall be able to identify a new detectable inter-RAT frequency SSB of an already detected cell within $T_{identify_irat_cca_without_index}$.

$$T_{identify_irat_cca_without_index} = (T_{PSS/SSS_sync_irat_cca} + T_{SSB_measurement_period_irat_cca})\ ms$$

$$T_{identify_irat_cca_with_index} = (T_{PSS/SSS_sync_irat_cca} + T_{SSB_measurement_period_irat_cca} + T_{SSB_time_index_irat_cca})\ ms$$

Where:

$T_{PSS/SSS_sync_irat_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.4.0.1.1-1.

$T_{SSB_time_index_irat_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.4.0.1.1-2.

$T_{SSB_measurement_period_irat_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.4.0.1.1-3.

$N_{freq}$ is defined in TS 36.133 [23] clause 8.1.2.1.1.

**Table 10.4.4.0.1.1-1: Time period for PSS/SSS detection, in NR carrier frequencies with CCA**

| Condition NOTE1,2,3,4 | $T_{PSS/SSS_sync_irat_cca}$ |
|---|---|
| No DRX | Max(600ms, (8 +$L_{PSS/SSS,gaps}$) × Max(MGRP, SMTC period)) × $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(600ms, Ceil((8+$L_{PSS/SSS,gaps}$) ×1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq}$ |
| DRX cycle > 320ms | (8+$L_{PSS/SSS,gaps}$) × DRX cycle × $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |
| NOTE 2: $L_{PSS/SSS,gaps}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_irat_cca}$, where $L_{PSS/SSS,gaps} \le L_{PSS/SSS,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. | |
| NOTE 3: $L_{PSS/SSS,gaps}$ = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms $L_{PSS/SSS,gaps}$ = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{PSS/SSS,gaps}$ = 5 for DRX cycle > 320 ms. | |

Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 10.4.4.0.1.1-2: Time period for time index detection, in NR carrier frequencies with CCA**

| Condition NOTE1,2,3,4 | $T_{SSB_time_index_irat_cca}$ |
|---|---|
| No DRX | Max(120ms, (3 + $L_{ind,gaps}$) × Max(MGRP, SMTC period)) × $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(120ms, ceil((3+ $L_{ind,gaps}$) x 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq}$ |
| DRX cycle > 320ms | (3+ $L_{ind,gaps}$) × DRX cycle × $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5 | |
| NOTE 2: $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_irat_cca}$, where $L_{ind,gaps} \le L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. | |
| NOTE 3: $L_{ind,gaps,max}$ = 5 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{ind,gaps,max}$ = 3 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{ind,gaps,max}$ = 2 for DRX cycle > 320 ms. | |

The UE shall restart the time index detection upon exceeding $L_{ind,gaps,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

In the requirements, an NR cell is considered to be detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in Clause TBD are fulfilled for a corresponding band, together with the corresponding side conditions in TBD of TS 38.133 [6],
- NR SS-RSRQ related conditions in the accuracy requirements in Clause TBD are fulfilled for a corresponding band, together with the corresponding side conditions in TBD of TS 38.133 [6],
- NR SS-SINR related conditions in the accuracy requirements in Clause TBD are fulfilled for a corresponding band, together with the corresponding side conditions in TBD of TS 38.133 [6].

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ, and SS-SINR measurements to higher layers with measurement accuracy as specified in clause TBD, with measurement period as shown in table 10.4.4.0.1.1-3:

**Table 10.4.4.0.1.1-3: Measurement period for inter-RAT measurements**

| Condition NOTE1,2,3,4 | $T_{SSB_measurement_period_irat_cca}$ |
|---|---|
| No DRX | $Max(200ms, (8+ L_{meas}) \times Max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle ≤ 320ms | $Max(200ms, ceil((8+ L_{meas}) \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle > 320ms | $(8+ L_{meas}) \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5<br>NOTE 3: $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_irat_cca}$, where $L_{meas} \le L_{meas,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP.<br>NOTE 4: $L_{meas,max}$ = 12 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{meas,max}$ = 8 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{meas,max}$ = 5 for DRX cycle > 320 ms. | |

The UE shall restart the measurement upon exceeding $L_{meas,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

When the time period of unsuccessful measurement attemps due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause TS 36.133 [23] 9.3A.6.3, the UE shall stop the measurement attempts on this SSB and perform the detection procedure again, like for any other SSB.

The UE shall be capable of performing SSB based SS-RSRP, SS-RSRQ, and SS-SINR for up to [7] NR carrier frequencies.

For each RAT E-UTRAN FDD-NR layer on, in carrier frequencies with CCA, the UE shall be capable of monitoring at least 4 cells.

For each RAT E-UTRAN FDD-NR layer in carrier frequencies with CCA, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB indexes and/or PCI on the RAT E-UTRAN FDD-NR layer.

The NR SS-RSRP measurement accuracy for all measured cells shall be as specified in clause TBD. The NR SS-RSRQ measurement accuracy for all measured cells shall be as specified in clause TBD. The NR SS-SINR measurement accuracy for all measured cells shall be as specified in clause TBD.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.1.1.

#### 10.4.4.0.1.2 Event Triggered Reporting

Reported measurements in event triggered measurement reports shall meet the requirements in TS 36.133 [23] clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_cca_without_index}$ or $T_{identify_irat_cca_with_index}$ defined in Clause 10.4.4.0.1.1 for the minimum requirements. When L3 filtering is used or IDC autonomous denial or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_irat_cca_without_index}$ or $T_{identify_irat_cca_with_index}$ defined in clause 10.4.4.0.1.1 for the minimum requirements and then triggers the measurement report as per TS 36.331 [29], the event triggered measurement reporting delay shall be less than $T_{measurement_NR_cca_FDD}$ defined in clause 10.4.4.0.1.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.1.3.

### 10.4.4.0.2 Minimum conformance requitements for E-UTRAN TDD – NR measurements when CCA is used

Requirements in this clause shall apply for NR capable UE when not configured with EN-DC, considering NR carrier frequencies with CCA.

The requirements in clause 10.4.4.0.1 also apply for this section.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.22A.

## 10.4.4.1 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

### 10.4.4.1.1 Test purpose

The purpose of the test is to verify that the UE makes correct reporting of an event in non-DRX without SSB time index detection. This test will partly verify the NR inter-RAT cell search requirements in clause 10.4.4.0.1 for E-UTRAN FDD-NR measurements under CCA and clause 10.4.4.0.2 for E-UTRAN TDD-NR measurements under CCA.

### 10.4.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier and supporting inter-RAT and RRM measurements on shared channel access.

### 10.4.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.4.1.

#### 10.4.4.1.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test configurations and parameters are given in Tables 10.4.4.1.4.1-1, 10.4.4.1.4.1-3, 10.4.4.1.5-1 and 10.4.4.1.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1, measurement gap pattern configuration # 0 as defined in Table 10.4.4.1.4.1-3 is provided for a UE that does not support per-FR gap.

##### 10.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.4.1.4.1-1.

**Table 10.4.4.1.4.1-1: Supported test configurations for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.4.1-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.4.1-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.4.1.4.1-2.

**Table 10.4.4.1.4.1-2: Initial conditions for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.4.1.4.1-3.
2. Message contents are defined in clause 10.4.4.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.4.1.4.1-3: General test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | 1, 2 | 1,2 | Two FR1 NR carrier frequency under CCA is used. |

| | | | | | |
|---|---|---|---|---|---|
| DL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 4, 5 | | | | |
| UL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 4, 5 | | | | |
| $L_{CCA_DL}$ | | | 1, 2 | 12 | |
| $W_{CCA_DL}$ | | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | |
| Active cell | | | 1, 2 | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | 1, 2 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 1, 2 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | | dBm | 1, 2 | Note 1 | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29] |
| b2-Threshold2NR | | dBm | 1, 2 | Note 2 | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [29] |
| Hysteresis | | dB | 1, 2 | 0 | |
| CP length | | | 1, 2 | Normal | |
| TimeToTrigger | | s | 1, 2 | 0 | |
| Filter coefficient | | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | | 1, 2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | | 1, 2 | 3μs | Synchronous cells. |
| T1 | | s | 1, 2 | 5 | |
| T2 | | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | Tidentify_irat_cca_without_index¬ is defined in clause 10.4.4.0.1 and 10.4.4.0.2 |

NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.1.1-3
NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.1.1-4
NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### 10.4.4.1.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) [16] is used. The UE is tested when *MeasTriggerQuantity* is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Tables 10.4.4.1.5-1 and 10.4.4.1.5-2 respectively.
3. The SS shall transmit an *RRCConnectionReconfiguration* message with event B2 configured on Cell 1.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 10.4.4.1.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 10.4.4.1.5-1 and 10.4.4.1.5-2. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 1602 ms for Test1, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
8. The SS shall transmit an *RRCConnectionRelease* message to release the RRC connection on Cell 1 which includes the release of the established radio bearers as well as all radio resources.
9. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. The SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
    - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
11. Repeat step 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.4.1.4.3-1: Common Exception messages for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE (Test 1)<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 39 (Test 1)<br>Table H.3.4-7 with Condition Inter-RAT and EVENT B2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.4.1-1 and 10.4.4.1-2 | Table H.3.4-6 with Conditions SMTC.1 and Synchronous cells |

10.4.4.1.5 Test requirements

Tables 10.4.4.1.5-1 and 10.4.4.1.5-2 define the primary level settings for all tests for EN-DC FR1-FR1 Event-triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is not used.

**Table 10.4.4.1.5-1: E-UTRAN PCell specific test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2 | -59.13 | -59.13 |
| Propagation Condition [Note6] | | 1, 2 | ETU70 | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 10.4.4.1.5-2: NR neighbour cell specific test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | | 3 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 6,8 | | 1, 2 | 1 | | 1 | |
| $P_{CCA_UL}$ for semi-static channel access Note 7,8 | | 1, 2 | 1 | | 1 | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | NA | | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -58.49 | -58.49 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | ETU70 | | ETU70 | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, the UE is not required to report SSB time index. $T_{identify_irat_cca_without_index}$ is defined in clause 10.4.4.0.1 and 10.4.4.0.2.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.4.2 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

### 10.4.4.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection. This test will partly verify the NR inter-RAT cell search requirements in clause 10.4.4.0.1 for E-UTRAN FDD-NR measurements under CCA and clause 10.4.4.0.2 for E-UTRAN TDD-NR measurements under CCA.

### 10.4.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, inter-RAT and RRM measurements on shared channel access and long DRX cycle.

### 10.4.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.4.2.

### 10.4.4.2.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test configurations and parameters are given in Tables 10.4.4.2.4.1-1, 10.4.4.2.4.1-3, 10.4.4.2.5-1 and 10.4.4.2.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 10.4.4.2.4.1-3 is provided for UE that does not support per-FR gap.

#### 10.4.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.4.2.4.1-1.

**Table 10.4.4.2.4.1-1: Supported test configurations for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.4.2-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.4.2-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.4.2.4.1-2.

**Table 10.4.4.2.4.1-2: Initial conditions for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.4.2.4.1-3.
2. Message contents are defined in clause 10.4.4.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.4.2.4.1-3: General test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|---|
| | | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | | 1, 2 | 1 | | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | | 1, 2 | 1,2 | | Two FR1 NR carrier frequency under CCA is used. |
| Active cell | | | 1, 2 | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| DL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.1 | | |
| | Semi-static channel access Note 4, 5 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| UL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.2 | | |
| | Semi-static channel access Note 4, 5 | | | | | |
| $L_{CCA_DL}$ | | | 1, 2 | 12 | 5 | |
| $W_{CCA_DL}$ | | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | | |
| Neighbour cell | | | 1, 2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | | 1, 2 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 1, 2 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | | dBm | 1, 2 | Note 1 | | E-UTRA RSRP threshold for measurement on cell 1 for event B2 [29] |
| b2-Threshold2NR | | dBm | 1, 2 | Note 2 | | SS-RSRP threshold measurement on cell 3 for event B2 [29] |
| Hysteresis | | dB | 1, 2 | 0 | | |
| CP length | | | 1, 2 | Normal | | |
| TimeToTrigger | | s | 1, 2 | 0 | | |
| Filter coefficient | | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | | 1, 2 | DRX.9 | DRX.12 | As specified in clause H3.7-2 |
| Time offset between serving and neighbour cells | | | 1, 2 | 3µs | | Synchronous cells. |
| T1 | | s | 1, 2 | 5 | | |
| T2 | | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | | $T_{identify_irat_cca_without_index}$ is defined in clause 10.4.4.0.1 and 10.4.4.0.2 |

NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.1.1-3
NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.1.1-4
NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### 10.4.4.2.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) [29] is used. The UE is tested when *MeasTriggerQuantity* is configured as RSRP, RSRQ and SINR for each test. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Tables 10.4.4.2.5-1 and 10.4.4.2.5-2 respectively.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event B2 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Tables 10.4.4.2.5-1 and 10.4.4.2.5-2. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 10.4.4.2.5-1 and 10.4.4.2.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for Test 1 or 16642 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. The SS shall transmit an *RRCConnectionRelease* message to release the RRC connection on Cell 1 which includes the release of the established radio bearers as well as all radio resources.

9. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. The SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

    - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

11. Repeat step 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

12. Repeat steps 1-11 for each Test in Tables 10.4.4.2.4.1-3, 10.4.4.2.5-1 and 10.4.4.2.5-2 as appropriate.

#### 10.4.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.4.2.4.3-1: Common Exception messages for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE (Test 1, Test 2<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1 and 2<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 39 (Test 1, Test 2)<br>Table H.3.4-7 with Condition Inter-RAT and EVENT B2<br>Table H.3.7-2 with Condition DRX.9 and Gap for Test 1<br>Table H.3.7-2 with Condition DRX.12 and Gap for Test 2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.4.2-1 and 10.4.4.2-2 | Table H.3.4-6 with Conditions SMTC.1 and Synchronous cells |

#### 10.4.4.2.5 Test requirements

Tables 10.4.4.2.5-1 and 10.4.4.2.5-2 define the primary level settings for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA without SSB time index detection when DRX is used.

**Table 10.4.4.2.5-1: E-UTRAN PCell specific test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |

| | | | | |
|---|---|---|---|---|
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2 | -59.13 | -59.13 |
| Propagation Condition [Note6] | | 1, 2 | ETU70 | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 10.4.4.2.5-2: NR neighbour cell specific test parameters for EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | | 3 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 6,8 | | 1, 2 | 1 | | 1 | |
| $P_{CCA_UL}$ for semi-static channel access Note 7,8 | | 1, 2 | 1 | | 1 | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | NA | | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -58.49 | -58.49 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | ETU70 | | ETU70 | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.4.3 EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

### 10.4.4.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX with SSB time index detection. This test will partly verify the NR inter-RAT cell search requirements in clause 10.4.4.0.1 for E-UTRAN FDD-NR measurements under CCA and clause 10.4.4.0.2 for E-UTRAN TDD-NR measurements under CCA.

### 10.4.4.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, supporting inter-RAT and RRM measurements on shared channel access.

### 10.4.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.4.3.

### 10.4.4.3.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test configurations and parameters are given in Tables 10.4.4.3.4.1-1, 10.4.4.3.4.1-3, 10.4.4.3.5-1 and 10.4.4.3.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In test 1 measurement gap pattern configuration # 0 as defined in Table 10.4.4.3.4.1-3 is provided for UE that does not support per-FR gap

#### 10.4.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.4.3.4.1-1.

**Table 10.4.4.3.4.1-1: Supported test configurations for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Config | Description |
|---|---|
| 10.4.4.3-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.4.3-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.4.3.4.1-2.

**Table 10.4.4.3.4.1-2: Initial conditions for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.4.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 10.4.4.3.4.1-3.
2. Message contents are defined in clause 10.4.4.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.4.3.4.1-3: General test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| E-UTRA RF Channel Number | | | 1, 2 | 1 | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | | 1, 2 | 1,2 | Two FR1 NR carrier frequency under CCA is used. |
| DL CCA model | Dynamic channel access[Note 3, 5] | | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 4, 5 | | | | |
| UL CCA model | Dynamic channel access[Note 3, 5] | | | As specified in clause D.7.2.2 | |

| | | | | | |
|---|---|---|---|---|---|
| | Semi-static channel access Note 4, 5 | | | | |
| $L_{CCA_DL}$ | | | 1, 2 | 12 | |
| $W_{CCA_DL}$ | | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | |
| Active cell | | | 1, 2 | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | 1, 2 | NR cell 3 | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 1, 2 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | | dBm | 1, 2 | Note 1 | E-UTRA RSRP threshold for measurement on cell 1 for event B2 [29] |
| b2-Threshold2NR | | dBm | 1, 2 | Note 2 | SS-RSRP threshold measurement on cell 3 for event B2 [29] |
| Hysteresis | | dB | 1, 2 | 0 | |
| CP length | | | 1, 2 | Normal | |
| TimeToTrigger | | s | 1, 2 | 0 | |
| Filter coefficient | | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | | 1, 2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | | 1, 2 | 3μs | Synchronous cells. |
| T1 | | s | 1, 2 | 5 | |
| T2 | | s | 1, 2 | ≥ $T_{identify_irat_cca_with_index}$ | $T_{identify_irat_cca_with_index}$ is defined in clause 10.4.4.0.1 and 10.4.4.0.2 |
| NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.3.1-3<br>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.3.1-4<br>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | | |

### 10.4.4.3.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) [29] is used. The UE is tested when *MeasTriggerQuantity* is configured as RSRP, RSRQ and SINR for each test. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Tables 10.4.4.3.5-1 and 10.4.4.3.5-2 respectively.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event B2 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Tables 10.4.4.3.5-1 and 10.4.4.3.5-2. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 10.4.4.3.5-1 and 10.4.4.3.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 1922 ms for Test1, then the number of successful tests is increased by

one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. The SS shall transmit an *RRCConnectionRelease* message to release the RRC connection on Cell 1 which includes the release of the established radio bearers as well as all radio resources.

9. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. The The SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

    - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

11. Repeat step 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.4.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.4.3.4.3-1: Common Exception messages for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE (Test 1)<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 39 (Test 1)<br>Table H.3.4-7 with Condition Inter-RAT and EVENT B2<br>Table H.3.4-8 with Condition SSB-Index<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.4.3-1 and 10.4.4.3-2 | Table H.3.4-6 with Conditions SMTC.1 and Synchronous cells |

#### 10.4.4.3.5 Test requirements

Table 10.4.4.3.5-1 and 10.4.4.3.5-2 define the primary level settings for all tests for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used.

**Table 10.4.4.3.5-1: E-UTRAN PCell specific test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25 | |

| | | | | |
|---|---|---|---|---|
| | | | 10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note2 | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns Note2 | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2 | -59.13 | -59.13 |
| Propagation Condition Note6 | | 1, 2 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 10.4.4.3.5-2: NR neighbour cell specific test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T2 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | | 3 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 6,8 | | 1, 2 | 1 | | 1 | |
| $P_{CCA_UL}$ for semi-static channel access Note 7,8 | | 1, 2 | 1 | | 1 | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | NA | | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -58.49 | -58.49 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | ETU70 | | ETU70 | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.

NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 10.4.4.4 EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

### 10.4.4.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX with SSB time index detection. This test will partly verify the NR inter-RAT cell search requirements in clause 10.4.4.0.1 for E-UTRAN FDD-NR measurements under CCA and clause 10.4.4.0.2 for E-UTRAN TDD-NR measurements under CCA.

### 10.4.4.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, supporting inter-RAT and RRM measurements on shared channel access and long DRX cycle.

### 10.4.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.4.4.

### 10.4.4.4.4 Test description

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 with CCA on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 with CCA on NR RF channel 2. The test configurations and parameters are given in Tables 10.4.4.4.4.1-1, 10.4.4.4.4.1-3, 10.4.4.4.5-1 and 10.4.4.4.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 10.4.4.4.4.1-3 is provided for UE that does not support per-FR gap.

#### 10.4.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.4.4.4.1-1.

**Table 10.4.4.4.4.1-1: Supported test configurations for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Config | Description |
|---|---|
| 10.4.4.4-1 | E-UTRAN cell: LTE FDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.4.4.4-2 | E-UTRAN cell: LTE TDD<br>NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 10.4.4.4.4.1-2.

**Table 10.4.4.4.4.1-2: Initial conditions for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.4.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | |

1. The general test parameter settings are set up according to Table 10.4.4.4.4.1-3.
2. Message contents are defined in clause 10.4.4.4.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are NR cells (PSCell and neighbour cell, respectively) in different frequencies with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 10.4.4.4.4.1-3: General test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|---|
| | | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | | 1, 2 | 1 | | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | | 1, 2 | 1,2 | | Two FR1 NR carrier frequency under CCA is used. |
| DL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.1 | | |
| | Semi-static channel access Note 4, 5 | | | | | |
| UL CCA model | Dynamic channel access Note 3, 5 | | | As specified in clause D.7.2.2 | | |
| | Semi-static channel access Note 4, 5 | | | | | |
| $L_{CCA_DL}$ | | | 1, 2 | 12 | 5 | |
| $W_{CCA_DL}$ | | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | | |
| Active cell | | | 1, 2 | E-UTRA cell 1 (PCell) and NR cell 2 with CCA (PSCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | 1, 2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id | | | 1, 2 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 1, 2 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | | dBm | 1, 2 | Note 1 | | E-UTRA RSRP/RSRQ/SINR threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29] |
| b2-Threshold2NR | | dBm | 1, 2 | Note 2 | | SS-RSRP/ SS-RSRQ/ SS-SINR threshold measurement on cell 3 for event B2 [29] |
| Hysteresis | | dB | 1, 2 | 0 | | |
| CP length | | | 1, 2 | Normal | | |
| TimeToTrigger | | s | 1, 2 | 0 | | |
| Filter coefficient | | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | | 1, 2 | DRX.9 | DRX.12 | As specified in clause A.3.3 |

| | | | | |
|---|---|---|---|---|
| Time offset between serving and neighbour cells | | 1, 2 | 3μs | Synchronous cells. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | ≥$T_{identify_irat_cca_with_index}$ | $T_{identify_irat_cca_with_index}$ is defined in clause 10.4.4.0.1 and 10.4.4.0.2 |
| NOTE 1: The value of b2-Threshold1 is defined in Table A.10.4.4.4.1-3<br>NOTE 2: The value of b2-Threshold2NR is defined in Table A.10.4.4.4.1-4<br>NOTE 3: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 4: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

### 10.4.4.4.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) [29] is used. The UE is tested when *MeasTriggerQuantity* is configured as RSRP, RSRQ and SINR for each test. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Tables 10.4.4.4.5-1 and 10.4.4.4.5-2 respectively.

3. The SS shall transmit an *RRCConnectionReconfiguration* message with event B2 configured on Cell 1.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Tables 10.4.4.4.5-1 and 10.4.4.4.5-2. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 10.4.4.4.5-1 and 10.4.4.4.5-2. T2 starts.

. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 2882 ms for Test 1 or 19842 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. The SS shall transmit an *RRCConnectionRelease* message to release the RRC connection on Cell 1 which includes the release of the established radio bearers as well as all radio resources.

9. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. The The SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

    - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

11. Repeat step 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

12. Repeat steps 1-11 for each Test in Tables 10.4.4.4.4.1-3, 10.4.4.4.5-1 and 10.4.4.4.5-2 as appropriate.

#### 10.4.4.42.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.4.4.4.4.3-1: Common Exception messages for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-3<br>Table H.3.4-4 with Condition gapUE (Test 1, Test 2<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1 and 2<br>Table H.3.4-5 with Condition Pattern #0 and gap offset = 39 (Test 1, Test 2<br>Table H.3.4-7 with Condition Inter-RAT and EVENT B2<br>Table H.3.7-2 with Condition DRX.9 and Gap for Test 1<br>Table H.3.7-2 with Condition DRX.12 and Gap for Test 2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |
| Specific message contents exceptions for Test Configuration 10.4.4.4-1 and 10.4.4.4-2 | Table H.3.4-6 with Conditions SMTC.1 and Synchronous cells |

#### 10.4.4.4.5 Test requirements

Table 10.4.4.4.5-1 and 10.4.4.4.5-2 define the primary level settings for all tests for EN-DC FR1-FR1 Event triggered reporting for FR1 cell with CCA with SSB time index detection when DRX is used.

**Table 10.4.4.4.5-1: E-UTRAN PCell specific test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |

| | | | | |
|---|---|---|---|---|
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2 | -59.13 | -59.13 |
| Propagation Condition Note6 | | 1, 2 | ETU70 | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table 10.4.4.4.5-2: NR neighbour cell specific test parameters for EN-DC FR1 E-UTRA-NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T2 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | | 3 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 6,8 | | 1, 2 | 1 | | 1 | |
| $P_{CCA_UL}$ for semi-static channel access Note 7,8 | | 1, 2 | 1 | | 1 | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | NA | | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -58.49 | -58.49 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | ETU70 | | ETU70 | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.

In In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 10.5 Measurement Performance

## 10.5.1 SS-RSRP

### 10.5.1.0 Minimum Conformance Requirements

### 10.5.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements under CCA

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.5.1.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.8 for a corresponding band for each relevant SSB.

**Table 10.5.1.0.1-1: SS-RSRP intra-frequency absolute accuracy**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±9 | ≥-6 | NR_CCA_FR1_I | -117 | -114 | N/A | -70 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±8 | ±11 | ≥-6 | NR_CCA_FR1_I | N/A | N/A | -70 | -50 |
| | | | NR_CCA_FR1_J | | | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.36.1.1.

### 10.5.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements under CCA

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell under CCA.

The accuracy requirements in Table 10.5.1.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.8 for a corresponding band for each relevant SSB.

**Table 10.5.1.0.2-1: SS-RSRP intra-frequency relative accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot [Note 2] | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 4] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±2 | ±3 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. | | | | | | | |

NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.36.1.2.

### 10.5.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements under CCA

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.5.1.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.9 for a corresponding band for each relevant SSB.

**Table 10.5.1.0.3-1: SS-RSRP inter-frequency absolute accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±9 | ≥-6 | NR_CCA_FR1_I | -117 | -114 | N/A | -70 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±8 | ±11 | ≥-6 | NR_CCA_FR1_I | N/A | N/A | -70 | -50 |
| | | | NR_CCA_FR1_J | | | | |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.37.1.1.

### 10.5.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements under CCA

The relative accuracy of SS-RSRP in inter-frequency case is defined as the RSRP measured from one cell on a frequency compared to the RSRP measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.5.1.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.9 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|Channel\ 1_Io - Channel\ 2_Io| \leq 20$ dB

**Table 10.5.1.0.4-1: SS-RSRP inter-frequency relative accuracy under CCA**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 2 | Io [Note 1] range |

| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±6 | ≥-6 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.<br>NOTE 3: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.37.1.2.

## 10.5.1.1 EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell

### 10.5.1.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.5.1.0.1 and 10.5.1.0.2 when the serving cell is subject to CCA.

### 10.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access.

### 10.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.1.0.1 and 10.5.1.0.2 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.1.1.

### 10.5.1.1.4 Test description

Supported test configurations are shown in Table 10.5.1.1.4.1-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table 10.5.1.1.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

#### 10.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.1.1.4.1-1.

**Table 10.5.1.1.4.1-1: Supported test configurations for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| Configuration | Description |
|---|---|
| 10.5.1.1-1 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.1.1-2 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.1.1.4.1-2.

**Table 10.5.1.1.4.1-2: Initial conditions for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.1.1.5-1.
2. Message contents are defined in clause 10.5.1.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.1.1.4.2 Test procedure

In this set of test cases there are three cells, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2), and target neighbour FR1 Cell 3. Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 10.5.1.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.1.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport*. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 10.5.1.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 2-7 for each subtest defined in Table 10.5.1.1.5-1.

### 10.5.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.1.1.4.3-1: Common Exception messages for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.1.1.4.3-2: *ReportConfigNR* for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

## 10.5.1.1.5 Test requirements

Table 10.5.1.1.5-1 defines the primary level settings including test tolerances for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell. Table 10.5.1.1.5-2 and Table 10.5.1.1.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 10.5.1.1.5-1: Cell specific test parameters for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | | |
| Duplex mode | Config 1, 2 | | TDD | | | |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1, 2 | MHz | 40: $N_{RB,c}$ = 106 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| TRS configuration | Config 1, 2 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 2 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Control Channel RMC | Config 1, 2 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UL CCA model | | | | As specified in clause D.7.2.2 | | | |
| $P_{CCA_DL}$ for dynamic channel access Note 7,8 | | Config 1, 2 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| $P_{CCA_DL}$ for semi-static channel access Note 6.8 | | Config 1, 2 | | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ | | Config 1, 2 | | 1 | 1 | 1 | 1 |
| SSB configuration | Semi-static channel access | Config 1, 2 | | SSB.1 CCA (As defined in A.3A.1) | SSB.1 CCA (As defined in A.3A.1) | SSB.1 CCA (As defined in A.3A.1) | SSB.1 CCA (As defined in A.3A.1) |
| | Dynamic channel access | | | SSB.2 CCA (As defined in A.3A.1) | SSB.2 CCA (As defined in A.3A.1) | SSB.2 CCA (As defined in A.3A.1) | SSB.2 CCA (As defined in A.3A.1) |
| Time offset with Cell 2 | | Config 1, 2 | µs | - | 3 | - | 3 |
| SMTC configuration | | Config 1, 2 | | SMTC.1 | | | |
| DBT Window Configuration | | Config 1, 2 | | DBT.1 (As defined in A.12.1) | | | |
| DL CCA model | | Config 1, 2 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | | Config 1, 2 | | As specified in clause D.7.2.2 | | | |
| OCNG Patterns | | | | OP.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 30kHz | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_CCA_FR1_I | dBm/15Khz | -94 | | -111 | |
| | | NR_CCA_FR1_J | | | | -111 | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_CCA_FR1_I | dBm/SCS | -91 | | -108 | |
| | | NR_CCA_FR1_J | | | | -108 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 2.23 | -5.57 | -2.11 | -3.34 |
| $\hat{E}_s / N_{oc}$ | | | dB | 6 | 1.4 | 1 | 0.2 |
| SS-RSRP Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/SCS | -85 | -89.6 | -107 | -107.8 |
| | | NR_CCA_FR1_J | | | | -107 | -107.8 |
| Io Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/38.16MHz | -51.91 | | -71.75 | |
| | | NR_CCA_FR1_J | | | | -71.75 | |

| | | | | | |
|---|---|---|---|---|---|
| Propagation condition | | | - | AWGN | |
| Antenna configuration | | | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 10.5.1.1.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest SS-RSRP reported value (cell 3) | 57 | Bands NR_CCA_FR1_I | 43 |
| | | Bands NR_CCA_FR1_J | 43 |
| Highest SS-RSRP reported value (cell 3) | 76 | Bands NR_CCA_FR1_I | 55 |
| | | Bands NR_CCA_FR1_J | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest SS-RSRP reported value (cell 3) | 54 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |
| Highest SS-RSRP reported value (cell 3) | 79 | Bands NR_CCA_FR1_I | 59 |
| | | Bands NR_CCA_FR1_J | 59 |

**Table 10.5.1.1.5-3: Relative accuracy requirements for the reported values for EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x – 1 | RSRP_x + 1 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 10.5.1.2 EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell

#### 10.5.1.2.1 Test purpose

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.5.1.0.3 and 10.5.1.0.4 when both the serving cell and the target cell are subject to CCA.

#### 10.5.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access.

#### 10.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.1.0.3 and 10.5.1.0.4 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.1.2.

#### 10.5.1.2.4 Test description

Supported test configurations are shown in Table 10.5.1.2.4.1-1. Both absolute and relative accuracy of SS-RSRP inter-frequency measurements are tested by using the parameters in Table 10.5.1.2.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell. The inter-frequency measurements are supported by a measurement gap.

##### 10.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.1.2.4.1-1.

**Table 10.5.1.2.4.1-1: Supported test configurations for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Configuration | Description |
|---|---|
| 10.5.1.2-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.1.2-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.1.2.4.1-2.

**Table 10.5.1.2.4.1-2: Initial conditions for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.1.2.5-1.
2. Message contents are defined in clause 10.5.1.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

#### 10.5.1.2.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.1.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform measurements in the target neighbouring frequency, as specified in section 10.5.1.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.1.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport*. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 10.5.1.2.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 2-7 for each subtest defined in Table 10.5.1.2.5-1.

#### 10.5.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.1.2.4.3-1: Common Exception messages for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.1.2.4.3-2: *ReportConfigNR* for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

10.5.1.2.5 Test requirements

Table 10.5.1.2.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell. Table 10.5.1.2.5-2 and Table 10.5.1.2.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 10.5.1.2.5-1: Cell specific test parameters for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Parameter | | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | 1, 2 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | | 1, 2 | MHz | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| Gap pattern ID | | | | 0 | | 0 | |
| Duplex mode | | 1, 2 | | TDD | | TDD | |
| TDD configuration | | 1, 2 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| PDSCH Reference measurement channel | | 1, 2 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | 1, 2 | | CR.1.1 CCA | - | CR.1.1 CCA | - |
| Dedicated CORESET Reference Channel | | 1, 2 | | CCR.1.1 CCA | - | CCR.1.1 CCA | - |
| SSB configuration | Semi-static channel access | 1, 2 | | SSB.1 CCA (As defined in A.3A.1) | | SSB.1 CCA (As defined in A.3A.1) | |
| | Dynamic channel access | | | SSB.2 CCA (As defined in A.3A.1) | | SSB.2 CCA (As defined in A.3A.1) | |
| OCNG Patterns | | 1, 2 | | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1, 2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dedicated BWP configuration | | 1, 2 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| Time offset with Cell 2 | | 1, 2 | µs | - | 3 | - | 3 |
| SMTC configuration | | 1, 2 | | SMTC.1 | | SMTC.1 | |
| DBT Window Configuration | | 1, 2 | | As defined in A.12.1 | | As defined in A.12.1 | |
| DL CCA model | | | | As specified in clause D.7.2.1 | | | |
| UL CCA model | | | | As specified in clause D.7.2.2 | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1, 2 | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | NR_CCA_FR1_I | 1, 2 | dBm/15kHz | -96 | | ( $N_{oc}$ for Cell 3 +8dB) | -111 |
| | NR_CCA_FR1_J | | | | | | -110.5 |
| $N_{oc}$ Note2 | NR_CCA_FR1_I | 1, 2 | dBm/SSB SCS | -93 | | ( $N_{oc}$ for Cell 3 +8dB) | -108.00 |
| | NR_CCA_FR1_J | | | | | | -107.50 |
| $\hat{E}_s / I_{ot}$ | | 1, 2 | dB | 10 | 10 | 13 | -3 |
| SS-RSRP Note3 | NR_CCA_FR1_I | 1, 2 | dBm/SCS | -82.99 | | (RSRP for Cell 3 +24dB) | -111 |
| | NR_CCA_FR1_J | | | | | | -110.50 |
| Io Note3 | R_CCA_FR1_I | 1, 2 | dBm/ 38.16MHz | -51.53 | | (Io for Channel 3 +19.45dB) | -67.18 |
| | NR_CCA_FR1_J | | | | | | -74.68 |
| $\hat{E}_s / N_{oc}$ | | 1, 2 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1, 2 | - | AWGN | | AWGN | |
| Antenna configuration | | | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.5.1.2.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest SS-RSRP reported value (cell 3) | 64 | Bands NR_CCA_FR1_I | 47 |
| | | Bands NR_CCA_FR1_J | 40 |
| Highest SS-RSRP reported value (cell 3) | 83 | Bands NR_CCA_FR1_I | 60 |
| | | Bands NR_CCA_FR1_J | 52 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest SS-RSRP reported value (cell 3) | 61 | Bands NR_CCA_FR1_I | 43 |
| | | Bands NR_CCA_FR1_J | 35 |
| Highest SS-RSRP reported value (cell 3) | 86 | Bands NR_CCA_FR1_I | 64 |
| | | Bands NR_CCA_FR1_J | 57 |

**Table 10.5.1.2.5-3: Relative accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 7 | RSRP_x – 31 |
| Highest reported value (Cell 3) | RSRP_x + 7 | RSRP_x – 18 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 9 | RSRP_x – 33 |
| Highest reported value (Cell 3) | RSRP_x + 9 | RSRP_x – 17 |
| RSRP_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.2 SS-RSRQ

### 10.5.2.0 Minimum Conformance Requirements

#### 10.5.2.0.1 Intra-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

Unless otherwise specified, the requirements for absolute SS-RSRQ accuracy in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.5.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.9 for a corresponding band for each relevant SSB.

**Table 10.5.2.0.1-1: SS-RSRQ intra-frequency absolute accuracy under CCA**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ | Io [Note 1] range | | |
| | | | NR operating band groups [Note 3] | Minimum Io | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ / dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |

| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
|---|---|---|---|---|---|---|---|
| ±2.5 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.29.1.1.

### 10.5.2.0.2 Void

### 10.5.2.0.3 Inter-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

The requirements for absolute SS-RSRQ accuracy in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.5.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.10 for a corresponding band for each relevant SSB.

**Table 10.5.2.0.3-1: SS-RSRQ inter-frequency absolute accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 3] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±2.5 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.30.1.1.

### 10.5.2.0.4 Inter-frequency relative SS-RSRQ measurement accuracy requirements under CCA

The relative SS-RSRQ accuracy in inter-frequency case is defined as the RSRQ measured from one cell on a frequency compared to the RSRQ measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.5.2.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.9 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB

- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 10.5.2.0.4-1: SS-RSRQ inter-frequency relative accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.30.1.2.

## 10.5.2.1 EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with serving cell and target cell under CCA

### 10.5.2.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.5.2.0.1 when the serving and target cell are subject to CCA.

### 10.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access.

### 10.5.2.1.3 Minimum conformance requirements

The minimum conformance requirement is specified in clause 10.5.2.0.1 for absolute RSRQ accuracy.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.2.1.

### 10.5.2.1.4 Test description

Supported test configurations are shown in Table 10.5.2.1.4.1-1. Absolute SS-RSRQ accuracy intra-frequency measurements is tested by using the parameters in Table 10.5.2.1.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

#### 10.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.2.1.4.1-1.

**Table 10.5.2.1.4.1-1: Supported test configurations for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell**

| Configuration | Description |
|---|---|
| 10.5.2.1-1 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.2.1-2 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.2.1.4.1-2.

**Table 10.5.2.1.4.1-2: Initial conditions for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.2.1.5-1.
2. Message contents are defined in clause 10.5.2.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.2.1.4.2 Test procedure

In this test case all cells are on the same carrier frequency. The absolute SS-RSRQ accuracy intra-frequency measurement is tested by using the parameters in Table 10.5.2.1.5-1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 10.5.2.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. The SS shall enable DL and UL CCA model according to Table 10.5.2.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 10.5.2.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 10.5.2.1.5-1.

### 10.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.2.1.4.3-1: Common Exception messages for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy on a CCA serving cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable H.3.10-2 with Condition SMTC.1 |

**Table 10.5.2.1.4.3-2: *ReportConfigNR* for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 10.5.2.1.5 Test requirements

Table 10.5.2.1.5-1 defines the primary level settings including test tolerances for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy on a CCA serving cell. Table 10.5.2.1.5-2 defines the absolute accuracy requirements.

**Table 10.5.2.1.5-1: Cell specific test parameters for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell**

| Parameter | | Unit | Test 1 | | Test 3 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | | | |
| Duplex mode | Config 1, 2 | | TDD | | | |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1, 2 | MHz | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| DRX Cycle | | ms | Not Applicable | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | Config 1, 2 | | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | Config 1, 2 | | | CR.1.1 CCA | | CR.1.1 CCA | |
| Control Channel RMC | Config 1, 2 | | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS configuration | Config 1, 2 | | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP. 1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 2 | Config 1, 2 | | µs | - | 3 | - | 3 |
| SMTC configuration | Config 1, 2 | | | SMTC.1 | | | |
| SSB configuration | Semi-static channel access | Config 1, 2 | | SSB.1 CCA (As defined in A.3A.1.1) | | | |
| | Dynamic channel access | | | SSB.2 CCA (As defined in A.3A.1.2) | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | kHz | 30kHz | | | |
| DBT Window Configuration | Config 1, 2 | | | DBT.1 (As defined in A.12.1) | | | |
| DL CCA model | Config 1, 2 | | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1, 2 | | | As specified in clause D.7.2.2 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | Config1, 2 | NR_CCA_FR1_I | Bm/15kHz | -92.6 | | -110 | |
| | | NR_CCA_FR1_J | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_CCA_FR1_I | dBm/SC S | -89.6 | | -107 | |
| | | NR_CCA_FR1_J | | | | -106.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.76 | | -5.46 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 3 | 3 | -4 | -4 |
| SS-RSRP Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/SCS | -86.59 | -86.59 | -110.99 | -110.99 |
| | | NR_CCA_FR1_J | | | | -110.49 | -110.49 |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.77 | -14.77 | -17.34 | -17.34 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.56 | | | -73.4 |
| | | NR_CCA_FR1_J | | | | | -72.9 |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Clause 3A.4.1.

| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |
|---|---|

**Table 10.5.2.1.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRQ_52 | SS-RSRQ_44 |
| Highest reported value (Cell 3) | SS-RSRQ_62 | SS-RSRQ_59 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRQ_49 | SS-RSRQ_43 |
| Highest reported value (Cell 3) | SS-RSRQ_65 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.2.2 EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with serving cell and target cell under CCA

### 10.5.2.2.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.5.2.0.3 and 10.5.2.0.4 when both the serving cell and the target cell are subject to CCA.

### 10.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access.

### 10.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.2.0.3 and 10.5.2.0.4 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.2.2.

### 10.5.2.2.4 Test description

Supported test configurations are shown in Table 10.5.2.2.4.1-1. Both absolute and relative SS-RSRQ accuracy inter-frequency measurements are tested by using the parameters in Table 10.5.2.2.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell. The inter-frequency measurements are supported by a measurement gap.

#### 10.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.2.2.4.1-1.

**Table 10.5.2.2.4.1-1: Supported test configurations for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| Configuration | Description |
|---|---|
| 10.5.2.2-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.2.2-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.2.2.4.1-2.

**Table 10.5.2.2.4.1-2: Initial conditions for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.2.2.5-1.
2. Message contents are defined in clause 10.5.2.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.2.2.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.2.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform measurements in the target neighbouring frequency, as specified in section 10.5.2.2.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. The SS shall enable DL and UL CCA model according to Table 10.5.2.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 10.5.2.2.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 10.5.2.2.5-1.

#### 10.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.2.2.4.3-1: Common Exception messages for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessH.3.10-2 with Condition SMTC.1 |

**Table 10.5.2.2.4.3-2: *ReportConfigNR* for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 10.5.2.2.5 Test requirements

Table 10.5.2.2.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell. Table 10.5.2.2.5-2 and Table 10.5.2.2.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 10.5.2.2.5-1: Cell specific test parameters for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1, 2 | | TDD | | | | | |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | Config 1, 2 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1, 2 | MHz | 40: $N_{RB,c}$ = 106 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Gap pattern ID | | | | 0 | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1, 2 | | SR.1.1 CCA | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.1.1 CCA | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.1.1 CCA | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS configuration | | Config 1, 2 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP.1 | | | | | |
| Time offset with Cell 2 | | Config 1, 2 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | | Config 1, 2 | | SMTC.1 | | | | | |
| SSB configuration | Semi-static channel access | Config 1, 2 | | SSB.1 CCA | | | | | |
| | Dynamic channel access | | | SSB.2 CCA | | | | | |
| DBT Window Configuration | | Config 1, 2 | | DBT.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_CCA_FR1_I | dBm/15kHz | -87.80 | -87.80 | -113 | -113 | -112 | -112 |
| | | NR_CCA_FR1_J | | | | | | -111.5 | -111.5 |
| $N_{oc}$ Note2 | Config 1, 2 | NR_CCA_FR1_I | dBm/SCS | -84.80 | -84.80 | -110 | -110 | -109 | -109 |
| | | NR_CCA_FR1_J | | | | | | -108.5 | -108.5 |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/SCS | -86.54 | -86.54 | -111.74 | -111.74 | -105.99 | -110.74 |
| | | NR_CCA_FR1_J | | | | | | -105.49 | -110.24 |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.76 | -14.76 | -14.76 | -14.76 | -14.76 | -12.56 |
| | | NR_CCA_FR1_J | | | | | | | |
| Io Note3 | Config 1, 2 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.52 | -51.52 | -76.72 | -76.72 | -73.18 | -75.72 |
| | | NR_CCA_FR1_J | | | | | | -72.68 | -75.22 |
| Propagation condition | | | | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Clause 3A.4.1.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.5.2.2.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_52 | SS-RSRQ_52 | SS-RSRQ_52 |
| Highest reported value (Cell 3) | SS-RSRQ_62 | SS-RSRQ_62 | SS-RSRQ_62 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_49 | SS-RSRQ_49 | SS-RSRQ_49 |
| Highest reported value (Cell 3) | SS-RSRQ_65 | SS-RSRQ_65 | SS-RSRQ_65 |

**Table 10.5.2.2.5-3: Relative accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with CCA serving cell and CCA target cell**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_x - 7 | SS-RSRQ_x - 7 | SS-RSRQ_x - 11 |
| Highest reported value (Cell 3) | SS-RSRQ_x + 7 | SS-RSRQ_x + 7 | SS-RSRQ_x + 2 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x - 13 |
| Highest reported value (Cell 3) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| RSRQ_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.3 SS-SINR

### 10.5.3.0 Minimum Conformance Requirements

#### 10.5.3.0.1 Intra-frequency absolute SS-SINR measurement accuracy requirements under CCA

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell under CCA.

The accuracy requirements in Table 10.5.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.9 for a corresponding band for each relevant SSB.

**Table 10.5.3.0.1-1: SS-SINR intra-frequency absolute accuracy under CCA**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 3 | Io Note 1 range | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3.0 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth. | | | | | | | |

NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.31.1.1.

### 10.5.3.0.2 Void

### 10.5.3.0.3 Inter-frequency absolute SS-SINR measurement accuracy requirements under CCA

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency under CCA that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.5.3.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.10 for a corresponding band for each relevant SSB.

**Table 10.5.3.0.3-1: SS-SINR inter-frequency absolute accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3.0 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | 116.5 | -113.5 | | |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.32.1.1.

### 10.5.3.0.4 Inter-frequency relative SS-SINR measurement accuracy requirements under CCA

The relative accuracy of SS-SINR in inter-frequency case is defined as the SS-SINR measured from one cell on a frequency compared to the SS-SINR measured from another cell on a different frequency, with at least one of the two frequencies being under CCA.

The accuracy requirements in Table 10.5.3.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.10 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 10.5.3.0.4-1: SS-SINR inter-frequency relative accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2,4 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | | |
| ±3.5 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 5: NR operating band groups are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.32.1.2.

## 10.5.3.1 EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA

### 10.5.3.1.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.5.3.0.1 when the serving and target cell are subject to CCA.

### 10.5.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum.

### 10.5.3.1.3 Minimum conformance requirements

The minimum conformance requirement is specified in clause 10.5.3.0.1 for absolute SS-SINR accuracy.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.3.1.

### 10.5.3.1.4 Test description

Supported test configurations are shown in Table 10.5.3.1.4.1-1. Absolute accuracy of SS-SINR intra-frequency measurements is tested by using the parameters in Table 10.5.3.1.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell under CCA, and Cell 3 is the target cell under CCA.

#### 10.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.3.1.4.1-1.

**Table 10.5.3.1.4.1-1: Supported test configurations for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Configuration | Description |
|---|---|
| 10.5.3.1-1 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.3.1-2 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.3.1.4.1-2.

**Table 10.5.3.1.4.1-2: Initial conditions for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.3.1.5-1.
2. Message contents are defined in clause 10.5.3.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.3.1.4.2 Test procedure

In this test case all cells are on the same carrier frequency. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 10.5.3.1.5-1. In all test cases, Cell 2 is the PSCell with CCA and Cell 3 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different $N_{oc}$ on Cells 2 and 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 10.5.3.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. The SS shall enable DL and UL CCA model according to Table 10.5.3.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 10.5.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 10.5.3.1.5-1.

#### 10.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.3.1.4.3-1: Common Exception messages for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessH.3.10-2 with Condition SMTC.1 |

**Table 10.5.3.1.4.3-2: *ReportConfigNR* for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 10.5.3.1.5 Test requirements

Table 10.5.3.1.5-1 defines the primary level settings including test tolerances for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on a CCA serving cell. Table 10.5.3.1.5-2 defines the absolute accuracy requirements.

**Table 10.5.3.1.5-1: Cell specific test parameters for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 | | freq1 | |
| DL CCA model | Config 1,2 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1,2 | | As specified in clause D.7.2.2 | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | | Config 1,2 | | TDD | | | |
| TDD configuration | | Config 1,2 | | TDDConf.1.1 CCA | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | |
| TRS Configuration | | Config 1,2 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1,2 | | SR.1.1 CCA | | SR1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1,2 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | Config 1,2 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | | OP.1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 2 | | Config 1,2 | µs | - | 3 | - | 3 |
| DBT Window Configuration | | Config 1,2 | | DBT.1 | | | |
| SSB configuration | | Config 1,2 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1,2 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 30 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -93.2 | | -112 | |
| | | NR_CCA_FR1_J | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1,2 | NR_CCA_FR1_I | dBm/SCS | -90.2 | | -109 | |
| | | NR_CCA_FR1_J | | | | -108.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -3.5 | -3.5 |
| SS-RSRP Note3 | Config 1,2 | NR_CCA_FR1_I | dBm/SCS | -85.65 | -87.53 | -112.49 | -112.49 |
| | | NR_CCA_FR1_J | | | | -111.99 | -111.99 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | 0 | -3.19 | -5.10 | -5.10 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1,2 | NR_CCA_FR1_I | dBm/38.16MHz | -51.59 | | -75.17 | |
| | | NR_CCA_FR1_J | | | | -74.67 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| | |
|---|---|
| Note 3: | SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | NR operating band groups are as defined in Clause 3A.4.1. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration. |
| Note 7: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 8: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 9: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

**Table 10.5.3.1.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 3) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 3) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.3.2 EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA

### 10.5.3.2.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.5.3.0.3 and 10.5.3.0.4 when both the serving cell and the target cell are subject to CCA.

### 10.5.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrumsupporting.

### 10.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.3.0.3 and 10.5.3.0.4 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.3.2.

### 10.5.3.2.4 Test description

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 10.5.3.2.4.1-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table 10.5.3.2.5-1. In all test cases, Cell 2 is the PSCell with CCA and Cell 3 is target cell with CCA. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.6B.

#### 10.5.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.3.2.4.1-1.

**Table 10.5.3.2.4.1-1: Supported test configurations for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Configuration | Description |
|---|---|
| 10.5.3.2-1 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.3.2-2 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.3.2.4.1-2.

**Table 10.5.3.2.4.1-2: Initial conditions for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.3.2.5-1.
2. Message contents are defined in clause 10.5.3.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

#### 10.5.3.2.4.2 Test procedure

Three sub-tests (Test 1, Test 2 and Test 3) are provided different $N_{oc}$ on Cells 2 and 3. In all test cases, Cell 2 is the PSCell under CCA, and Cell 3 is the target cell under CCA. The inter-frequency measurements are supported by a measurement gap. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.3.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform measurements in the target neighbouring frequency, as specified in section 10.5.3.2.4.3.

4. The UE shall transmit an *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. The SS shall enable DL and UL CCA model according to Table 10.5.3.2.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 5, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 10.5.3.2.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 10.5.3.2.5-1.

#### 10.5.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.3.2.4.3-1: Common Exception messages for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessH.3.10-2 with Condition SMTC.1 |

**Table 10.5.3.2.4.3-2: *ReportConfigNR* for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

10.5.3.2.5 Test requirements

Table 10.5.3.2.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy with CCA serving cell and CCA target cell. Table 10.5.3.2.5-2 and Table 10.5.3.2.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 10.5.3.2.5-1: Cell specific test parameters for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| DL CCA model | | Config 1,2 | | As specified in clause D.7.2.1 | | | | | |
| UL CCA model | | Config 1,2 | | As specified in clause D.7.2.2 | | | | | |
| UL CCA probability | | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| | | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| Duplex mode | | Config 1,2 | | TDD | | | | | |
| TDD configuration | | Config 1,2 | | TDDConf.1.1 CCA | | | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | | Config 1,2 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1,2 | | SR.1.1 CCA | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1,2 | | CR.1.1 CCA | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | Config 1,2 | | CCR.1.1 CCA | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | |
| Time offset with Cell 2 | | Config 1,2 | µs | - | 3 | - | 3 | - | 3 |
| DBT Window configuration | | Config 1,2 | | DBT.1 | | | | | |
| SSB configuration | | Config 1,2 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | | | |
| SMTC configuration | | Config 1,2 | | SMTC.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -88 | | -108.5 | | -115.5 | |
| | | NR_CCA_FR1_J | | | | | | -115 | |
| $N_{oc}$ Note2 | Config 1,2 | NR_CCA_FR1_I | dBm/SCS | -85 | | -105.5 | | -112.5 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_CCA_FR1_J | | | | -112 |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | 20 | -3.2 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | 20 | -3.2 |
| SS-RSRP Note3 | Config 1,2 | NR_CCA_FR1_I | | -86.74 | -85.49 | -115.69 |
| | | NR_CCA_FR1_J | | | | -115.19 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | -1.75 | 20 | -3.2 |
| | | NR_CCA_FR1_J | | | | |
| Io Note3 | Config 1,2 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.72 | -54.40 | -79.75 |
| | | NR_CCA_FR1_J | | | | -79.25 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3A.4.1.
Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration
Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.5.3.2.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_35 | SS-SINR_79 | SS-SINR_32 |
| Highest reported value (Cell 3) | SS-SINR_51 | SS-SINR_94 | SS-SINR_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_33 | SS-SINR_77 | SS-SINR_31 |
| Highest reported value (Cell 3) | SS-SINR_53 | SS-SINR_96 | SS-SINR_50 |

**Table 10.5.3.2.5-3: Relative accuracy requirements for the reported values for EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 3) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 3) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| SS-SINR_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.3.3 EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA

### 10.5.3.3.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.5.3.0.1 when the serving and target cell are subject to CCA.

### 10.5.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum, and 2DL CA.

### 10.5.3.3.3 Minimum conformance requirements

The minimum conformance requirement is specified in clause 10.5.3.0.1 for absolute SS-SINR accuracy.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.3.1.

### 10.5.3.3.4 Test description

Supported test configurations are shown in Table 10.5.3.3.4.1-1. Absolute accuracy of SS-SINR intra-frequency measurements is tested by using the parameters in Table 10.5.3.3.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell with CCA, Cell 3 is the SCell with CCA, and Cell 4 is the target cell with CCA.

#### 10.5.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.3.3.4.1-1.

**Table 10.5.3.3.4.1-1: Supported test configurations for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Configuration | Description |
|---|---|
| 10.5.3.3-1 | LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.3.3-2 | LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.3.3.4.1-2.

**Table 10.5.3.3.4.1-2: Initial conditions for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 10.5.3.3.5-1.
2. Message contents are defined in clause 10.5.3.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 and Cell 3 are the NR cell (PSCell) and NR SCell respectively, with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 4 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.3.3.4.2 Test procedure

In this test case Cell 2 (PSCell) in on frequency 1 while Cell 3 (SCell) and Cell 4 (target cell) which are intra-frequency neighbour s, are on frequency 2. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 10.5.3.3.5-1. Cell 2 is the PSCell with CCA, Cell 3 is the SCell with CCA, and Cell 4 is the target cell with CCA. Two sub-tests (Test 1 and Test 2) are provided different $N_{oc}$ on Cells 2, 3 and 4. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. The SS shall configure SCell (Cell 3) on the NR-U SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 10.5.3.3.4.3. NR *RRCReconfiguration* message is contained in *RRCConnectionReconfiguration* and NR *RRCReconfigurationComplete* message is contained in *RRCConnectionReconfigurationComplete*. Cell 3 is an activated SCell and is scheduled throughout the test as specified in Table 10.5.3.3.5-1.
3. Set the parameters according to Table 10.5.3.3.5-1 as appropriate.
4. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform SCC intra-frequency measurements as specified in section 10.5.3.3.4.3.
5. The UE shall transmit an *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. The SS shall enable DL and UL CCA model according to Table 10.5.3.3.5-1.
6. The UE shall transmit periodical *MeasurementReport* messages.
7. After 10s wait from Step 6, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 4 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 10.5.3.3.5-2 or the UE fails to report the measurement value for Cell 4, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
8. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
9. Repeat steps 1-8 for each subtest defined in Table 10.5.3.3.5-1.

### 10.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.3.3.4.3-1: Common Exception messages for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessH.3.10-2 with Condition SMTC.1 CCA |

**Table 10.5.3.3.4.3-2: *RRCReconfiguration* (step 2, SCell addition) for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | NR_MEAS |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | SCell_add |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.5.3.3.4.3-3: *ReportConfigNR* for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

10.5.3.3.5 Test requirements

Table 10.5.3.3.5-1 defines the primary level settings including test tolerances for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on a CCA serving SCell. Table 10.5.3.3.5-2 defines the absolute accuracy requirements.

**Table 10.5.3.3.5-1: Cell specific test parameters for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 / Cell 3 | Cell 4 | Cell 2 / Cell 3 | Cell 4 |
| SSB ARFCN | | freq1 for Cell 2 | freq2 | freq1 for Cell 2 | freq2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | freq2 for Cell 3 | | freq2 for Cell 3 | | |
| DL CCA model | Config 1,2 | | As specified in clause D.7.2.1 | | | | |
| UL CCA model | Config 1,2 | | As specified in clause D.7.2.2 | | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - | |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - | |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - | |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - | |
| Duplex mode | Config 1,2 | | TDD | | | | |
| TDD configuration | Config 1,2 | | TDDConf.1.1 CCA | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | |
| TRS Configuration | Config 1,2 | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 CCA | | SR1.1 CCA | | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 CCA | | CR.1.1 CCA | | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 CCA | | CCR.1.1 CCA | | |
| OCNG Patterns | | | OP.1 | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | |
| Time offset with Cell 2 | Config 1,2 | µs | 3 (for Cell 3) | 3 | 3 (for Cell 3) | 3 | |
| DBT Window Configuration | Config 1,2 | | DBT.1 | | | | |
| SSB configuration | Config 1,2 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | | |
| SMTC configuration | Config 1,2 | | SMTC.1 | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 30 | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -93.2 | | -112 | |
| | | NR_CCA_FR1_J | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1,2 | NR_CCA_FR1_I | dBm/SCS | -90.2 | | -109 | |
| | | NR_CCA_FR1_J | | | | -108.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -3.5 | -3.5 |
| SS-RSRP Note 3 | Config 1,2 | NR_CCA_FR1_I | dBm/SCS | -85.65 | -87.53 | -112.49 | -112.49 |
| | | NR_CCA_FR1_J | | | | -111.99 | -111.99 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | 0 | -3.19 | -5.10 | -5.10 |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_CCA_FR1_J | | | |
| Io[Note3] | Config 1,2 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.59 | -75.17 |
| | | NR_CCA_FR1_J | | | -74.67 |
| Propagation condition | | | - | AWGN | |
| Antenna configuration | | | - | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Clause 3A.4.1.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration

Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 10.5.3.3.5-2: Absolute accuracy requirements for the reported values for EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest reported value (Cell 4) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 4) | SS-SINR_49 | SS-SINR_45 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 4) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 4) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.4 L1-RSRP measurement accuracy for beam reporting with CCA serving cell

### 10.5.4.0 Minimum conformance requirements

#### 10.5.4.0.1 Minimum conformance requitements for SSB-based L1-RSRP measurement accuracy for beam reporting under CCA

##### 10.5.4.0.1.1 SSB-based L1-RSRP measurement absolute accuracy under CCA

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement under CCA.

The accuracy requirements in Table 10.5.4.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.11.1 of TS 38.133 [6] for a corresponding band for each relevant SSB.

**Table 10.5.4.0.1.1-1: SSB based L1-RSRP absolute accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
| | | | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±5.0 | ±9.5 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -70 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| ±8.5 | ±11.5 | ≥-3 | NR_CCA_FR1_I | N/A | N/A | -70 | -50 |
| | | | NR_CCA_FR1_J | | | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined in TS 38.133 [6] Table 10.1.6.1-1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.33.1 and 10.1.6.

### 10.5.4.0.1.2 SSB-based L1-RSRP measurement relative accuracy under CCA

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell under CCA.

The accuracy requirements in Table 10.5.4.0.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3F of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to 38.133 [6] Annex B.2.11.1 for a corresponding band for each relevant SSB.

**Table 10.5.4.0.1.2-1: SSB based L1-RSRP relative accuracy under CCA**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_CCA_FR1_I | -117 | -114 | N/A | -50 |
| | | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.<br>NOTE 3: NR operating band groups are as defined in clause 3A.4.1. | | | | | | | |

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by TS 38.133 [6] Table 10.1.6.1-1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.33.1 and 10.1.6.

## 10.5.4.1 EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA

#### 10.5.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands. This test will verify the L1-RSRP measurement accuracy requirements in clauses 10.5.4.0.1.1 and 10.5.4.0.1.2.

#### 10.5.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements in dynamic channel access or in semi-static channel access and UL with a shared spectrum NR carrier.

#### 10.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.5.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.4.1.

#### 10.5.4.1.4 Test description

There are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in Table A.6B.1-1. The test configurations and parameters for the Cell 2 are given in Table 10.5.4.1.4.1-1 and Table 10.5.4.1.5-1 below respectively. Two sub-tests (Test 1 and Test 2) are provided with different $N_{oc}$ on Cell 2. The absolute and relative accuracy of L1-RSRP measurements is tested by using the parameters in Table 10.5.4.1.5-2 and Table 10.5.4.1.5-3 respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 10.5.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 10.5.4.1.4.1-2. Test environment parameters are given in Table 10.5.4.1.4.1-2.

**Table 10.5.4.1.4.1-1: Supported test configurations for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Config | Description |
|---|---|
| 10.5.4.1-1 | LTE FDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 10.5.4.1-2 | LTE TDD<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 10.5.4.1.4.1-2: Test Environment parameters for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 10.5.4.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Table A.6B.1-1. Cell 2 is NR FR1 PSCell under CCA and is the target for SSB based L1-RSRP measurements.

#### 10.5.4.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the table 10.5.4.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 10.5.4.1.4.1-2.
2. The SS shall set the parameters according to Test 1 in Table 10.5.4.1.5-1 and enable DL and UL CCA model according to the same table.
3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.
4. The SS shall check following requirements:

   R1: The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 10.5.4.1.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   R2: The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 10.5.4.1.5-3, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
6. Set the parameters according to Test 2 in Table 10.5.4.1.5-1 and repeat steps 3-5.

#### 10.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.4.1.4.3-1: Common Exception messages for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 10.5.4.1.4.3-2: *RadioLinkMonitoringConfig* for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

10.5.4.1.5 Test requirement

Table 10.5.4.1.5-1 defines the primary level settings for all tests for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA. In both Test 1 and Test 2, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.5.4.0.1.1 and 10.5.4.0.1.2 while meeting the corresponding absolute accuracy requirements in Table 10.5.4.1.5-2, and the corresponding relative accuracy requirements in Table 10.5.4.1.5-3 for all test configurations.

**Table 10.5.4.1.5-1: Test parameters for EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1,2 | | freq1 | freq1 |
| DL CCA model | 1,2 | | As specified in D.7.2.1 | As specified in D.7.2.1 |
| UL CCA model | 1,2 | | As specified in D.7.2.2 | As specified in D.7.2.2 |
| Duplex mode | 1,2 | | TDD | TDD |
| TDD Configuration | 1,2 | | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1,2 | MHz | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| Duplex mode | 1,2 | | TDD | TDD |
| TDD configuration | 1,2 | | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| PDSCH Reference measurement channel | 1,2 | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 | | CCR.1.1 CCA | CCR.1.1 CCA |
| SSB configuration for Semi-static channel access | 1,2 | | SSB.3 CCA | SSB.3 CCA |
| SSB configuration for Dynamic channel access | 1,2 | | SSB.4 CCA | SSB.4 CCA |
| OCNG Patterns | 1,2 | | OP.1 | OP.1 |
| TRS configuration | 1,2 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | 1,2 | | DBT.1 | DBT.1 |
| *reportConfigType* | 1,2 | | periodic | periodic |
| *reportQuantity* | 1,2 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1,2 | | 2 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| L1-RSRP reporting period | | 1,2 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1,2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | 1,2 | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | NR_TDD_FR1_I | 1,2 | dBm/15kHz | -96 | -113 |
| $N_{oc}$ Note2 | NR_TDD_FR1_I | 1,2 | dBm/SCS | -93 | -110 |
| $\hat{E}_s / I_{ot}$ | | 1,2 | dB | 10 | -2.2 |
| SS-RSRP Note3 | NR_TDD_FR1_I | 1,2 | dBm/SCS | -82.99 | -112.19 |
| Io Note3 | NR_TDD_FR1_I | 1,2 | dBm/ 38.16MHz | -51.53 | -76.90 |
| $\hat{E}_s / N_{oc}$ | | 1,2 | dB | 10 | -2.2 |
| Propagation condition | | 1,2 | | AWGN | AWGN |
| Antenna configuration | | 1,2 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 10.5.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 63 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |
| Highest reported value (Cell 2) | 84 | Bands NR_CCA_FR1_I | 51 |
| | | Bands NR_CCA_FR1_J | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 60 | Bands NR_CCA_FR1_I | 33 |
| | | Bands NR_CCA_FR1_J | 33 |
| Highest reported value (Cell 2) | 87 | Bands NR_CCA_FR1_I | 56 |
| | | Bands NR_CCA_FR1_J | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4.1, Table 3A.4.1-1 | | | |

**Table 10.5.4.1.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 10.5.5 RSSI

### 10.5.5.0 Minimum Conformance Requirements

#### 10.5.5.0.1 Intra-frequency absolute RSSI measurement accuracy requirements in FR1

The accuracy requirements for intra-frequency RSSI measurements on a carrier frequency under CCA are specified in Table 10.5.5.0.1-1. The requirements apply for any configured RSSI *measDuration* [13], provided that:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval.

The intra-frequency RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [37], where the channel has the centre frequency configured by *ARFCN-valueNR*.

**Table 10.5.5.0.1-1: Intra-frequency RSSI accuracy under CCA**

| **Accuracy** | | **Conditions** | | | | |
|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **Io [Note 1] range** | | | | |
| | | **NR operating band groups [Note 2]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| [±3.5] | [±6.5] | NR_CCA_FR1_I | -117 | -114 | N/A | -70 |
| | | NR_CCA_FR1_J | -116.5 | -113.5 | | |
| [±5.5] | [±8.5] | NR_CCA_FR1_I | N/A | N/A | -70 | -50 |
| | | NR_CCA_FR1_J | | | | |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups are as defined in clause 3A.4.1. | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.34.1.

#### 10.5.5.0.2 Inter-frequency absolute RSSI measurement accuracy requirements in FR1

The accuracy requirements for inter-frequency RSSI measurements on a carrier frequency under CCA are the same as specified in clause 10.5.5.0.1.

The inter-frequency RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [37], where the channel has the centre frequency configured by *ARFCN-valueNR*.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.34.2.

## 10.5.5.1 EN-DC FR1 RSSI measurement accuracy on PSCC with CCA

### 10.5.5.1.1 Test purpose

The purpose of this test is to verify that RSSI measurement accuracy for PSCC is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in clause 10.5.5.0.1 when the PSCC is subject to CCA.

### 10.5.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting RRM and RSSI measurements on shared channel access.

### 10.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.5.1.

### 10.5.5.1.4 Test description

#### 10.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.5.1.4.1-1.

**Table 10.5.5.1.4.1-1: EN-DC FR1 RSSI measurement accuracy supported test configurations for PSCC under CCA**

| Test Case ID | Description |
|---|---|
| 10.5.5.1-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.5.1-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.5.1.4.1-2.

**Table 10.5.5.1.4.1-2: Initial conditions for EN-DC FR1 RSSI measurement accuracy on PSCC under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.5.1.5-1.
2. Message contents are defined in clause 10.5.5.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the PSCell and is the target cell for RSSI measurements. The connection setup is done according to the settings in clause C.1.2 and C.1.3.

#### 10.5.5.1.4.2 Test procedure

In this set of test cases there are two cells, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.5.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform RSSI measurements according to the RMTC specified in section 10.5.5.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.5.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 10.5.5.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.5.1.4.3-1: Common Exception messages for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.5.1.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.5.1.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

10.5.5.1.5 Test requirement

Table 10.5.5.1.5-1 defines the primary level settings including test tolerances for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA. Each RSSI measurement report shall meet the corresponding accuracy requirements in Table 10.5.5.1.5-3.

**Table 10.5.5.1.5-1: Cell specific test parameters for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Parameter | | Configurations | Unit | Test 1 |
|---|---|---|---|---|
| | | | | Cell 2 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | | MHz | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | As specified in D.7.2.1 |
| UL CCA model | | | | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRB}$ | Same as channel access bandwidth |
| Channel access bandwidth | | | MHz | 20 |
| DRX Cycle configuration | | | ms | Not Applicable |
| PDSCH Reference measurement channel | | | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 CCA |
| OCNG Patterns | | | | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -58.96 |
| Propagation condition | | - | AWGN |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

**Table 10.5.5.1.5-2: EN-DC FR1 RSSI RMTC parameters for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 10.5.5.1.5-3: Requirements for the reported values for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| **Normal Conditions** | **Test 1<br>All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| Extreme Conditions | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 10.5.5.2 EN-DC FR1 RSSI measurement accuracy on SCC with CCA

#### 10.5.5.2.1 Test purpose

The purpose of this test is to verify that RSSI measurement accuracy for SCC is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in clause 10.5.5.0.1 when SCC is subject to CCA.

#### 10.5.5.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting RRM and RSSI measurements on shared channel access.

#### 10.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A. 10.5.5.2.

#### 10.5.5.2.4 Test description

##### 10.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.5.2.4.1-1.

**Table 10.5.5.2.4.1-1: Supported test configurations for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| Configuration | Description |
|---|---|
| 10.5.5.2-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.5.2-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.5.2.4.1-2.

**Table 10.5.5.2.4.1-2: Initial conditions for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.5.2.5-1.
2. Message contents are defined in clause 10.5.5.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR cell (SCC) also with the power level set according to clauses C.1.2 and C.1.3 for this test.

#### 10.5.5.2.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 SCC cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. Both Cell 2 (PCell) and Cell 3 (SCell) are configured on the UE.

2. Set the parameters according to Table 10.5.5.2.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform RSSI measurements in the target SCC frequency, according to the RMTC specified in section 10.5.5.2.4.3.

4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.5.2.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 5, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 3 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 10.5.5.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.5.2.4.3-1: Common Exception messages for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 |

**Table 10.5.5.2.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy on SCC under CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.5.2.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy on SCC under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

10.5.5.2.5 Test requirements

Table 10.5.5.2.5-1 defines the primary level settings including test tolerances for EN-DC FR1 RSSI measurement accuracy on SCC with CCA. Each RSSI measurement report shall meet the corresponding accuracy requirements in Table 10.5.5.2.5-3.

**Table 10.5.5.2.5-1: Cell specific test parameters for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 1 | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | | 1 | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

**Table 10.5.5.2.5-2: EN-DC FR1 RSSI RMTC parameters for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 10.5.5.2.5-3: Requirements for the reported values for EN-DC FR1 RSSI measurement accuracy on SCC with CCA**

| **Normal Conditions** | **Test 1<br>All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| Extreme Conditions | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 10.5.5.3 EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA

### 10.5.5.3.1 Test purpose

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.5.5.0.2 when both the serving cell and the target cell are subject to CCA.

### 10.5.5.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting inter-frequency RRM and RSSI measurements on shared channel access.

### 10.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.5.0.2 for absolute accuracy.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.5.3.

### 10.5.5.3.4 Test description

Supported test configurations are shown in Table 10.5.5.3.4.1-1. Absolute accuracy of RSSI inter-frequency measurements are tested by using the parameters in Table 10.5.5.3.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell. The inter-frequency measurements are supported by a measurement gap.

#### 10.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.5.3.4.1-1.

**Table 10.5.5.3.4.1-1: Supported test configurations for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 10.5.5.3-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.5.3-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.5.3.4.1-2.

**Table 10.5.5.3.4.1-2: Initial conditions for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |

| | | | |
|---|---|---|---|
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.5.3.5-1.
2. Message contents are defined in clause 10.5.5.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.5.3.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.5.3.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform RSSI measurements in the target neighbouring frequency, according to the RMTC specified in section 10.5.5.3.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.5.3.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 3 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 10.5.5.3.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G. 2.7 is achieved.

### 10.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.5.3.4.3-1: Common Exception messages for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 |

**Table 10.5.5.3.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy on a carrier under CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.5.3.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy on a carrier under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

### 10.5.5.3.5 Test requirements

Table 10.5.5.3.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA. Each RSSI measurement report shall meet the corresponding accuracy requirements in Table 10.5.5.3.5-3.

**Table 10.5.5.3.5-1: Cell specific test parameters for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA | SSB.2 CCA |

| | | | | |
|---|---|---|---|---|
| $P_{CCA_DL}$ | | | 1 | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | 1 | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | MHz | 20 | |
| DRX Cycle configuration | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | SR.1.1 TDD | NA |
| RMSI CORESET Reference Channel | | | CR.1.1 TDD | NA |
| Dedicated CORESET Reference Channel | | | CCR.1.1 TDD | NA |
| OCNG Patterns | | | OP.1 | NA |
| EPRE ratio of PSS to SSS | | dB | 0 | NA |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

| |
|---|
| Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |

**Table 10.5.5.3.5-2: EN-DC FR1 RSSI RMTC parameters for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 10.5.5.3.5-3: Absolute accuracy requirements for the reported values for EN-DC FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| **Normal Conditions** | **Test 1**<br>**All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| Extreme Conditions | **Test 1**<br>**All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 10.5.6 Channel occupancy

### 10.5.6.0 Minimum Conformance Requirements

#### 10.5.6.0.1 Intra-frequency channel occupancy measurement accuracy requirements in FR1

The UE shall be able to correctly evaluate the intra-frequency channel occupancy configured according to TS 38.331 [13], provided that the following conditions are met:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval,
- RSSI at the UE receiver meets the following condition with respect to the configured *channelOccupancyThreshold* [13]:
  - RSSI at the UE receiver is below *channelOccupancyThreshold*- $\Delta_{RSSI}$, or
  - RSSI at the UE receiver is above *channelOccupancyThreshold*+ $\Delta_{RSSI}$,
- where $\Delta_{RSSI}$ is the applicable RSSI measurement accuracy value from the RSSI measurement accuracy requirements specified in clause 10.5.5.0.1.

The channel occupancy measurement bandwidth is the same as the RSSI measurement bandwidth in Clause 10.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.35.1.

#### 10.5.6.0.2 Inter-frequency channel occupancy measurement accuracy requirements in FR1

The UE shall be able to correctly evaluate the inter-frequency channel occupancy configured according to TS 38.331 [13], provided that the following conditions are met:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same reporting interval,
- RSSI at the UE receiver meets the following condition with respect to the configured *channelOccupancyThreshold* [2]:
  - RSSI at the UE receiver is below *channelOccupancyThreshold*- $\Delta_{RSSI}$, or
  - RSSI at the UE receiver is above *channelOccupancyThreshold*+ $\Delta_{RSSI}$,
- where $\Delta_{RSSI}$ is the applicable RSSI measurement accuracy value from the RSSI measurement accuracy requirements specified in clause 10.5.5.0.2.

The channel occupancy measurement bandwidth is the same as the RSSI measurement bandwidth in Clause 10.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.35.2.

### 10.5.6.1 EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA

#### 10.5.6.1.1 Test purpose

The purpose of this test is to verify that Channel occupancy measurement accuracy for PSCC is within the specified limits. This test will partially verify the Channel occupancy measurement accuracy requirements in clause 10.5.6.0.1 when the PSCC is subject to CCA.

#### 10.5.6.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

#### 10.5.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.5.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.6.1.

#### 10.5.6.1.4 Test description

##### 10.5.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.6.1.4.1-1.

**Table 10.5.6.1.4.1-1: Supported test configurations for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA**

| Test Case ID | Description |
|---|---|
| 10.5.6.1-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.6.1-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.6.1.4.1-2.

**Table 10.5.6.1.4.1-2: Initial conditions for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.6.1.5-1.
2. Message contents are defined in clause 10.5.6.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B.Cell 2 is the PSCell and is the target cell for Channel occupancy measurements. The connection setup is done according to the settings in clause C.1.2 and C.1.3.

### 10.5.6.1.4.2 Test procedure

In this set of test cases there are two cells, E-UTRAN PCell (Cell 1), FR1 PSCell under CCA (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.6.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform Channel occupancy measurements in DBT windows according to the RMTC specified in section 10.5.6.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.6.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 2 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

### 10.5.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.6.1.4.3-1: Common Exception messages for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.6.1.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.6.1.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy for PSCC under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

10.5.6.1.5 Test requirement

Table 10.5.6.1.5-1 defines the primary level settings including test tolerances for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA.

**Table 10.5.6.1.5-1: Cell specific test parameters for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA**

| Parameter | | Configurations | Unit | Test 1 |
|---|---|---|---|---|
| | | | | Cell 2 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | | MHz | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA |

| | | | | |
|---|---|---|---|---|
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | As specified in D.7.2.1 |
| UL CCA model | | | | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth | | | MHz | 20 |
| DRX Cycle configuration | | | ms | Not Applicable |
| PDSCH Reference measurement channel | | | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 CCA |
| OCNG Patterns | | | | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dB | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/measBW | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/measBW | -58.96 |
| Propagation condition | | | - | AWGN |
| channelOccupancyThreshold | | | dBm | -83 |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 10.5.6.1.5-2: EN-DC FR1 Channel occupancy RMTC parameters for EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 10.5.6.2 EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA

### 10.5.6.2.1 Test purpose

The purpose of this test is to verify that Channel occupancy measurement accuracy for SCC is within the specified limits. This test will partially verify the Channel occupancy measurement accuracy requirements in clause 10.5.6.0.1 when SCC is subject to CCA.

### 10.5.6.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

### 10.5.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.6.2.

### 10.5.6.2.4 Test description

#### 10.5.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.6.2.4.1-1.

**Table 10.5.6.2.4.1-1: Supported test configurations for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA**

| Configuration | Description |
|---|---|
| 10.5.6.2-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.6.2-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.6.2.4.1-2.

**Table 10.5.6.2.4.1-2: Initial conditions for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 10.5.6.2.5-1.
2. Message contents are defined in clause 10.5.6.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR cell (SCC) also with the power level set according to clauses C.1.2 and C.1.3 for this test.

#### 10.5.6.2.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 SCC cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.6.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform measurements in the target SCC frequency, according to the RMTC specified in section 10.5.6.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.6.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 3 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

#### 10.5.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.6.2.4.3-1: Common Exception messages for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.6.2.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy on SCC under CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.6.2.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy on SCC under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

10.5.6.2.5 Test requirements

Table 10.5.6.2.5-1 defines the primary level settings including test tolerances for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA.

**Table 10.5.6.2.5-1: Cell specific test parameters for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 2 | Cell 3 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 1 | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | | 1 | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |

| | | | | |
|---|---|---|---|---|
| UL CCA model | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | $n_{PRE}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | MHz | 20 | |
| DRX Cycle configuration | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |
| channelOccupancyThreshold | | dBm | -83 | |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 10.5.6.2.5-2: EN-DC FR1 Channel occupancy RMTC parameters for EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 10.5.6.3 EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA

### 10.5.6.3.1 Test purpose

The purpose of this test is to verify that the Channel occupancy measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.5.6.0.2 when both the serving cell and the target cell are subject to CCA.

### 10.5.6.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with a shared spectrum NR carrier and supporting inter-frequency RRM and Channel occupancy measurements on shared channel access.

### 10.5.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 10.5.6.0.2 for absolute accuracy.

The normative reference for this requirement is TS 38.133 [6] clause A.10.5.6.3.

### 10.5.6.3.4 Test description

Supported test configurations are shown in Table 10.5.6.3.4.1-1. Absolute accuracy of Channel occupancy inter-frequency measurements are tested by using the parameters in Table 10.5.6.3.5-1. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.6B. In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell. The inter-frequency measurements are supported by a measurement gap.

#### 10.5.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.5.6.3.4.1-1.

**Table 10.5.6.3.4.1-1: Supported test configurations for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 10.5.6.3-1 | LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 10.5.6.3-2 | LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 10.5.6.3.4.1-2.

**Table 10.5.6.3.4.1-2: Initial conditions for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.8-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.5.6.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 10.5.6.3.5-1.
2. Message contents are defined in clause 10.5.6.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 3 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

### 10.5.6.3.4.2 Test procedure

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. Both Cell 2 and Cell 3 are subject to CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 10.5.6.3.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) on Cell 1 configuring the UE to perform measurements in the target neighbouring frequency, according to the RMTC specified in section 10.5.6.3.4.3.
4. The UE shall transmit an *RRCReconfiguration* message (embedded in *RRCConnectionReconfigurationComplete* message) to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 10.5.6.3.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 3 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

### 10.5.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 10.5.6.3.4.3-1: Common Exception messages for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.4-1<br>Table H.3.4-1a<br>Table H.3.4-2<br>Table H.3.4-4 with Condition gapUE<br>Table H.3.4-5 with Condition Pattern#0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 10.5.6.3.4.3-2: *MeasResults* for EN-DC FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 10.5.6.3.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

10.5.6.3.5 Test requirements

Table 10.5.6.3.5-1 defines the primary level settings including test tolerances for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA.

**Table 10.5.6.3.5-1: Cell specific test parameters for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | Configurations | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 2 | Cell 3 |
| RF Channel Number | | | 1 | 2 |
| $BW_{channel}$ | | MHz | 40 | 40 |

| | | | | | |
|---|---|---|---|---|---|
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2 | | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2 | | SSB.2 CCA | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 1 | 0.9375 (Note 1, 3) |
| $P_{CCA_UL}$ | | | | 1 | 0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | | $\eta_{PRE}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | | SR.1.1 TDD | NA |
| RMSI CORESET Reference Channel | | | | CR.1.1 TDD | NA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 TDD | NA |
| OCNG Patterns | | | | OP.1 | NA |
| EPRE ratio of PSS to SSS | | | dB | 0 | NA |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI | | | dBm/measBW | -77.96 | -58.96 |

| | | | | |
|---|---|---|---|---|
| measurement time configuration (RMTC) | | | | |
| Propagation condition | | - | AWGN | |
| channelOccupancyThreshold | | dBm | -83 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

**Table 10.5.6.3.5-2: EN-DC FR1 Channel occupancy RMTC parameters for EN-DC FR1-FR1 Channel occupancy measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

# 11 NR Standalone Tests with NR PCell under CCA and Other NR Cells in FR1

## 11.0 General

### 11.0.1 Principle of testing for UE capable of EN-DC with only NR bands with shared spectrum access

Test cases in table 11.0.1-1 are defined for UE capable of NR SA operation with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access).

**Table 11.0.1-1: Test cases applicable to UE supporting SA operation with only NR bands with shared spectrum access**

| Test category | Clause | Test case |
|---|---|---|
| Active BWP switching | 11.4.5.2.1 | NR SA FR1 - NR FR1 DL active BWP switch of PCell under CCA with non-DRX |
| | 11.4.5.2.2 | NR SA FR1 DL active BWP switch with non-DRX under CCA |
| | 11.4.5.3.1 | NR SA FR1 DL active BWP switch of Cell with non-DRX under CCA |

# 11.1 RRC_IDLE state mobility

## 11.1.1 Cell re-selection with both source and target NR carrier frequencies under CCA

### 11.1.1.0 Minimum conformance requirements

#### 11.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection with both source and target NR carrier frequencies under CCA

The UE shall be able to identify new intra-frequency cells with CCA and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra_CCA}$ when that $T_{reselection}= 0$ . An intra-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.2.9 for a corresponding band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra_CCA}$ (see table 11.1.1.0.1-1) for intra-frequency cells that are identified and measured according to the measurement rules. For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra_CCA}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS 38.304 [30] within $T_{evaluate,NR_Intra_CCA}$ when $T_{reselection} = 0$ as specified in table 11.1.1.0.1-1 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 or 4.5 dB better ranked in FR2-2.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them.
        - the cell is at least 3dB better ranked in FR1 or 4.5 dB better ranked in FR2-2 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria, which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 11.1.1.0.1-1: $T_{detect,NR_Intra_CCA}$, $T_{measure,NR_Intra_CCA}$ and $T_{evaluate,NR_Intra_CCA}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra_CCA}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_CCA}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_CCA}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2-2 Note 5 | | | |

| | | | | | |
|---|---|---|---|---|---|
| 0.32 | 1 | 12 | 0.32xN1x(36+$M_d$)xM2 {(36+$M_d$)xN1xM2} | 0.32xN1x(4+$M_m$)xM2 {(4+$M_m$)xN1 xM2 | 0.32xN1x(16+$M_e$) x M2 {(16+$M_e$)xN1xM2} |
| 0.64 | | 8 | 0.64xN1x(28+$M_d$) {(28+$M_d$)xN1 } | 0.64xN1x(2+$M_m$) {(2+$M_m$)xN1 } | 0.64xN1x(8+$M_e$) {(8+$M_e$)xN1 } |
| 1.28 | | 6 | 1.28xN1x(25+$M_d$) {(25+$M_d$)xN1 } | 1.28xN1x(1+$M_m$) {(1+$M_m$)xN1 } | 1.28xN1x(5+$M_e$) {(5+$M_e$)xN1 } |
| 2.56 | | 5 | 2.56xN1x(23+$M_d$) {(23+$M_d$)xN1 } | 2.56xN1x(1+$M_m$) {(1+$M_m$)xN1 } | 2.56xN1x(3+$M_e$) {(3+$M_e$)xN1 } |
| Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. | | | | | |
| Note 2: Md, Mm, Me are the number of groups of consecutive N1 DRX cycles each group with at least one SMTC occasion not available during the $T_{detect,NR_Intra_CCA}$, $T_{measure,NR_Intra_CCA}$ and $T_{evaluate,NR_Intra_CCA}$, and $M_m \leq M_{m,max}$, $M_d \leq M_{d,max}$ and $M_e \leq M_{e,max}$ | | | | | |
| Note 3: $M_{m,max}$ = 16 for DRX cycle length = 0.32s; $M_{m,max}$ = 8 for DRX cycle length = 0.64s; $M_{m,max}$ = 4 for DRX cycle length = 1.28s; $M_{m,max}$ = 4 for DRX cycle length = 2.56s. | | | | | |
| Note 4: $M_{d,max} = 4*M_{m,max}$, $M_{e,max} = 2*M_{m,max}$. | | | | | |
| Note 5: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length. | | | | | |

The UE shall restart the measurements upon exceeding $M_{m,max}$, $M_{d,max}$, or $M_{e,max}$.

The normative reference for this requirement is TS 38.133 [6] clause 4.2A.2.3.

### 11.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection with target NR carrier frequency under CCA

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2A.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $K_{carrier} * T_{detect,NR_Inter} + K_{carrier_CCA} * T_{detect,NR_Inter_CCA}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5dB in FR2-2 for reselections based on ranking or 6dB in FR1 or 7.5 dB in FR2-2 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 and 4 dB in FR2-2 for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers on licensed band and $K_{carrier_CCA}$ is the number of NR inter-frequency carriers on unlicensed band indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.2.10 for a corresponding band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter_CCA}$. If after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_CCA} * T_{measure,NR_Inter_CCA}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter_CCA}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier} * T_{evaluate,NR_Inter} + K_{carrier_CCA} * T_{evaluate,NR_Inter_CCA}$ when $T_{reselection} = 0$ as specified in table 11.1.1.0.2-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  when *rangeToBestCell* is not configured:

  - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2-2 or.

  when *rangeToBestCell* is configured:

  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

    - if there are multiple such cells, the cell has the highest rank among them

  - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2-2 if the current serving cell is among them. or

- 6dB in FR1 or 7.5dB in FR2-2 for SS-RSRP reselections based on absolute priorities or

- 4dB in FR1 or 4dB in FR2-2 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 11.1.1.0.2-1 under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where $T_{SMTC_intra}$ and $T_{SMTC_inter}$ are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion [30].

**Table 11.1.1.0.2-1: $T_{detect,NR_Inter_CCA}$, $T_{measure,NR_Inter_CCA}$ and $T_{evaluate,NR_Inter_CCA}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter_CCA}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_CCA}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_CCA}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2-2 Note 5 | | | |
| 0.32 | 1 | 12 | 0.32xN1x(36+$M_d$)xM2 {(36+$M_d$)xN1xM2} | 0.32xN1x(4+$M_m$) xM2 {(4+$M_m$)xN1xM2} | 0.32xN1x(16+$M_e$) x M2 {(16+$M_e$)xN1 xM2} |
| 0.64 | | 8 | 0.64xN1x(28+$M_d$) {(28+$M_d$)xN1 } | 0.64xN1x(2+$M_m$) {(2+$M_m$)xN1 } | 0.64xN1x(8+$M_e$) {(8+$M_e$)xN1 } |
| 1.28 | | 6 | 1.28xN1x(25+$M_d$) {(25+$M_d$)xN1 } | 1.28xN1x(1+$M_m$) {(1+$M_m$)xN1 } | 1.28xN1x(5+$M_e$) {(5+$M_e$)xN1} |
| 2.56 | | 5 | 2.56xN1x(23+$M_d$) {(23+$M_d$)xN1 } | 2.56xN1x(1+$M_m$) {(1+$M_m$)xN1 } | 2.56xN1x(3+$M_e$) {(3+$M_e$)xN1} |

| | |
|---|---|
| Note 1: | M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. |
| Note 2: | Md, Mm, Me are the number of groups of consecutive N1 DRX cycles each group with at least one SMTC occasion not available at the UE during $T_{detect,NR_Inter_CCA}$, $T_{measure,NR_Inter_CCA}$ and $T_{evaluate,NR_Inter_CCA}$, and $M_m \leq M_{m,max}$, $M_d \leq M_{d,max}$ and $M_e \leq M_{e,max}$ |
| Note 3: | $M_{m,max}$ = 16 for DRX cycle length = 0.32s;<br>$M_{m,max}$ = 8 for DRX cycle length = 0.64s;<br>$M_{m,max}$ = 4 for DRX cycle length = 1.28s;<br>$M_{m,max}$ = 4 for DRX cycle length = 2.56s |
| Note 4: | $M_{d,max} = 4*M_{m,max}$, $M_{e,max} = 2*M_{m,max}$. |
| Note 5: | Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length. |

The UE shall restart the measurements upon exceeding Mm,max, Md.max, or Me,max.

The normative reference for this requirement is TS 38.133 [6] clause 4.2A.2.4.

## 11.1.1.1 NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell

### 11.1.1.1.1 Test purpose

The purpose of this test is to verify that UE can meet the intra-frequency NR cell reselection requirements specified in clause 11.1.1.0.1 when both the serving and target cells are subject to CCA.

### 11.1.1.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.1.1.

### 11.1.1.1.4 Test description

#### 11.1.1.1.4.1 Initial conditions

This test shall be run in the configuration defined in Table 11.1.1.1.4.1-1.

**Table 11.1.1.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Configuration | Description |
|---|---|
| 11.1.1.1-1 | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.1.1.1.4.1-2.

**Table 11.1.1.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |

1. The general test parameter settings are set up according to Table 11.1.1.1.4.1-3.

2. Message contents are defined in clause 11.1.1.1.4.3.

3. The test scenario comprises of 1 NR carrier and 2 cells that are subject to CCA. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 11.1.1.1.4.1-3: General test parameters for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell1 | |
| | Neighbour cells | | 1 | Cell2 | |
| T2 end condition | Active cell | | 1 | Cell2 | |
| | Neighbour cells | | 1 | Cell1 | |
| Final condition | Active cell | | 1 | Cell1 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | Semi-static channel access | | 1 | SSB.1 CCA | (As defined in clause A.3A.1 ) |
| | Dynamic channel access | | | SSB.2 CCA | |
| DBT Window Configuration | | | 1 | DBT.1 | As specified in clause A.12.1. |
| SMTC confituration | | | | SMTC.1 | |
| DL CCA model | | | 1 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1 | As specified in clause D.7.2.2 | |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1 | Not configured | |
| T1 | | s | 1 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 11.1.1.1.4.2 Test procedure

Two cells are deployed in the test, FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency both of which are subject to CCA. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 11.1.1.1.5-1. The SS shall enable DL and UL CCA model according to Table 11.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.1.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 54 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a failure for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 11.1.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 18 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a failure for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

13. Repeat step 2-12 until a test verdict has been achieved.
    Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G clause G.2.7 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 11.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.1.1.4.3-1: Common Exception messages NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.1.1.1.4.3-2: SIB1 (Cell 1 and Cell 2) for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -64 | -128 is actual value in dBm (-64 * 2 +1 dBm) | |
| } | | | |
| } | | | |

**Table 11.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2) for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -64 | Actual value is -64*2 = -128dBm | |
| deriveSSB-IndexFromCell | true | | |
| } | | | |
| } | | | |

#### 11.1.1.1.5 Test requirement

Table 11.1.1.1.5-1 defines the primary level settings including test tolerances for intra-frequency NR cell re-selection test case.

**Table 11.1.1.1.5-1: Cell specific test parameters for NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1 | 0.9 | | | 0.9 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1 | 0.75 | | | 0.75 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1 | 0.5 | | | 0.5 | | |
| UL CCA probability $P_{CCA_UL}$ | | 1 | 1 | | | 1 | | |
| $M_{d,max}$ | | 1 | 16 | | | 16 | | |
| $M_{m,max}$ | | 1 | 4 | | | 4 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $M_{e,max}$ | | 1 | 8 | | | 8 | | | |
| PDSCH RMC | | 1 | SR.1.1 CCA | | | SR.1.1 CCA | | | |
| RMSI CORESET | | 1 | CR.1.1 CCA | | | CR.1.1 CCA | | | |
| Dedicated CORESET | | 1 | CCR.1.1 CCA | | | CCR.1.1 CCA | | | |
| OCNG Pattern | | 1 | OP.1 | | | OP.1 | | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | | |
| RLM-RS | | 1 | SSB | | | SSB | | | |
| Qrxlevmin | dBm/SCS | 1 | -127 | | | -127 | | | |
| Pcompensation | dB | 1 | 0 | | | 0 | | | |
| $Qhyst_s$ | dB | 1 | 0 | | | 0 | | | |
| $Qoffset_{s,n}$ | dB | 1 | 0 | | | 0 | | | |
| Cell_selection_and_ reselection_quality_measurement | | 1 | SS-RSRP | | | SS-RSRP | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -95 | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 | |
| SS-RSRP Note3 | dBm/SCS | 1 | -79 | -82 | -78.54 | -infinity | -78.54 | -82 | |
| Io | dBm/38.16 MHz | 1 | -47.84 | -45.81 | -45.81 | Same as parameters specified in Cell 1 columns- | | | |
| Treselection | s | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| SintrasearchP | dB | 1 | 50 | | | 50 | | | |
| Propagation Condition | | 1 | AWGN | | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than $(25 + M_d)*1.28 + T_{SI_CCA}$ s. $M_d$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{detect,NR_Intra_CCA}$. If $M_d > M_{d,max}$ the UE is required to restart the detection of Cell 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than $(5+M_e)*1.28 + T_{SI_CCA}$ s. $M_e$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of Cell 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $T_{detect, NR_Intra_CCA} + T_{SI_CCA}$, and to an already detected cell can be expressed as: $T_{evaluate, NR_intra_CCA} + T_{SI_CCA}$,

Where:

- $T_{detect, NR_Intra_CCA}$ See Table 11.1.1.0.1-1 in clause 11.1.1.0.1
- $T_{evaluate, NR_intra_CCA}$ See Table 11.1.1.0.1-1 in clause 11.1.1.0.1
- $T_{SI_CCA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of $(25 + M_d)*1.28 + T_{SI_CCA}$ s for the cell re-selection delay to a newly detectable cell and $(5+M_e)*1.28 + T_{SI_CCA}$ s for the cell re-selection delay to an already detected cell in the test case.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 11.1.1.2 NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell

### 11.1.1.2.1 Test purpose

The purpose of this test is to verify that UE can meet the inter-frequency NR cell reselection requirements specified in clause 11.1.1.0.2 when both the serving and target cells are subject to CCA.

### 11.1.1.2.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.1.2.

### 11.1.1.2.4 Test description

#### 11.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 11.1.1.2.4.1-1.

**Table 11.1.1.2.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell**

| Configuration | Description of cell 1 with CCA | Description of cell 2 with CCA |
|---|---|---|
| 11.1.1.2-1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.1.1.2.4.1-2.

**Table 11.1.1.2.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.1.1.2.4.1-3.

2. Message contents are defined in clause 11.1.1.2.4.3.

3. The test scenario comprises of 2 cells on 2 different NR carriers that are subject to CCA. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 11.1.1.2.4.1-3: General test parameters for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
| T1 end condition | Active cell | | 1 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| | Neighbour cells | | 1 | Cell2 | |
| T3 end condition | Active cell | | 1 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| RF Channel Number | | | 1 | 1, 2 | |
| Time offset between cells | | | 1 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | Semi-static channel access | | 1 | SSB.1 CCA | (As defined in clause A.3A.1) |
| | Dynamic channel access | | | SSB.2 CCA | |
| DBT Window Configuration | | | 1 | DBT.1 | As specified in clause A.12.1. |
| SMTC configuration | | | 1 | SMTC.1 | |
| DL CCA model | | | 1 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1 | As specified in clause D.7.2.2 | |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1 | Not configured | |
| T1 | | s | 1 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 11.1.1.2.4.2 Test procedure

Two cells are deployed in the test, FR1 NR PCell (Cell 2) and an NR neighbour cell (Cell 1) on different frequencies both of which are subject to CCA. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 11.1.1.2.5-1. The SS shall enable DL and UL CCA model according to Table 11.1.1.1.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 18 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 11.1.1.2.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.1.1.2.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 78 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

12. Repeat step 2-11 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G clause G.2.7 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 11.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.1.2.4.3-1: Common Exception messages for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br>Table H.2.2-2 with Condition synchronous cells<br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

11.1.1.2.5 Test requirement

Table 11.1.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell.

**Table 11.1.1.2.5-1: Cell specific test parameters for NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1 | 0.9 | | | 0.9 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1 | 0.75 | | | 0.75 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1 | 0.5 | | | 0.5 | | |
| UL CCA probability $P_{CCA_UL}$ | | 1 | 1 | | | 1 | | |
| $M_{d,max}$ | | 1 | 16 | | | 16 | | |
| $M_{m,max}$ | | 1 | 4 | | | 4 | | |
| $M_{e,max}$ | | 1 | 8 | | | 8 | | |
| PDSCH RMC | | 1 | SR.1.1 CCA | | | SR.1.1 CCA | | |
| RMSI CORESET | | 1 | CR.1.1 CCA | | | CR.1.1 CCA | | |
| Dedicated CORESET | | 1 | CCR.1.1 CCA | | | CCR.1.1 CCA | | |
| OCNG Pattern | | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -137 | | | -137 | | |
| Pcompensation | dB | 1 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -95 | | | -97 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | -100 | -98 | -98 |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SS-RSRP Note3 | dBm/SCS | 1 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 |
| Io | dBm/Ch BW | 1 | -48.23 | -48.23 | -48.23 | -67.38 | -66.96 | -53.17 |
| Treselection | s | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1 | 50 | | | 50 | | |
| $Thresh_{x, high}$ | dB | 1 | 48 | | | 48 | | |
| $Thresh_{serving, low}$ | dB | 1 | 44 | | | 44 | | |
| $Thresh_{x, low}$ | dB | 1 | 50 | | | 50 | | |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 60 + 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s. $M_e$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of cell 2.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s. $M_e$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of cell 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate, NR_inter_CCA}$ + $T_{SI_CCA}$, and to a lower priority cell can be expressed as: $T_{evaluate, NR_inter_CCA}$ + $T_{SI_CCA}$,

Where:

- $T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]
- $T_{evaluate, NR_inter_CCA}$ See Table 11.1.1.0.2-1 in clause 11.1.1.0.2
- $T_{SI_CCA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of 60 + 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s for the cell re-selection delay to a higher priority cell and 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s for the cell re-selection delay to a lower priority cell in the test case.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 11.1.2 Cell re-selection to NR with source NR carrier frequency under CCA

### 11.1.2.0 Minimum conformance requirements

The requirements in this sections apply as follows:

- When the target cell is an NR cell operating in a carrier frequency under CCA, there requirements are same as section 11.1.1.0.
- When the target cell is an NR cell operating in a carrier frequency which is not under CCA, there requirements are same as section 6.1.1.0.

### 11.1.2.1 NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA

#### 11.1.2.1.1 Test purpose

The purpose of this test is to verify the inter-frequency NR cell reselection requirements specified in clause 11.1.2.0 when only the serving cell is subject to CCA.

#### 11.1.2.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, SSB-based RRM, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.2.1.

#### 11.1.2.1.4 Test description

##### 11.1.2.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 11.1.2.1.4.1-1.

**Table 11.1.2.1.4.1-1: Supported test configurations for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.1.2.1-1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.1.2.1-2 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.1.2.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 11.1.2.1.4.1-2.

**Table 11.1.2.1.4.1-2: Initial conditions for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.1.2.1.4.1-3.

2. Message contents are defined in clause 11.1.2.1.4.3.

3. The test scenario comprises of 2 cells on 2 different NR carriers where the first carrier is subject to CCA. Cell 2 is the PCell subject to CCA and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 11.1.2.1.4.1-3: General test parameters for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on cell 2 which is subject to CCA in the initial phase and during T1 period the UE reselects to cell 1 which is an inter-frequency NR cell |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T3 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | Cell 1: SSB.1 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access | |
| | | | 2 | Cell 1: SSB.1 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access | |
| | | | 3 | Cell 1: SSB.2 FR1<br>Cell 2: SSB.1 CCA for semi-static channel access;<br>Cell 2: SSB.2 CCA for dynamic channel access | |
| SMTC configuration | | | 1 | Cell 1: SMTC.2<br>Cell 2: SMTC.1 | |
| | | | 2 | Cell 1: SMTC.1<br>Cell 2: SMTC.1 | |
| | | | 3 | Cell 1: SMTC.1<br>Cell 2: SMTC.1 | |
| DBT Window Configuration | | | 1, 2, 3 | Cell 1: N/A<br>Cell 2: DBT.1 | As specified in clause A.12.1. |
| DL CCA model | | | 1, 2, 3 | Cell 1: N/A<br>Cell 2: As specified in clause D.7.2.1 | |

| | | | | |
|---|---|---|---|---|
| UL CCA model | | 1, 2, 3 | Cell 1: N/A<br>Cell 2: As specified in clause D.7.2.2 | |
| DRX cycle length | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 11.1.2.1.4.2 Test procedure

Two cells are deployed in the test, FR1 NR PCell (Cell 2) and an NR neighbour cell (Cell 1) on different frequencies of which only cell 2 is subject to CCA. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. The CCA model for Cell 2 (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 11.1.2.1.5-1. The SS shall enable DL and UL CCA model for cell 2 according to Table 11.1.2.1.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 11.1.2.1.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.1.2.1.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within [76.64 + $T_{SI_CCA}$] seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2. The SS shall disable the CCA model for Cell 2 (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

12. Repeat step 2-11 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G clause G.2.7 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 11.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.2.1.4.3-1: Common Exception messages for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Conditions SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 11.1.2.1-1 and Cell 1<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and Synchronous cells for configuration 11.1.2.1-2 and Cell 1<br>Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 11.1.2.1-3 and Cell 1<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 11.1.2.1.5 Test requirement

Table 11.1.2.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA.

**Table 11.1.2.1.5-1: Cell specific test parameters for NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | TDDConf.1.1.CCA | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1.CCA | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.1.1.CCA | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1, 2, 3 | N/A | | | 0.9 | | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1, 2, 3 | N/A | | | 0.75 | | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1, 2, 3 | N/A | | | 0.5 | | | |
| UL CCA probability $P_{CCA_UL}$ | | 1, 2, 3 | N/A | | | 1 | | | |
| $M_{d,max}$ | | 1, 2, 3 | N/A | | | 16 | | | |
| $M_{m,max}$ | | 1, 2, 3 | N/A | | | 4 | | | |
| $M_{e,max}$ | | 1, 2, 3 | N/A | | | 8 | | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 CCA | | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 CCA | | | |
| | | 3 | SR.2.1 TDD | | | SR.1.1 CCA | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 CCA | | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 CCA | | | |
| | | 3 | CR.2.1 TDD | | | CR.1.1 CCA | | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 CCA | | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 CCA | | | |
| | | 3 | CCR.2.1 TDD | | | CCR.1.1 CCA | | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 | | | OP.1 | | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -137 | | | |
| | | 3 | -137 | | | -137 | | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | -100.00 | -98.00 | -98.00 | |
| | | 2 | -98 | | | -100.00 | -98.00 | -98.00 | |
| | | 3 | -95 | | | -97.00 | -95.00 | -95.00 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | -100.00 | -98.00 | -98.00 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.4 | -82.4 | -82.4 | -100.59 | -infinity | -81.39 | |
| | | 2 | -82.4 | -82.4 | -82.4 | -100.59 | -infinity | -81.39 | |
| | | 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 | |
| Io | dBm/Ch BW | 1 | -54.33 | -54.33 | -54.33 | -67.38 | -66.96 | -53.17 | |
| | dBm/Ch BW | 2 | -54.33 | -54.33 | -54.33 | -67.38 | -66.96 | -53.17 | |
| | dBm/Ch BW | 3 | -48.23 | -48.23 | -48.23 | -67.38 | -66.96 | -53.17 | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3 | 48 | | | 48 | | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3 | 44 | | | 44 | | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3 | 50 | | | 50 | | | |

| | | | |
|---|---|---|---|
| Propagation Condition | | 1, 2, 3 | AWGN |
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| Note 4: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. | | |

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 60 + 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s. $M_e$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of cell 2.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate,\ NR_inter_CCA}$ + $T_{SI_CCA}$, and to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter}$ + $T_{SI\text{-}NR}$.

Where:

- $T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]
- $T_{evaluate,\ NR_inter_CCA}$ See Table 11.1.1.0.2-1 in clause 11.1.1.0.2
- $T_{SI_CCA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.
- $T_{evaluate,\ NR_inter}$ See Table 6.1.1.0.2-1 in clause 6.1.1.0.2.
- $T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test cases.

This gives a total of 60 + 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 11.1.3 Cell re-selection from NR carrier with target NR carrier frequency under CCA

### 11.1.3.0 Minimum conformance requirements

The requirements in this sections apply as follows:

- When the target cell is an NR cell operating in a carrier frequency under CCA, there requirements are same as section 11.1.1.0.
- When the target cell is an NR cell operating in a carrier frequency which is not under CCA, there requirements are same as section 6.1.1.0.

## 11.1.3.1 NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA

### 11.1.3.1.1 Test purpose

The purpose of this test is to verify the inter-frequency NR cell reselection requirements specified in clause 11.1.1.0.2 when the target cell is subject to CCA.

### 11.1.3.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.3.1.

### 11.1.3.1.4 Test description

#### 11.1.3.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 11.1.3.1.4.1-1.

**Table 11.1.3.1.4.1-1: Supported test configurations for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA**

| Configuration | Description of a cell without CCA | Description of a cell with CCA |
|---|---|---|
| 11.1.3.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.1.3.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.1.3.1-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 11.1.3.1.4.1-2.

**Table 11.1.3.1.4.1-2: Initial conditions for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.1.3.1.4.1-3.

2. Message contents are defined in clause 11.1.3.1.4.3.

3. The test scenario comprises of 2 cells on 2 different NR carriers. Cell 2 is the NR PCell and Cell 1 is the neighbour cell subject to CCA in a different carrier than Cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

**Table 11.1.3.1.4.1-3: General test parameters for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell2 | The UE camps on cell 2 which is an inter-frequency NR cell in the initial phase and during T1 period the UE reselects to cell 1 which is cell subject to CCA |
| | Neighbour cell | | 1, 2, 3 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| | Neighbour cells | | 1, 2, 3 | Cell2 | |
| T3 end condition | Active cell | | 1, 2, 3 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| | Neighbour cell | | 1, 2, 3 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | Cell 1: SSB.1 CCA for semi-static channel access; Cell 1: SSB.2 CCA for dynamic channel access; Cell 2: SSB.1 FR1 | |
| | | | 2 | Cell 1: SSB.1 CCA for semi-static channel access; Cell 1: SSB.2 CCA for dynamic channel access; Cell 2: SSB.1 FR1 | |
| | | | 3 | Cell 1: SSB.1 CCA for semi-static channel access; Cell 1: SSB.2 CCA for dynamic channel access; Cell 2: SSB.2 FR1 | |
| SMTC configuration | | | 1 | Cell 1: SMTC.1 Cell 2: SMTC.2 | |
| | | | 2 | Cell 1: SMTC.1 Cell 2: SMTC.1 | |
| | | | 3 | Cell 1: SMTC.1 Cell 2: SMTC.1 | |
| DBT Window Configuration | | | 1, 2, 3 | Cell 1: DBT.1 Cell 2: N/A | As specified in clause A.12.1. |
| DL CCA model | | | 1, 2, 3 | Cell 1: As specified in clause D.7.2.1 Cell 2: N/A | |
| UL CCA model | | | 1, 2, 3 | Cell 1: As specified in clause D.7.2.2 Cell 2: N/A | |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |

| | | | | |
|---|---|---|---|---|
| PRACH configuration index | | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2, 3 | Not configured | |
| T1 | s | 1, 2, 3 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 11.1.3.1.4.2 Test procedure

Two cells are deployed in the test, FR1 NR PCell (Cell 2) and an NR neighbour cell (Cell 1) on different frequencies of which only cell 1 is subject to CCA. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. The CCA model for Cell 1 (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 11.1.3.1.5-1. The SS shall enable DL and UL CCA model for cell 1 according to Table 11.1.3.1.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within [16.64 + $T_{SI_CCA}$] seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 11.1.3.1.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.1.3.1.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2. The SS shall disable the CCA model for Cell 1 (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

12. Repeat step 2-11 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G clause G.2.7 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 11.1.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.3.1.4.3-1: Common Exception messages for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 11.1.3.1-1 and Cell 2<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and Synchronous cells for configuration 11.1.3.1-2 and Cell 2<br>Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and Synchronous cells for configuration 11.1.3.1-3 and Cell 2<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 11.1.3.1.5 Test requirement

Table 11.1.3.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA.

**Table 11.1.3.1.5-1: Cell specific test parameters for NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | TDDConf.1.1.CCA | | | N/A | | |
| | | 2 | TDDConf.1.1.CCA | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.1.1.CCA | | | TDDConf.2.1 | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1, 2, 3 | 0.9 | | | N/A | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1, 2, 3 | 0.75 | | | N/A | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1, 2, 3 | 0.5 | | | N/A | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA_UL}$ | | 1, 2, 3 | 1 | | | N/A | | | |
| $M_{d,max}$ | | 1, 2, 3 | 16 | | | N/A | | | |
| $M_{m,max}$ | | 1, 2, 3 | 4 | | | N/A | | | |
| $M_{e,max}$ | | 1, 2, 3 | 8 | | | N/A | | | |
| PDSCH RMC configuration | | 1 | SR.1.1 CCA | | | SR.1.1 FDD | | | |
| | | 2 | SR.1.1 CCA | | | SR.1.1 TDD | | | |
| | | 3 | SR.1.1 CCA | | | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 CCA | | | CR.1.1 FDD | | | |
| | | 2 | CR.1.1 CCA | | | CR.1.1 TDD | | | |
| | | 3 | CR.1.1 CCA | | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 CCA | | | CCR.1.1 FDD | | | |
| | | 2 | CCR.1.1 CCA | | | CCR.1.1 TDD | | | |
| | | 3 | CCR.1.1 CCA | | | CCR.2.1 TDD | | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 | | | OP.1 | | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | | |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -137 | | | -140 | | | |
| | | 3 | -137 | | | -137 | | | |
| Pcompensation | dB | 1, 2, 3 | 0 | | | 0 | | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3 | SS-RSRP | | | SS-RSRP | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -95 | | | -100.00 | -98.00 | -98.00 | |
| | | 2 | -95 | | | -100.00 | -98.00 | -98.00 | |
| | | 3 | -95 | | | -97.00 | -95.00 | -95.00 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | -100.00 | -98.00 | -98.00 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -79.39 | -79.39 | -79.39 | -103.6 | -infinity | -84.4 | |
| | | 2 | -79.39 | -79.39 | -79.39 | -103.6 | -infinity | -84.4 | |
| | | 3 | -79.39 | -79.39 | -79.39 | -100.59 | -infinity | -81.39 | |
| Io | dBm/Ch BW | 1 | -48.23 | -48.23 | -48.23 | -70.48 | -70.05 | -56.26 | |
| | dBm/Ch BW | 2 | -48.23 | -48.23 | -48.23 | -70.48 | -70.05 | -56.26 | |
| | dBm/Ch BW | 3 | -48.23 | -48.23 | -48.23 | -67.38 | -66.96 | -53.17 | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 | 0 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3 | 50 | | | 50 | | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3 | 48 | | | 48 | | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3 | 44 | | | 44 | | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3 | 50 | | | 50 | | | |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s. Me is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of cell 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate,\ NR_inter}$ + $T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter}$ + $T_{SI\text{-}NR}$.

Where:

- $T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]
- $T_{evaluate,\ NR_inter_CCA}$ See Table 11.1.1.0.2-1 in clause 11.1.1.0.2
- $T_{SI_CCA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.
- $T_{evaluate,\ NR_inter}$ See Table 6.1.1.0.2-1 in clause 6.1.1.0.2
- $T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s for the cell re-selection delay to a lower priority cell in the test case.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

## 11.1.4 Inter-RAT cell re-selection to E-UTRAN with source NR carrier frequency under CCA

### 11.1.4.0 Minimum conformance requirements

#### 11.1.4.0.1 Minimum conformance requirements for Inter-RAT cell re-selection to E-UTRAN with source NR carrier frequency under CCA

The requirements in clause 6.1.2.0.1 shall apply.

### 11.1.4.1 NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA

#### 11.1.4.1.1 Test purpose

This test is to verify the requirement for the NR cell subject to CCA to E-UTRAN inter-RAT cell reselection requirements specified in clause 11.1.4.0.1 when the E-UTRAN cell is of higher priority.

#### 11.1.4.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, and UL with a shared spectrum NR carrier.

#### 11.1.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.4.1.

#### 11.1.4.1.4 Test description

##### 11.1.4.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.1.4.1.4.1-1.

**Table 11.1.4.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.1.4.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 11.1.4.1-2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 11.1.4.1.4.1-2.

**Table 11.1.4.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.1.4.1.4.1-3.

2. Message contents are defined in clause 11.1.4.1.4.3.

3. The test scenario comprises of one NR cell which is subject to CCA and one E-UTRAN cell. Cell 1 is the NR PCell under CCA and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.2 and C.1.3, Cell 2 is configured according to Annex A.6B.1.

**Table 11.1.4.1.4.1-3: General test parameters for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2. |
| T2 end condition | Active cell | | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 during T2. |
| | Neighbour cells | | 1, 2 | Cell1 | |
| T3 end condition | Active cell | | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T3 for iteration of the tests. |
| | Neighbour cells | | 1, 2 | Cell2 | |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |

| | | | | |
|---|---|---|---|---|
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT Window Configuration | | 1, 2 | DBT.1 | As specified in clause A.12.1. |
| SSB configuration | | | Cell 1: SSB.1 CCA for semi-static channel access; Cell 1: SSB.2 CCA for dynamic channel access; | |
| DL CCA model | | 1, 2 | As specified in clause D.7.2.1 | |
| UL CCA model | | 1, 2 | As specified in clause D.7.2.2 | |
| DRX cycle length | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | 1 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | 2 | 4 | |
| T1 | s | 1, 2 | >7 | During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | s | 1, 2 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 11.1.4.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) under CCA and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1. The CCA model (both DL and UL) on Cell 1 is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 11.1.4.1.5-1 and 11.1.4.1.5-2. The SS shall enable DL and UL CCA model on Cell 1 according to Table 11.1.4.1.5-1. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.1.4.1.5-1 and 11.1.4.1.5-2. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority cell, Cell 2.

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

7a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 11.1.4.1.5-1 and 11.1.4.1.5-2. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority cell, Cell 1.

10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) on Cell 1.

12. Repeat step 2-11 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.1.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.4.1.4.3-1: Common Exception messages for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition higher priority<br><br>Table H.2.3-3 with Condition higher priority |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.1.4.1.4.3-2: *SystemInformationBlockType3* for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 5 | | higher priority E-UTRA |
| } | | | |
| } | | | |

**Table 11.1.4.1.4.3-3: *SystemInformationBlockType24* for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 4 | | higher priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

11.1.4.1.5 Test requirement

Tables 11.1.4.1.5-1 and 11.1.4.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

**Table 11.1.4.1.5-1: NR Cell 1 specific parameters for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.1.1.CCA | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1, 2 | 0.9 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1, 2 | 0.75 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1, 2 | 0.5 | | |
| UL CCA probability $P_{CCA_UL}$ | | 1, 2 | 1 | | |
| $M_{d,max}$ | | 1, 2 | 16 | | |
| $M_{m,max}$ | | 1, 2 | 4 | | |
| $M_{e,max}$ | | 1, 2 | 8 | | |
| PDSCH parameters | | 1, 2 | SR.1.1 CCA | | |
| RMSI CORESET parameters | | 1, 2 | CR.1.1 CCA | | |
| Dedicated CORESET parameters | | 1, 2 | CCR.1.1 CCA | | |
| SSB parameters | | 1, 2 | SSB.1 CCA for semi-static channel access; SSB.2 CCA for dynamic channel access | | |
| NR SMTC parameters | | 1, 2 | SMTC.1 | | |
| OCNG Pattern | | 1, 2 | OP.1 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0 | | |
| RLM-RS | | 1, 2 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -137 | | |
| $N_{oc}$ | dBm/SCS | 1, 2 | -95 | | |
| $N_{oc}$ | dBm/15 kHz | 1, 2 | -98 | | |
| SS-RSRP | | 1, 2 | -80.99 | -80.99 | -80.99 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2 | 14 | 15.6 | 15.6 |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 14 | 15.6 | 15.6 |
| Io | dBm/38.16 MHz | 1, 2 | -49.78 | -48.23 | -48.23 |
| Treselection | S | 1, 2 | 0 | | |
| Snonintrasearch | dB | 1, 2 | 50 | | |
| $Thresh_{x, high (Note 2)}$ | dB | 1, 2 | 48 | | |
| $Thresh_{serving, low}$ | dB | 1, 2 | 44 | | |
| $Thresh_{x, low}$ | dB | 1, 2 | 50 | | |
| Propagation Condition | | 1, 2 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell
Note 3: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.1.4.1.5-2: E-UTRA Cell 2 specific parameters for NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA**

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ | dBm/15 kHz | -98 | -98 | -100 |
| RSRP | dBm/15 kHz | -infinity | -84.4 | -103.6 |
| $\hat{E}_s / I_{ot}$ | dB | -infinity | 13.6 | -3.6 |
| $\hat{E}_s / N_{oc}$ | dB | -infinity | 13.6 | -3.6 |
| $Treselection_{EUTRAN}$ | s | 0 | | |
| Snonintrasearch | dB | 50 | | |
| $Thresh_{x, high (Note 2)}$ | dB | 48 | | |
| $Thresh_{serving, low}$ | dB | 44 | | |
| $Thresh_{x, low}$ | dB | 50 | | |
| Propagation Condition | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

- $T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]
- $T_{evaluate, E-UTRAN}$ See Table 6.1.2.0.1-1 in TS 38.133 [6] clause 6.1.2.0.1
- $T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

## 11.1.4.2 NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA

### 11.1.4.2.1 Test purpose

This test is to verify the requirement for the NR cell subject to CCA to E-UTRAN inter-RAT cell reselection requirements specified in clause 11.1.4.0.1 when the E-UTRAN cell is of lower priority.

### 11.1.4.2.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, SSB-based RRM, and UL with a shared spectrum NR carrier.

### 11.1.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.1.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.1.4.2.

### 11.1.4.2.4 Test description

#### 11.1.4.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.1.4.2.4.1-1.

**Table 11.1.4.2.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.1.4.2-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 11.1.4.2-2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test requirement and the DUT according to the parameters in Table 11.1.4.2.4.1-2.

**Table 11.1.4.2.4.1-2: Initial conditions for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.1.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.1.4.2.4.1-3.

2. Message contents are defined in clause 11.1.4.2.4.3.

3. The test scenario comprises of one NR cell which is subject to CCA and one E-UTRAN cell. Cell 1 is the NR PCell under CCA and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.2 and C.1.3, Cell 2 is configured according to Annex A.6B.1.

**Table 11.1.4.2.4.1-3: General test parameters for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | The UE camps on cell 1 in the initial phase. |
| T1 end condition | Active cell | | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 during T1. |
| | Neighbour cells | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T2 for iteration of the tests. |
| | Neighbour cells | | 1, 2 | Cell2 | |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DBT Window Configuration | | | 1, 2 | DBT.1 | As specified in clause A.12.1. |
| DL CCA model | | | 1, 2 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1, 2 | As specified in clause D.7.2.2 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | | 1 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 2 | 4 | |
| T1 | | s | 1, 2 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 11.1.4.2.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) under CCA and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1. The CCA model (both DL and UL) on Cell 1 is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

1a. Set the parameters according to T2 in Table 11.1.4.2.5-1 and 11.1.4.2.5-2. SS waits at least for 32sec ($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbour cell (Cell2).

2. Set the parameters according to T1 in Table 11.1.4.2.5-1 and 11.1.4.2.5-2. The SS shall enable DL and UL CCA model on Cell 1 according to Table 11.1.4.2.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 9.

5a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 11.1.4.2.5-1 and 11.1.4.2.5-2. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

8. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 8a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch on and off the UE and skip to step 9.

8a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

9. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) on Cell 1.

9a. Set the parameters according to T2 in Table 11.1.4.2.5-1 and 11.1.4.2.5-2. SS waits at least for 32sec ($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbour cell(Cell2).

10. Repeat step 2-9a until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.1.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.1.4.1.4.3-1: Common Exception messages for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.1.4.1.4.3-2: *SystemInformationBlockType3* for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

**Table 11.1.4.1.4.3-3: *SystemInformationBlockType24* for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[*n*] | 5 | | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

11.1.4.2.5 Test requirement

Tables 11.1.4.2.5-1 and 11.1.4.2.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

**Table 11.1.4.2.5-1: NR Cell 1 specific parameters for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| TDD configuration | | 1, 2 | TDDConf.1.1.CCA | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1, 2 | 0.9 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1, 2 | 0.75 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1, 2 | 0.5 | |
| UL CCA probability $P_{CCA_UL}$ | | 1, 2 | 1 | |
| $M_{d,max}$ | | 1, 2 | 16 | |
| $M_{m,max}$ | | 1, 2 | 4 | |
| $M_{e,max}$ | | 1, 2 | 8 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 CCA | |
| RMSI CORESET RMC Configuration | | 1, 2 | CR.1.1 CCA | |
| Dedicated CORESET RMC Configuration | | 1, 2 | CCR.1.1 CCA | |
| SSB configuration | | 1, 2 | SSB.1 CCA for semi-static channel access; SSB.2 CCA for dynamic channel access | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| OCNG Pattern | | 1, 2 | OP.1 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0 | |
| RLM-RS | | 1, 2 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 2 | -97 | -95 |
| $N_{oc}$ | dBm/15 kHz | 1, 2 | -100 | -98 |
| SS-RSRP | dBm/SCS | 1, 2 | -100.59 | -81.39 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2 | -3.6 | 13.6 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | -3.6 | 13.6 |
| Io | dBm/38.16 MHz | 1, 2 | -64.37 | -50.16 |
| Treselection | S | 1, 2 | 0 | |
| Snonintrasearch | dB | 1, 2 | 50 | |
| $Thresh_{x, high (Note 2)}$ | dB | 1, 2 | 48 | |
| $Thresh_{serving, low}$ | dB | 1, 2 | 44 | |
| $Thresh_{x, low}$ | dB | 1, 2 | 50 | |
| Propagation Condition | | 1, 2 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell<br>Note 3: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. | | | | |

**Table 11.1.4.2.5-2: E-UTRA Cell 2 specific parameters for NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA[Note 1] | dB | | |
| OCNG_RB[Note 1] | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s / I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s / N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| Snonintrasearch | dB | 50 | |
| $Thresh_{x, high (Note 2)}$ | dB | 48 | |
| $Thresh_{serving, low}$ | dB | 44 | |
| $Thresh_{x, low}$ | dB | 50 | |
| Propagation Condition | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell | | | |

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate,\ E\text{-}UTRAN} + T_{SI\text{-}E\text{-}UTRA}$,

Where:

- $T_{evaluate,\ E\text{-}UTRAN}$ See Table 6.1.2.0.1-1 in TS 38.133[6] clause 6.1.2.0.1
- $T_{SI\text{-}E\text{-}UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

# 11.2 RRC_CONNECTED state mobility

## 11.2.1 Handover

### 11.2.1.0 Minimum conformance requirements

#### 11.2.1.0.1 Minimum conformance requirements for NR FR1 - NR FR1 Handover

The requirements in this clause are applicable to inter-frequency handovers from NR FR1 cell to NR FR1 cell in carrier frequencies with CCA, and to both intra-frequency and inter-frequency handovers from NR FR1 cell in carrier frequencies with CCA to NR FR1 cell in carrier frequencies with CCA.

When the UE receives an RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ ms from the end of the last TTI containing the RRC command.

Where:

$D_{handover}$ equals the applicable RRC procedure delay to be defined in clause12 in TS 38.331 [13] plus the interruption time.

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot ≥-2 dB, then $T_{search} = (1+L_1) * T_{rs}$. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot ≥-2 dB, then $T_{search} = (3+L_1') * T_{rs}$ where $L_1$ and $L_1'$ are the number of SMTC occasions not available at the UE during the intra-frequency and inter-frequency detection period, respectively. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = (1+ L_2) * T_{rs}$ ms, where $L_2$ is the number of SMTC occasions not available at the UE during the time tracking period.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{IU}$ is the interruption uncertainty due to the random access procedure when sending PRACH to the new cell. $T_{IU}$ can be up to: $(1+ L_3)*T_{SSB,RO}$ + 10 ms where $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [8] and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. When the UE is configured with both the UL BWP with PRACH occasion on the target cell and UL CCA failure detection/recovery, the interruption can be longer.

$T_{rs}$ is the SMTC periodicity of the target NR cell in a carrier frequency with CCA if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The interruption time considering the potential extensions caused by $L_1$, $L_1$´,$L_2$ , $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [13].

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 38.133 [6] Clause 9.2A.5 for intra-frequency handover and Clause 9.3A.4 for inter-frequency handover to a carrier frequency with CCA.

The normative reference for this requirement is TS 38.133 [6] clause 6.1B.1.2.

## 11.2.1.1 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell

### 11.2.1.1.1 Test purpose

To verify the NR intra-frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 11.2.1.0.1 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

### 11.2.1.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.1.

### 11.2.1.1.4 Test description

#### 11.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.1.4.1-1.

**Table 11.2.1.1.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell**

| Config | Description |
|---|---|
| 11.2.1.1-1 | With CCA: Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.1.4.1-2

**Table 11.2.1.1.4.1-2: Initial conditions for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 11.2.1.1.4.3.
2. The test scenario comprises of 1 NR carrier and 2 cells that are subject to CCA. The power levels and settings for source NR cell and target FR1 NR cell are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.2.1.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 11.2.1.1.4.1-3: General test parameters for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | On the carrier under CCA |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| A3-Offset | | dB | -1 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T304 | | ms | 500 | |
| $L_{CCA_DL}$ | | | 5 | |
| $W_{CCA_DL}$ | | ms | T304 | |
| $L_{CCA_UL}$ | | | 5 | |
| $W_{CCA_UL}$ | | ms | T304 | |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |
| T3 | | s | ≥ $T_{interrupt}$ | $T_{interrupt}$ is defined in clause 11.2.1.0.1 |

NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

#### 11.2.1.1.4.2 Test procedure

Two cells are deployed in the test, FR1 NR Cell 1 and FR1 NR Cell 2 on the same frequency both of which are subject to CCA as given in tables 11.2.1.1.4.1-3 and 11.2.1.1.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

The SS shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 11.2.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model according to Table 11.1.1.1.5-1. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.
4. UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.1.1.5-1.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3.
7. SS shall transmit the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 11.2.1.1.5-1. T3 starts.
8. If the UE transmits the uplink PRACH channel to Cell 2 within [222 ms] from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.
10. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.
12. Repeat steps 2-11 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.1.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, and Synchronous cells<br>Table H.3.1-4 with A3-offset = -1dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br><br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 11.2.1.1.5 Test requirements

Table 11.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell test.

**Table 11.2.1.1.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | - | $P_{CCA_DL}$=0.9375 | | | $P_{CCA_DL}$=0.9375 | | |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | - | 0.75 | | | 0.75 | | |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | - | 0.87 | | | 0.87 | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | Config 1 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference | Config 1 | | SR.1.1 CCA | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA | | | | | |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.1.1 CCA | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| DBT window configuration | Config 1 | | DBT.1 | | | | | |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1 | | SSB.1 CCA | | | | | |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1 | | SSB.2 CCA | | | | | |
| ssb-PositionQCL | Config 1 | | [1] | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | 0 | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -95 | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB_RP | Config 1 | dBm/SCS | -87 | -87 | -87 | -Infinity | -85 | -85 |
| Io Note3 | Config 1 | dBm/38.16MHz | -55.31 | -51.56 | -51.56 | -55.31 | -51.56 | -51.56 |
| Propagation condition | | - | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{interrupt}$ from the beginning of time period T3, where $T_{interrupt}$ is defined in clause 11.2.1.0.1.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

$T_{search} = 0$.

$T_{processing} = 20$ ms.

$T_{margin} = 2$ ms.

$T_{\Delta} = (1+ L_2) *20$ ms.

$T_{IU} = (1+ L_3)*10 + 10$ ms

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13], $L_2$ is the number of SMTC occasions not available at the UE during the time tracking period where $L_2 \leq L_{CCA_DL}$, and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where $L_3 \leq L_{CCA_UL}$. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. The interruption time considering the potential extensions caused by $L_1$, $L_2$ , $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [13]. Test equipment should make sure that $L_{CCA_DL}$ and $L_{CCA_UL}$ are not exceeded during a test by monitoring the number of CCA failures and preventing additional CCA failures from happening after $L_{CCA_DL}$ or $L_{CCA_UL}$ is reached.

## 11.2.1.2 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

### 11.2.1.2.1 Test purpose

To verify the NR intra-frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 11.2.1.0.1 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

### 11.2.1.2.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.2.

### 11.2.1.2.4 Test description

#### 11.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.2.4.1-1.

**Table 11.2.1.2.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Config | Description |
|---|---|
| 11.2.1.2-1 | With CCA: Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.2.4.1-2

**Table 11.2.1.2.4.1-2: Initial conditions for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 11.2.1.2.4.3.
2. The test scenario comprises of 1 NR carrier and 2 cells that are subject to CCA. The power levels and settings for source NR cell and target FR1 NR cell are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.2.1.2.4.1-3 below.

**Table 11.2.1.2.4.1-3: General test parameters for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | On the carrier under CCA |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T304 | | ms | 500 | |
| $L_{CCA_DL}$ | | | 5 | |
| $W_{CCA_DL}$ | | ms | T304 | |
| $L_{CCA_UL}$ | | | 5 | |
| $W_{CCA_UL}$ | | ms | T304 | |
| T1 | | s | 5 | |
| T2 | | s | ≥ $T_{interrupt}$ | $T_{interrupt}$ is defined in clause 11.2.1.0.1 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

### 11.2.1.2.4.2 Test procedure

Two cells are deployed in the test, FR1 NR Cell 1 and FR1 NR Cell 2 on the same frequency both of which are subject to CCA as given in tables 11.2.1.2.4.1-3 and 11.2.1.2.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2 after it receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model according to Table 11.2.1.2.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 11.2.1.2.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than [242 ms] from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.2.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 11.2.1.2.5 Test requirements

Table 11.2.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell test.

**Table 11.2.1.2.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | - | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | - | 0.75 | | 0.75 | |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | - | 0.87 | | 0.87 | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference | Config 1 | | SR.1.1 CCA | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA | | | |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.1.1 CCA | | | |
| TRS configuration | Config 1 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| DBT window configuration | Config 1 | | DBT.1 | | | |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1 | | SSB.1 CCA | | | |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1 | | SSB.2 CCA | | | |
| ssb-PositionQCL | Config 1 | | [1] | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -0.64 | -Infinity | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 8 |
| SSB_RP | Config 1 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -55.31 | -52.60 | -55.31 | -52.60 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{interrupt}$ from the beginning of time period T3, where $T_{interrupt}$ is defined in clause 11.2.1.0.1.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

$T_{search} = (1+L_1)* 20$ ms.

$T_{processing} = 20$ ms.

$T_{margin} = 2$ ms.

$T_{\Delta} = (1+ L_2) *20$ ms.

$T_{IU} = (1+ L_3)*10 + 10$ ms

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13], $L_1$ is the number of SMTC occasions not available at the UE during the intra-frequency detection period, $L_2$ is the number of SMTC occasions not available at the UE during the time tracking period, where $L_1 + L_2 \leq L_{CCA_DL}$, and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where $L_3 \leq L_{CCA_UL}$. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. The

interruption time considering the potential extensions caused by $L_1$, $L_2$ , $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer.

### 11.2.1.3 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell

#### 11.2.1.3.1 Test purpose

To verify the inter-frequency handover requirements from FR1 carrier under CCA to FR1 carrier under CCA specified in clause 11.2.1.0.1 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

#### 11.2.1.3.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.3.

#### 11.2.1.3.4 Test description

##### 11.2.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.3.4.1-1.

**Table 11.2.1.3.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Config | Description |
|---|---|
| 11.2.1.3-1 | With CCA: Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.3.4.1-2

**Table 11.2.1.3.4.1-2: Initial conditions for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 11.2.1.3.4.3.
2. The power levels and settings for source NR cell 1 and target FR1 NR cell 2 are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 11.2.1.3.4.1-3 below.

**Table 11.2.1.3.4.1-3: General test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | On the carrier under CCA |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T304 | | ms | 500 | |
| $L_{CCA_DL}$ | | | 5 | |
| $W_{CCA_DL}$ | | ms | T304 | |
| $L_{CCA_UL}$ | | | 5 | |
| $W_{CCA_UL}$ | | ms | T304 | |
| T1 | | s | 5 | |
| T2 | | s | $\leq T_{interrupt}$ | $T_{interrupt}$ is defined in clause 11.2.1.0.1 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

### 11.2.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier both of which are subject to CCA as given in tables 11.2.1.3.4.1-3 and 11.2.1.3.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model according to Table 11.2.1.3.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 11.2.1.3.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than [282 ms] from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*,

Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.3.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange<br><br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 11.2.1.3.5 Test requirements

Table 11.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell test.

**Table 11.2.1.3.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | - | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | - | 0.75 | | 0.75 | |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | - | 0.87 | | 0.87 | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference | Config 1 | | SR.1.1 CCA | | | |
| CORESET Reference Channel | Config 1 | | CR1.1 CCA | | | |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.1.1 CCA | | | |
| TRS configuration | Config 1 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| DBT window configuration | Config 1 | | DBT.1 | | | |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1 | | SSB.1 CCA | | | |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1 | | SSB.2 CCA | | | |
| ssb-PositionQCL | Config 1 | | [1] | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{interrupt}$ from the beginning of time period T3, where $T_{interrupt}$ is defined in clause 11.2.1.0.1.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

$T_{search} = (3+L_1')* 20$ ms.

$T_{processing} = 20$ ms.

$T_{margin} = 2$ ms.

$T_{\Delta} = (1+ L_2) *20$ ms.

$T_{IU} = (1+ L_3)*10 + 10$ ms

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13], $L_1'$ is the number of SMTC occasions not available at the UE during the inter-frequency detection period, $L_2$ is the number of SMTC occasions not available at

the UE during the time tracking period, where $L_1$' + $L_2 \leq L_{CCA_DL}$, and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure, where $L_3 \leq L_{CCA_UL}$. $L_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. The interruption time considering the potential extensions caused by , $L_1$´,$L_2$ , $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer.

## 11.2.1.4 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell

### 11.2.1.4.1 Test purpose

To verify the NR with CCA FR1-NR FR1 handover requirements specified in clause 6.3.1.0.2 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

### 11.2.1.4.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.4.

### 11.2.1.4.4 Test description

#### 11.2.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.4.4.1-1.

**Table 11.2.1.4.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell**

| Config | Description |
|---|---|
| 11.2.1.4-1 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.2.1.4-2 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.2.1.4-3 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.4.4.1-2

**Table 11.2.1.4.4.1-2: Initial conditions for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |

1. Message contents are defined in clause 11.2.1.4.4.3.

2. The test scenario comprises of 2 cells on 2 different NR carriers where the first carrier is subject to CCA. The power levels and settings for source NR cell under CCA and target FR1 NR cell are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 11.2.1.4.4.1-3 below, with A3-Offset modified by Test Tolerance.

**Table 11.2.1.4.4.1-3: General test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | NR cell with CCA |
| | Neighbouring cell | | Cell 2 | NR cell |
| Final condition | Active cell | | Cell 2 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| A3-Offset | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 11.2.1.4.4.2 Test procedure

Two cells are deployed in the test, FR1 NR Cell 1 under CCA and FR1 NR Cell 2 on a different frequency than Cell 1 as given in tables 11.2.1.4.4.1-3 and 11.2.1.4.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR Cell 1 with CCA shall send a RRC message implying handover to Cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model according to Table 11.1.1.4.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.1.4.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3.

7. SS shall transmit the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 11.2.1.4.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 within 112 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

12. Repeat steps 2-11 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.4.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1, SMTC.1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1, SMTC.1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -1dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br><br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 11.2.1.4.5 Test requirements

Table 11.2.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell test.

**Table 11.2.1.4.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | 1,2,3 | 1 | | | 2 | | |
| Duplex mode | | 1 | TDD | | | FDD | | |
| | | 2 | TDD | | | TDD | | |
| | | 3 | TDD | | | TDD | | |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | | Not Applicable | | |
| | | 2 | TDDConf.1.1 CCA | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.1.1 CCA | | | TDDConf.2.1 | | |
| $BW_{channel}$ | MHz | 1 | 40: $N_{RB,c}$ = 106 | | | 10: $N_{RB,c}$ = 52 | | |
| | | 2 | 40: $N_{RB,c}$ = 106 | | | 10: $N_{RB,c}$ = 52 | | |
| | | 3 | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BWP BW | | MHz | 1 | 40: $N_{RB,c}$ = 106 | | | 10: $N_{RB,c}$ = 52 | | |
| | | | 2 | 40: $N_{RB,c}$ = 106 | | | 10: $N_{RB,c}$ = 52 | | |
| | | | 3 | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DRX Cycle | | ms | 1,2,3 | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | 1 | SR.1.1 CCA | | | SR.1.1 FDD | | |
| | | | 2 | SR.1.1 CCA | | | SR.1.1 TDD | | |
| | | | 3 | SR.1.1 CCA | | | SR2.1 TDD | | |
| CORESET Reference Channel | | | 1 | CR1.1 CCA | | | CR.1.1 FDD | | |
| | | | 2 | CR1.1 CCA | | | CR.1.1 TDD | | |
| | | | 3 | CR1.1 CCA | | | CR2.1 TDD | | |
| Dedicated CORESET RMC configuration | | | 1 | CCR.1.1 CCA | | | CCR.1.1 FDD | | |
| | | | 2 | CCR.1.1 CCA | | | CCR.1.1 TDD | | |
| | | | 3 | CCR.1.1 CCA | | | CCR.2.1 TDD | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$)DL CCA probability $P_{CCA_DL}$ | | | 1,2,3 | 0.9375 | | | N/A | | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_1}$) | | | 1,2,3 | 0.75 | | | N/A | | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_2}$) | | | 1,2,3 | 0.75 | | | N/A | | |
| UL CCA probability for semi-static channel access $P_{CCA_UL}$ | | | 1,2,3 | 0.75 | | | N/A | | |
| UL CCA probability for dynamic static channel access $P_{CCA_UL}$ | | | 1,2,3 | 0.87 | | | | | |
| TRS configuration | | | 1 | TRS.1.2 TDD | | | TRS.1.1 FDD | | |
| | | | 2 | TRS.1.2 TDD | | | TRS.1.1 TDD | | |
| | | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SMTC Configuration | | | | SMTC.1 | | | | | |
| SSB Configuration | Semi-static channel access | | 1,2 | SSB.1 CCA (As defined in A.3A.1) | | | SSB.1 FR1 | | |
| | Dynamic channel access | | | SSB.2 CCA (As defined in A.3A.1) | | | | | |
| | Semi-static channel access | | 3 | SSB.1 CCA (As defined in A.3A.1) | | | SSB.2 FR1 | | |
| | Dynamic channel access | | | SSB.2 CCA (As defined in A.3A.1) | | | | | |
| DBT window configuration | | | | As defined in A.12.1 | | | Not applicable | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1,2 | 30 kHz | | | 15 kHz | | |
| | | | 3 | 30 kHz | | | 30 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 1,2 | 30 kHz | | | 15 kHz | | |
| | | | 3 | 30 kHz | | | 30 kHz | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 under CCA | | | FR1 PRACH configuration 1 | | |
| BWP configuration | Initial DL BWP | | 1,2,3 | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | 1,2,3 | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | 1,2,3 | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | 1,2,3 | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 1,2,3 | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | 1,2,3 | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | 1,2,3 | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | 1,2,3 | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | 1,2,3 | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 1,2,3 | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | 1,2,3 | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note1] | | | 1,2,3 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note1] | | | 1,2,3 | | | | | | |
| $N_{oc}$ [Note2] | | dBm/SCS | 1,2 | -95 | | | -98 | | |
| | | | 3 | -95 | | | -95 | | |
| $\hat{E}_s / I_{ot}$ | | dB | 1,2,3 | 8 | 8 | 8 | -Infinity | 11 | 11 |
| $\hat{E}_s / N_{oc}$ | | dB | 1,2,3 | 8 | 8 | 8 | -Infinity | 11 | 11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SSB_RP | dBm/SCS | 1,2,3 | -87 | -87 | -87 | -Infinity | -87 | -87 |
| Io[Note3] | dBm/Ch BW | 1,2 | -55.31 | -55.31 | -55.31 | -70.05 | -58.72 | -58.72 |
| Io[Note3] | dBm/Ch BW | 3 | -55.31 | -55.31 | -55.31 | -63.94 | -52.61 | -52.61 |
| Propagation condition | - | 1,2,3 | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 102 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 112 ms

### 11.2.1.5 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell

#### 11.2.1.5.1 Test purpose

To verify the NR with CCA FR1-NR FR1 inter-frequency handover handover requirements specified in clause 6.3.1.0.2 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

#### 11.2.1.5.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.2.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.5.

#### 11.2.1.5.4 Test description

##### 11.2.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.5.4.1-1.

**Table 11.2.1.5.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell**

| Config | Description |
|---|---|

| | |
|---|---|
| 11.2.1.5-1 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.2.1.5-2 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.2.1.5-3 | Source cell: NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.5.4.1-2

**Table 11.2.1.5.4.1-2: Initial conditions for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 11.2.1.5.4.3.
2. The power levels and settings for source NR cell 1 under CCA and target FR1 NR cell 2 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.2.1.5.4.1-3 below.

**Table 11.2.1.5.4.1-3: General test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | NR cell with CCA |
| | Neighbouring cell | | Cell 2 | NR cell |
| Final condition | Active cell | | Cell 2 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

### 11.2.1.5.4.2 Test procedure

The test scenario comprises of two carriers and one cell on each carrier. Cell 1 is the NR cell with CCA cell and Cell 2 is an NR neighbour cell. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2.

Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The CCA model (both DL and UL) for Cell 1 is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model for Cell 1 according to Table 11.2.1.5.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 11.2.1.5.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model for Cell 1 (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.2.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.5.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 11.2.1.5.5 Test requirements

Table 11.2.1.5.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell test.

**Table 11.2.1.5.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell**

| Parameter | Unit | Configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3 | 1 | | 2 | |
| Duplex mode | | 1 | TDD | | FDD | |
| | | 2 | TDD | | TDD | |
| | | 3 | TDD | | TDD | |
| DL CCA model | | 1, 2, 3 | As specified in clause D.7.2.1 | | N/A | |
| UL CCA model | | 1, 2, 3 | As specified in clause D.7.2.2 | | | |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | Not Applicable | |

| | | | | |
|---|---|---|---|---|
| | | 2 | TDDConf.1.1 CCA | TDDConf.1.1 |
| | | 3 | TDDConf.1.1 CCA | TDDConf.2.1 |
| $BW_{channel}$ | MHz | 1 | 40: $N_{RB,c}$ = 106 | 10: $N_{RB,c}$ = 52 |
| | | 2 | 40: $N_{RB,c}$ = 106 | 10: $N_{RB,c}$ = 52 |
| | | 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP BW | MHz | 1 | 40: $N_{RB,c}$ = 106 | 10: $N_{RB,c}$ = 52 |
| | | 2 | 40: $N_{RB,c}$ = 106 | 10: $N_{RB,c}$ = 52 |
| | | 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| DRX Cycle | ms | | Not Applicable | |
| PDSCH Reference measurement channel | | 1 | SR.1.1 CCA | SR.1.1 FDD |
| | | 2 | SR.1.1 CCA | SR.1.1 TDD |
| | | 3 | SR.1.1 CCA | SR2.1 TDD |
| CORESET Reference Channel | | 1 | CR2.1 TDD | CR.1.1 FDD |
| | | 2 | CR2.1 TDD | CR.1.1 TDD |
| | | 3 | CR2.1 TDD | CR2.1 TDD |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 CCA | CCR.1.1 FDD |
| | | 2 | CCR.1.1 CCA | CCR.1.1 TDD |
| | | 3 | CCR.1.1 CCA | CCR.2.1 TDD |
| TRS configuration | | 1 | TRS.1.2 TDD | TRS.1.1 FDD |
| | | 2 | TRS.1.2 TDD | TRS.1.1 TDD |
| | | 3 | TRS.1.2 TDD | TRS.1.2 TDD |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$)DL CCA probability $P_{CCA_DL}$ | | 1, 2, 3 | 0.9375 | N/A |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_1}$) | | 1, 2, 3 | 0.75 | N/A |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_2}$) | | 1, 2, 3 | 0.75 | N/A |
| UL CCA probability for semi-static channel access $P_{CCA_UL}$ | | 1, 2, 3 | 0.75 | N/A |
| UL CCA probability for dynamic static channel access $P_{CCA_UL}$ | | 1, 2, 3 | 0.87 | N/A |
| OCNG Patterns | | 1, 2, 3 | OP.1 | |
| SMTC Configuration | | 1, 2, 3 | SMTC.1 | |
| DBT window configuration | | 1, 2, 3 | As defined in A.12.1 | N/A |
| SSB configuration | Semi-static channel access | 1,2 | SSB.1 CCA (As defined in A.3A.1) | SSB.1 FR1 |
| | Dynamic channel access | | SSB.2 CCA (As defined in A.3A.1) | |
| | Semi-static channel access | 3 | SSB.1 CCA (As defined in A.3A.1) | SSB.2 FR1 |
| | Dynamic channel access | | SSB.2 CCA (As defined in A.3A.1) | |
| ssb-PositionQCL | | | [1] | N/A |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 30 kHz | 15 kHz |
| | | 2 | 30 kHz | 15 kHz |
| | | 3 | 30 kHz | 30 kHz |
| PUCCH/PUSCH subcarrier spacing | kHz | 1 | 30 kHz | 15 kHz |
| | | 2 | 30 kHz | 15 kHz |
| | | 3 | 30 kHz | 30 kHz |
| PRACH configuration | | 1,2,3 | FR1 PRACH configuration 1 under CCA | FR1 PRACH configuration 1 |
| BWP configuration | Initial DL BWP | 1,2,3 | DLBWP.0.1 | |
| | Dedicated DL BWP | 1,2,3 | DLBWP.1.1 | |
| | Initial UL BWP | 1,2,3 | ULBWP.0.1 | |
| | Dedicated UL BWP | 1,2,3 | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | 1,2,3 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | 1,2,3 | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | 1,2,3 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | 1,2,3 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | 1,2,3 | | | | |
| EPRE ratio of PDSCH to PDSCH | | 1,2,3 | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note1] | | 1,2,3 | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note1] | | 1,2,3 | | | | |
| $N_{oc}$ [Note2] | dBm/SCS | 1,2,3 | -95 | | -98 | |
| | | | -95 | | -95 | |
| $\hat{E}_s / I_{ot}$ | dB | 1,2,3 | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | dB | 1,2,3 | 4 | 4 | -Infinity | 5 |
| SSB_RP | dBm/SCS | 1,2,3 | -91 | -91 | -Infinity | -93 |
| | | | -91 | -91 | -Infinity | -90 |
| Io[Note3] | dBm/Ch BW | 1,2,3 | -58.49 | -58.49 | -70.05 | -63.85 |
| | dBm/Ch BW | 1,2,3 | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | - | 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 132 ms.

## 11.2.1.6 NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell

### 11.2.1.6.1 Test purpose

To verify the inter-frequency handover requirements from FR1 to FR1 carrier under CCA specified in clause 11.2.1.0.1 in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

### 11.2.1.6.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.6.

### 11.2.1.6.4 Test description

#### 11.2.1.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 11.2.1.6.4.1-1.

**Table 11.2.1.6.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.2.1.6-1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.2.1.6-2 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.2.1.6-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.1.6.4.1-2

**Table 11.2.1.6.4.1-2: Initial conditions for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. Message contents are defined in clause 11.2.1.6.4.3.
2. The test scenario comprises of 1 NR carrier and 2 cells that are subject to CCA. The power levels and settings for source NR cell and target FR1 NR cell are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.2.1.6.4.1-3 below.

**Table 11.2.1.6.4.1-3: General test parameters for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |

| | | | |
|---|---|---|---|
| T2 | s | ≤ $T_{interrupt}$ | $T_{interrupt}$ is defined in clause 11.2.1.0.1 |

### 11.2.1.6.4.2 Test procedure

The test scenario comprises of two carriers and one cell on each carrier. FR1 NR Cell 1 and FR1 NR Cell 2 which is subject to CCA as given in tables 11.2.1.6.4.1-3 and 11.2.1.6.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model according to Table 11.2.1.6.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 11.2.1.6.5-1. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than [282 ms] from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.2.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.6.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

11.2.1.6.5 Test requirements

Table 11.2.1.6.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell test.

**Table 11.2.1.6.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell**

| Parameter | Unit | Configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | 1, 2, 3 | 1 | | 2 | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$)DL CCA probability $P_{CCA_DL}$ | | 1, 2, 3 | N/A | | 0.9375 | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_1}$) | | 1, 2, 3 | N/A | | 0.75 | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_2}$) | | 1, 2, 3 | N/A | | 0.75 | |
| UL CCA probability for semi-static channel access $P_{CCA_UL}$ | | 1, 2, 3 | N/A | | 0.75 | |
| UL CCA probability for dynamic static channel access $P_{CCA_UL}$ | | 1, 2, 3 | N/A | | 0.87 | |
| TDD configuration | | 1 | N/A | | TDDConf.1.1.CCA | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1.CCA | |
| | | 3 | TDDConf.1.2 | | TDDConf.1.1.CCA | |
| $BW_{channel}$ | | 1 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | 2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | 1 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | 2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| DRX Cycle | ms | | Not Applicable | | | |
| PDSCH Reference | | 1 | SR.1.1 FDD | | SR.1.1 CCA | |
| | | 2 | SR.1.1 TDD | | SR.1.1 CCA | |
| | | 3 | SR.2.1 TDD | | SR.1.1 CCA | |
| CORESET Reference Channel | | 1 | CR.1.1 FDD | | CR.1.1 CCA | |
| | | 2 | CR.1.1 TDD | | CR.1.1 CCA | |
| | | 3 | CR.2.1 TDD | | CR.1.1 CCA | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | CCR.1.1 CCA | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 CCA | |
| | | 3 | CCR.2.1 TDD | | CCR.1.1 CCA | |
| TRS configuration | | 1 | TRS.1.1 FDD | | TRS.1.2 TDD | |
| | | 2 | TRS.1.1 TDD | | TRS.1.2 TDD | |
| | | 3 | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | 1, 2, 3 | OP.1 | | | |
| SMTC Configuration | | 1, 2, 3 | SMTC.1 | | | |
| DBT window configuration | | 1, 2, 3 | N/A | | As defined in A.12.1 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 CCA for semi-static channel access; SSB.2 CCA for dynamic channel access; | |
| | | 3 | SSB.2 FR1 | | SSB.1 CCA for semi-static channel access; SSB.2 CCA for dynamic channel access; | |
| ssb-PositionQCL | | | N/A | | [1] | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 15 kHz | | 30 kHz | |
| | | 2 | 15 kHz | | 30 kHz | |
| | | 3 | 30 kHz | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | kHz | 1 | 15 kHz | | 30 kHz | |
| | | 2 | 15 kHz | | 30 kHz | |
| | | 3 | 30 kHz | | 30 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | FR1 PRACH configuration 1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | 1, 2, 3 | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | 1, 2, 3 | DLBWP.1.1 | | | |
| | Initial UL BWP | | 1, 2, 3 | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | 1, 2, 3 | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | | 98 | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | 1, 2 | -98 | | -95 | |
| | | | 3 | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1 | dBm/SCS | 1, 2 | -94 | -94 | -Infinity | -90 |
| | | | 3 | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1 | dBm/Ch BW | 1, 2 | -64.59 | -64.59 | -63.94 | -57.75 |
| | | dBm/Ch BW | 3 | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | | - | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{interrupt}$ from the beginning of time period T3, where $T_{interrupt}$ is defined in clause 11.2.1.0.1.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13], $L_1$' is the number of SMTC occasions not available at the UE during the inter-frequency detection period, $L_2$ is the number of SMTC occasions not available at the UE during the time tracking period, and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. $L_3$ = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [37]. The interruption time considering the potential extensions caused by $L_1$, $L_1$´,$L_2$ , $L_3$ and by the UL CCA failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is detailed in TS 38.331 [13].

## 11.2.1.7 NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell

### 11.2.1.7.1 Test purpose

The purpose of this test is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.3.1.0.1.

### 11.2.1.7.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.7.

### 11.2.1.7.4 Test description

#### 11.2.1.7.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.2.1.7.4.1-1.

**Table 11.2.1.7.4.1-1: Supported test configurations for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.2.1.7-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 11.2.1.7-2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested. | | |

Configure the test requirement and the DUT according to the parameters in Table 11.2.1.7.4.1-2.

**Table 11.2.1.7.4.1-2: Initial conditions for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.2.1.7.4.1-3.

2. Message contents are defined in clause 11.2.1.7.4.3.

3. The test comprises of one NR carrier under CCA and one E-UTRA carrier with one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.2 and C.1.3, Cell 2 is configured according to Annex A.6B.1.

**Table 11.2.1.7.4.1-3: General test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell on a carrier under CCA |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| b2-Threshold1 | | dBm | As specified in Table 11.2.1.7.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| b2-Threshold2EUTRAN | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| Hysteresis | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 11.2.1.7.4.2 Test procedure

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in TS 38.133 [6] Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the next instant after the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.7.5-1 and 11.2.1.7.5-2. Propagation conditions are set according to Annex C clause C.2.2. The SS shall enable DL and UL CCA model on Cell 1 according to Table 11.2.1.7.5-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.1.7.5-1 and 11.2.1.7.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2.

7. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.
8. The start of T3 is the next instant after the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 11.2.1.7.5-1 and 11.2.1.7.5-2.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. The UE shall transmit *RRCConnectionReconfigurationComplete* message on Cell 2.
11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model on Cell 1 (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).
12. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.2.1.7.4.3-1: Common Exception messages for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-RAT and GAP NEEDED<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RAT<br>Table H.3.3-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.2.1.7.4.3-2: *PRACH-Config-DEFAULT* for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PRACH-Config-DEFAULT ::= SEQUENCE { | | | |
| prach-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | Config 1 |
| | 53 | | Config 2 |
| } | | | |
| } | | | |

**Table 11.2.1.7.4.3-3: *RRCConnectionReconfiguration* for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell**

| Derivation Path: TS 36.508 [25], Table 4.6.1-8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| securityConfigHO | Not present | | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v890-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v920-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1020-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1130-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1250-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1310-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1430-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1510-IEs | |
| nonCriticalExtension SEQUENCE { | | RRCConnectionReconfiguration-v1530-IEs | |
| securityConfigHO-v1530 { | | | |
| handoverType-v1530 CHOICE { | fivegc-ToEPC-r15 | | |
| fivegc-ToEPC-r15 { | | | |
| securityAlgorithmConfig-r15 { | | | |
| cipheringAlgorithm | eea0 | | |
| integrityProtAlgorithm | eia1 | | |
| } | | | |
| nextHopChainingCount-r15 | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

11.2.1.7.5 Test requirement

Tables 11.2.1.7.4.1-3, 11.2.1.7.5-1 and 11.2.1.7.5-2 define the primary level settings including test tolerances for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell test case.

**Table 11.2.1.7.5-1: Cell specific test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2 | 1 | | |
| TDD Configuration | | 1, 2 | TDDConf.1.1.CCA | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$)DL CCA probability $P_{CCA_DL}$ | | | 1, 2 | 0.9375 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | | 1, 2 | 0.75 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | | 1, 2 | 0.75 | | |
| UL CCA probability for semi-static channel access $P_{CCA_UL}$ | | | 1, 2 | 0.75 | | |
| UL CCA probability for dynamic static channel access $P_{CCA_UL}$ | | | 1, 2 | 0.87 | | |
| $BW_{channel}$ | | | 1, 2 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 2 | SR.1.1 CCA | | |
| CORESET reference channel | | | 1, 2 | CR.1.1 CCA | | |
| Dedicated CORESET RMC configuration | | | 1, 2 | CCR.1.1 CCA | | |
| TRS configuration | | | 1, 2 | TRS.1.2 TDD | | |
| OCNG pattern[Note1] | | | 1, 2 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2 | SMTC.1 | | |
| DBT window configuration | | | 1, 2 | As defined in A.12.1 | | |
| SSB configuration | | | 1, 2 | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; | | |
| b2-Threshold1 | | dBm | 1, 2 | -93 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2 | -100 | -104 | -100 |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2 | -97 | -101 | -97 |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2 | 12 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2 | 12 | 0 | 0 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2 | -85 | -101 | -97 |
| Io[Note3] | | dBm/38.16 MHz | 1, 2 | -53.68 | -66.93 | -62.93 |
| Propagation condition | | | 1, 2 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.2.1.7.5-2: Cell specific test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2 | 2 | | |
| Duplex mode | | 1 | FDD | | |
| | | 2 | TDD | | |
| TDD special subframe configuration[Note1] | | 2 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2 | 10 MHz: $N_{RB,c}$ = 50 | | |
| PRACH Configuration[Note2] | | 1 | 4 | | |
| | | 2 | 53 | | |
| PDSCH parameters: DL Reference Measurement Channel[Note3] | | 1 | 10 MHz: R.3 FDD | | |
| | | 2 | 10 MHz: R.0 TDD | | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3] | | 1 | 10 MHz: R.6 FDD | | |
| | | 2 | 10 MHz: R.6 TDD | | |
| OCNG Patterns[Note3] | | 1 | 10 MHz: OP.10 FDD | | |
| | | 2 | 10 MHz: OP.1 TDD | | |
| PBCH_RA | dB | 1, 2 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note4] | | | | | |
| OCNG_RB[Note4] | | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 9.55 | 9.55 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2 | -Infinity | 9.55 | 9.55 |
| RSRP[Note6] | dBm/15kHz | 1, 2 | -Infinity | -88.45 | -88.45 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2 | -Infinity | -88.45 | -88.45 |
| Io[Note6] | dBm/9MHz | 1, 2 | -67.21 | -57.20 | -57.20 |
| Propagation Condition | | 1, 2 | AWGN | | |

| | | | |
|---|---|---|---|
| Antenna Configuration and Correlation Matrix Note7 | | 1, 2 | 1x2 Low |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in clause 6.3.1.0.1.

$T_{interrupt}$ = 35 ms in the test; $T_{interrupt}$ is defined in clause 6.3.1.0.1.

This gives a total of 85 ms.

## 11.2.1.8 NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell

### 11.2.1.8.1 Test purpose

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1 carrier under CCA. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.3.1.0.1.

### 11.2.1.8.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.1.8.

### 11.2.1.8.4 Test description

#### 11.2.1.8.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.2.1.8.4.1-1.

**Table 11.2.1.8.4.1-1: Supported test configurations for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell**

| Configuration | Description of a cell with CCA | Description of a cell without CCA |
|---|---|---|
| 11.2.1.8-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 11.2.1.8-2 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |

Note 1: The UE is only required to be tested in one of the supported test configurations.
Note 2: The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested.

Configure the test requirement and the DUT according to the parameters in Table 11.2.1.8.4.1-2.

**Table 11.2.1.8.4.1-2: Initial conditions for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.2.1.8.4.1-3.

2. Message contents are defined in clause 11.2.1.8.4.3.

3. The test comprises of one NR carrier under CCA and one E-UTRA carrier with one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.2 and C.1.3, Cell 2 is configured according to Annex A.6B.1.

**Table 11.2.1.8.4.1-3: General test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell on a carrier under CCA |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| NR measurement quantity | | | SS-RSRP | |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| T1 | | s | ≤5 | |
| T2 | | s | 1 | |

### 11.2.1.8.4.2 Test procedure

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the next instant after the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.2.1.8.5-1 and 11.2.1.8.5-2. The SS shall enable DL and UL CCA model on Cell 1 according to Table 11.2.1.6.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last subframe containing the RRC Reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 11.2.1.8.5-1 and 11.2.1.8.5-2. T2 starts.

5. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. The UE shall transmit *RRCConnectionReconfigurationComplete* message on Cell 2.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model on Cell 1 (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.2.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.1.8.4.3-1: Common Exception messages for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.3-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.2.1.8.4.3-2: *PRACH-Config-DEFAULT* for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell**

| Derivation Path: TS 36.508 [25], Table 4.6.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PRACH-Config-DEFAULT ::= SEQUENCE { | | | |
| prach-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | Config 1 |
| | 53 | | Config 2 |
| } | | | |
| } | | | |

### 11.2.1.8.5 Test requirement

Tables 11.2.1.8.4.1-3, 11.2.1.8.5-1 and 11.2.1.8.5-2 define the primary level settings including test tolerances for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell test.

**Table 11.2.1.8.5-1: Cell specific test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2 | 1 | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$)DL CCA probability $P_{CCA_DL}$ | | | 1, 2 | 0.9375 | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_1}$) | | | 1, 2 | 0.75 | |
| DL CCA probability for dynamic channel access ($P_{CCA_DL_2}$) | | | 1, 2 | 0.75 | |
| UL CCA probability for semi-static channel access $P_{CCA_UL}$ | | | 1, 2 | 0.75 | |
| UL CCA probability for dynamic static channel access $P_{CCA_UL}$ | | | 1, 2 | 0.87 | |
| TDD Configuration | | | 1, 2 | TDDConf.1.1.CCA | |
| $BW_{channel}$ | | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 (TDD) | |
| PDSCH reference measurement channel | | | 1, 2 | SR.1.1 CCA | |
| CORESET reference channel | | | 1, 2 | CR.1.1 CCA | |
| Dedicated CORESET RMC configuration | | | 1, 2 | CCR.1.1 CCA | |
| TRS configuration | | | 1, 2 | TRS.1.2 TDD | |
| OCNG pattern[Note1] | | | 1, 2 | OP.1 | |
| BWP | Initial DL BWP | | 1, 2 | DLBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DBT window configuration | | | 1, 2 | As defined in A.12.1 | |
| SSB configuration | | | 1, 2 | SSB.1 CCA for semi-static channel access;<br>SSB.2 CCA for dynamic channel access; | |
| EPRE ratio of PSS to SSS | | dB | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2 | -98 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2 | -95 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2 | 0 | 0 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2 | -95 | -95 |
| Io[Note3] | | dBm/38.16 MHz | 1, 2 | -60.93 | -60.93 |
| Propagation condition | | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1, 2 | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.2.1.8.5-2: Cell specific test parameters for NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 2 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 10 MHz: $N_{RB,c}$ = 50 | |
| PRACH Configuration[Note2] | | 1 | 4 | |
| | | 2 | 53 | |
| PDSCH parameters: DL Reference Measurement Channel[Note3] | | 1 | 10 MHz: R.3 FDD | |
| | | 2 | 10 MHz: R.0 TDD | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3] | | 1 | 10 MHz: R.6 FDD | |
| | | 2 | 10 MHz: R.6 TDD | |
| OCNG Patterns[Note3] | | 1 | 10 MHz: OP.10 FDD | |
| | | 2 | 10 MHz: OP.1 TDD | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 7 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2 | -Infinity | 7 |
| RSRP[Note6] | dBm/15kHz | 1, 2 | -Infinity | -91 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2 | -Infinity | -91 |
| Io[Note6] | dBm/9MHz | 1, 2 | -67.21 | -59.42 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note7] | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

| | |
|---|---|
| Note 5: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 6: | $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 7: | Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27]. |

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in clause 6.3.1.0.1.

$T_{interrupt}$ = 115 ms in the test; $T_{interrupt}$ is defined in clause 6.3.1.0.1.

This gives a total of 165 ms.

## 11.2.2 RRC connection mobility control

### 11.2.2.1 RRC re-establishment

#### 11.2.2.1.0 Minimum conformance requirements

##### 11.2.2.1.0.1 Minimum conformance requirements for NR SA FR1 RRC re-establishment with CCA

In In RRC_CONNECTED state on the carrier w/o or with CCA the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay_CCA}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay_CCA}$) shall be less than:

$$T_{re-establish_delay_CCA} = T_{UE_re-establish_delay_CCA} + T_{UL_grant}$$

$T_{UL_grant}$: It is the time required to acquire and process uplink grant from the target PCell with CCA. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment on the carrier with CCA delay ($T_{UE_re\text{-}establish_delay_CCA}$) is the time between the moments when any of the conditions requiring RRC re-establishment on the carrier with CCA as defined in TS 38.331 [13] clause 5.3.7 is detected by the UE and when the UE sends PRACH to the target PCell on the carrier with CCA . The UE re-establishment delay requirement ($T_{UE_re\text{-}establish_delay_CCA}$) on the carrier with CCA shall be less than:

$$T_{UE_re-establish_delay_CCA} = 50\ \text{ms} + T_{identify_intra_NR_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR_CCA,i} + T_{SI-NR_CCA} + T_{PRACH_CCA}$$

The intra-frequency target NR cell with CCA shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in TS 38.133 [6] clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR band for FR1 and FR2-2, respectively, and
- the conditions of SSB_RP and SSB $\hat{E}s/Iot$ according to TS 38.133 [6] Annex B.2.2 for a corresponding NR band are fulfilled.

The inter-frequency target NR cell on the carrier with CCA shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR band for FR1 and FR2-2, respectively, and
- the conditions of SSB_RP and SSB $\hat{E}s/Iot$ according to TS 38.133 [6] Annex B.2.3 for a corresponding NR band are fulfilled.

$T_{identify_intra_NR_CCA}$: If the target intra-frequency carrier is the carrier without CCA, it is the time to identify the target intra-frequency NR cell which is defined in clause 6.3.2.1.0; otherwise it is the time to identify the target intra-frequency NR cell on the carrier with CCA and it depends on whether the target NR cell on the carrier with CCA is

known cell or unknown cell and on the frequency range (FR) of the target NR cell on the carrier with CCA. If the UE is not configured with intra-frequency NR carrier with CCA for RRC re-establishment then $T_{identify_intra_NR_CCA}$=0; otherwise $T_{identify_intra_NR_CCA}$ shall not exceed the values defined in Table 11.2.2.1.0.1-1.

$T_{identify_inter_NR_CCA,i}$: If the target inter-frequency carrier is the carrier without CCA, it is the time to identify the target inter-frequency NR cell which is defined in clause 6.3.2.1.0; otherwise it is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* with CCA configured for RRC re-establishment and it depends on whether the target NR cell on the inter-frequency carrier with CCA is known or unknown. $T_{identify_inter_NR_CCA,i}$ shall not exceed the values defined in Table 11.2.2.1.0.1-2.

$T_{SMTC}$: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2*, $T_{smtc}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is not larger than 20 ms.

$T_{SI\text{-}NR_CCA}$: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [13] for the target NR cell on the carrier with CCA.

$T_{PRACH_CCA}$ is the delay uncertainty in acquiring the first available PRACH occasion in the target NR Cell on the carrier with CCA:

$T_{PRACH_CCA} = (1+ K_3)*T_{SSB,RO} + 10$ ms, where:

- $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined inTable 8.1-1 of TS 38.213 [8].
- $K_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. $K_3 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. $L_3 = 0$ if *ra-ChannelAccess-r17* is not configured in FR2-2.

$N_{freq}$: It is the total number of NR frequencies to be monitored for RRC re-establishment; $N_{freq} = 1$ if the target NR cell on the intra-frequency carrier with CCA is known, else $N_{freq} = 2$ and $T_{identify_intra_NR_CCA} = 0$ if the target NR cell on the inter-frequency carrier with CCA is known.

There is no requirement if the target cell on the carrier with CCA does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell on the carrier with CCA is known if it has been meeting the relevant cell identification requirement during the last 8 seconds otherwise it is unknown.

**Table 11.2.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell with CCA**

| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | $T_{identify_intra_NR_CCA}$ | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, $(5+K_1) \times T_{SMTC}$) | MAX (800 ms, $(10+ K_1) \times T_{SMTC}$) |
| ≥ -8 | FR2-2 | N/A | MAX (1000 ms, N x $(10+ K_3) \times T_{SMTC}$) |
| < -8 | FR1 | N/A | $(800+20 \times K_1)^{Note1}$ |
| < -8 | FR2-2 | N/A | N x $(440+20 \times K_3)^{Note1}$ |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer with CCA when $T_{SMTC}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |
| Note 2: $K_1$ is the number of SMTC occasions not available at the UE due during RRC re-establishment period on the carrier with CCA. | | | |
| Note 3: $K_3$ is the number of SMTC occasion groups not available at the UE during RRC re-establishment period on the carrier with CCA. An SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. N is equal to 12. | | | |

**Table 11.2.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell on the carrier with CCA**

| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | $T_{identify_inter_NR_CCA, i}$ | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, ([6]+$K_{2,i}$) x $T_{SMTC, i}$) | MAX (800 ms, ([13]+$K_{2,i}$) x $T_{SMTC, i}$) |
| < -8 | FR1 | N/A | (800+20 x $K_{2,i}$) Note1 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer with CCA when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.<br>Note 2: $K_{2,i}$ is the number of SMTC occasions not available at the UE during RRC re-establishment period on the "i" th carrier with CCA, | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1A.2.

## 11.2.2.1.1 NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1

### 11.2.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay with CCA in FR1 with known target cell is within the specified limits. These tests will verify the requirements in clause 11.2.2.1.0.1.

### 11.2.2.1.1.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

### 11.2.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.1.1.

### 11.2.2.1.1.4 Test description

#### 11.2.2.1.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.2.2.1.1.4.1-1

**Table 11.2.2.1.1.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Configuration | Description |
|---|---|
| 11.2.2.1.1-1 | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 11.2.2.1.1.4.1-2

**Table 11.2.2.1.1.4.1-2: Initial conditions for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |

1. The general test parameter settings are set up according to Table 11.2.2.1.1.4.1-3.
2. Message contents are defined in clause 11.2.2.1.1.4.3.

There is one NR carrier and two cells under CCA specified in the test. Cell 1 is the cell used for registration with the power levels set according to Annex C.1.2 and C.1.3 for this test.

**Table 11.2.2.1.1.4.1-3: General test parameters for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial Condition | Active cell | - | Cell1 | Cell 1 is with CCA. |
| | Neighbour cells | - | Cell2 | Cell 2 is with CCA. |
| Final condition | Active cell | - | Cell2 | |
| RF Channel Number | | - | 1 | |
| DL CCA model | Dynamic channel access Note 1, 3 | - | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | - | | |
| UL CCA model | Dynamic channel access Note 1, 3 | - | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | - | | |
| Time offset between cells | | - | 3 μs | Synchronous cells |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| SSB configuration | Dynamic channel access Note 1, 3 | - | SSB.2 CCA | Table A.3A.1 |
| | Semi-static channel access Note 2, 3 | - | SSB.1 CCA | Table A.3A.1 |
| DBT window configuration | | - | DBT.1 | Table A.12.1 |
| SMTC configuration | | - | SMTC.1 | |
| DRX cycle length | | s | OFF | |
| PRACH configuration | | - | FR1 PRACH configuration 1 under CCA | Table A.7.1A.1 |
| T1 | | s | 5 | |
| T2 | | ms | 480 | Time for the UE to detect RLF |
| T3 | | s | 2 | |

NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

### 11.2.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, is deactivated. The time period T3 starts after the occurrence of the radio link failure. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 11.2.2.1.1.5-1. The SS shall enable DL and UL CCA model according to Table 11.2.2.1.1.5-1. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.2.2.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1350 + MAX (200, (5+$K_1$) x 20) ms from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

**Table 11.2.2.1.1.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, and Synchronous cells<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.2.2.1.1.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 11.2.2.1.1.4.3-3: *MeasConfig* for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |

| | | | |
|---|---|---|---|
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

11.2.2.1.1.5 Message contents

Table 11.2.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1 test case.

**Table 11.2.2.1.1.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | - | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| DL CCA probability $P_{CCA_DL}$ for dynamic channel access Note 4,6 | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| DL CCA probability $P_{CCA_DL}$ for semi-static channel access Note 5,6 | - | $P_{CCA_DL}$=0.9375 | | | $P_{CCA_DL}$=0.9375 | | |
| UL CCA probability $P_{CCA_UL}$ | - | 1 | | | 1 | | |
| PDSCH RMC configuration | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| RMSI CORESET RMC configuration | | CR.1.1 CCA | | | CR.1.1 CCA | | |
| Dedicated CORESET RMC configuration | | CCR.1.1 CCA | | | CCR.1.1 CCA | | |
| OCNG Pattern | | OP.1 | | | OP.1 | | |
| TRS configuration | | TRS.1.2 TDD | | | N/A | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| $N_{oc}$ Note2 | dBm/SCS | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 7 | -infinity | -infinity | 4 | 4 | 4 |
| SS-RSRP Note3 | dBm/SCS | -88 | -infinity | -infinity | -91 | -91 | -91 |
| Io | dBm/38.16 MHz | -54.65 | -58.50 | -58.50 | -54.65 | -58.50 | -58.50 |
| Propagation Condition | | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{OC}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra-frequency cell with CCA shall be less than 1350 + MAX (200, $(5+K_1)$ x 20) ms.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish_delay_CCA} = T_{UE_re-establish_delay_CCA} + T_{UL_grant}$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay_CCA} = 50 \text{ ms} + T_{identify_intra_NR_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR_CCA,i} + T_{SI-NR_CCA} + T_{PRACH_CCA}$$

Where

$N_{freq} = 1$

$T_{identify_intra_NR_CCA}$ = MAX (200 ms, $(5+K_1)$ x $T_{SMTC}$), where

$K_1$ is the number of SMTC occasions not available at the UE due to DL CCA failures during RRC re-establishment period on the carrier with CCA.

$T_{SMTC}$ = 20 ms is the SMTC periodicity.

$T_{identify_inter_NR_CCA}$ = 0 ms

$T_{SI-NR_CCA}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

$T_{PRACH_CCA} = T_{SSB,RO}$ + 10 ms, where:

- $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [8], which is $T_{SSB,RO}$=10 ms for FR1 PRACH configuration 1 under CCA.

This gives a total of 1350 + MAX (200, $(5+K_1)$ x 20) ms.

### 11.2.2.1.2 NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1

#### 11.2.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay with CCA in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 11.2.2.1.0.1.

#### 11.2.2.1.2.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.2.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.1.2.

#### 11.2.2.1.2.4 Test description

##### 11.2.2.1.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.2.2.1.2.4.1-1

**Table 11.2.2.1.2.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Configuration | Description |
|---|---|
| 11.2.2.1.2-1 | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 11.2.2.1.2.4.1-2

**Table 11.2.2.1.2.4.1-2: Initial conditions for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.2.2.1.2.4.1-3.
2. Message contents are defined in clause 11.2.2.1.2.4.3.

There are two NR carriers and one cell on each carrier both of which are subject to CCA. Cell 1 is the cell used for registration with the power levels set according to Annex C.1.2 and C.1.3 for this test.

**Table 11.2.2.1.2.4.1-3: General test parameters for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial Condition | Active cell | - | Cell1 | Cell 1 is with CCA. |
| | Neighbour cells | - | Cell2 | Cell 2 is with CCA. |
| Final condition | Active cell | - | Cell2 | |

| | | | | |
|---|---|---|---|---|
| RF Channel Number | | - | 1, 2 | |
| DL CCA model | Dynamic channel access Note 1, 3 | - | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2, 3 | - | | |
| UL CCA model | Dynamic channel access Note 1, 3 | - | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2, 3 | - | | |
| Time offset between cells | | - | 3 μs | Synchronous cells |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| SSB configuration | Dynamic channel access Note 1, 3 | - | SSB.2 CCA | Table A.3A.1 |
| | Semi-static channel access Note 2, 3 | - | SSB.1 CCA | Table A.3A.1 |
| DBT window configuration | | - | DBT.1 | Table A.12.1 |
| SMTC configuration | | - | SMTC.1 | |
| DRX cycle length | | s | OFF | |
| PRACH configuration | | - | FR1 PRACH configuration 1 under CCA | Table A.7.1A.1 |
| T1 | | s | 5 | |
| T2 | | ms | 200 | Time for the UE to detect RLF |
| T3 | | s | 2 | |

NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 3: For a UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.

#### 11.2.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 11.2.2.1.2.5-1. The SS shall enable DL and UL CCA model according to Table 11.2.2.1.2.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.2.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within MAX (200 ms, (6+K2,1) x TSMTC, 1) + 1340 ms from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

**Table 11.2.2.1.1.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, and Synchronous cells<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.2.2.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 11.2.2.1.2.4.3-3: *MeasConfig* for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

#### 11.2.2.1.2.5 Message contents

Table 11.2.2.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1 test case.

**Table 11.2.2.1.2.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| DL CCA probability $P_{CCA_DL}$ for dynamic channel access Note 4,6 | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| DL CCA probability $P_{CCA_DL}$ for semi-static channel access Note 5,6 | - | $P_{CCA_DL}$=0.9375 | | | $P_{CCA_DL}$=0.9375 | | |
| UL CCA probability $P_{CCA_UL}$ | - | 1 | | | 1 | | |
| PDSCH RMC configuration | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| RMSI CORESET RMC configuration | | CR.1.1 CCA | | | CR.1.1 CCA | | |
| Dedicated CORESET RMC configuration | | CCR.1.1 CCA | | | CCR.1.1 CCA | | |
| OCNG Pattern | | OP.1 | | | OP.1 | | |
| TRS configuration | | TRS.1.2 TDD | | | N/A | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 7 | -infinity | -infinity | -infinity | -infinity | 4 |
| $N_{oc}$ Note2 | dBm/SCS | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 7 | -infinity | -infinity | -infinity | -infinity | 4 |
| SS-RSRP Note3 | dBm/SCS | -88 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/38.16MHz | -56.15 | -63.94 | -63.94 | -63.94 | -63.94 | -58.49 |
| Propagation Condition | | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.

NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.

NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter-frequency cell shall be less than $T_{re-establish_{delay_{CCA}}}$.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish_{delay_{CCA}}} = T_{UE_{re-establish_{delay_{CCA}}}} + T_{UL_{grant}}$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay_CCA} = 50 \text{ ms} + T_{identify_intra_NR_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR_CCA,i} + T_{SI-NR_CCA} + T_{PRACH_CCA}$$

Where

$T_{identify_intra_NR_CCA}$: 0 ms

$T_{identify_inter_NR_CCA,i}$: MAX (200 ms, (6+K2,i) x TSMTC, i),

where

K2,i is the number of SMTC not available at the UE during RRC re-establishment period on the "i" th carrier with CCA

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*.

$N_{freq}$ = 2

$T_{SI-NR_CCA}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target inter-frequency NR cell.

$T_{PRACH_CCA}$ = (1+ $K_3$)*$T_{SSB,RO}$ + 10 ms, where:

- $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [8].
- $K_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. $K_3$ = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [37].

This gives a total of $T_{re-establish_{delay_{CCA}}}$ = 50 + MAX (200 ms, (6+K2,1) x TSMTC, 1) + 1280 + (1+ $K_3$)*$T_{SSB,RO}$ + 10 ms.

### 11.2.2.1.3 NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing

#### 11.2.2.1.3.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay with CCA in FR1 without serving cell timing is within the specified limits and to verify the requirements in TS 38.133 [6] clause 6.2.1A.

#### 11.2.2.1.3.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.2.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.1.3.

11.2.2.1.3.4 Test description

11.2.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 11.2.2.1.3.4.1-1

**Table 11.2.2.1.3.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing in FR1**

| Configuration | Description |
|---|---|
| 11.2.2.1.3-1 | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 11.2.2.1.3.4.1-2

**Table 11.2.2.1.3.4.1-2: Initial conditions for NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.2.2.1.3.4.1-3.
2. Message contents are defined in clause 11.2.2.1.3.4.3.
3. There is one NR carrier and two cells under CCA specified in the test. Cell 1 is the cell used for registration with the power levels set according to Annex C.1.2 and C.1.3 for this test.

**Table 11.2.2.1.3.4.1-3: General test parameters for NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing in FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial Condition | Active cell | - | Cell 1 | Cell 1 is with CCA. |
| | Neighbour cells | - | Cell 2 | Cell 2 is with CCA. |
| Final condition | Active cell | - | Cell 2 | |
| RF Channel Number | | - | 1 | |
| DL CCA model | Dynamic channel access Note 1,3 | - | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2,3 | - | | |
| UL CCA model | Dynamic channel access Note 1,3 | - | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | - | | |
| $L_{CCA_DL}$ | | | 5 | |
| $W_{CCA_DL}$ | | ms | T311 | |
| $L_{CCA_UL}$ | | | 5 | |
| $W_{CCA_UL}$ | | ms | T311 | |
| Time offset between cells | | - | 3 µs | Synchronous cells |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |

| | | | | |
|---|---|---|---|---|
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| SSB configuration | Dynamic channel access Note 1, 3 | - | SSB.2 CCA | Table A.3A.1 |
| | Semi-static channel access Note 2, 3 | - | SSB.1 CCA | Table A.3A.1 |
| DBT window configuration | | - | DBT.1 | Table A.12.1 |
| SMTC configuration | | - | SMTC.1 | |
| DRX cycle length | | s | OFF | |
| PRACH configuration | | - | FR1 PRACH configuration 1 | Table A.7.1A.1 |
| T1 | | s | 5 | |
| T2 | | ms | 520 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1A in TS 38.133 [6], T310 and the period for UE turns off transmitter) |
| T3 | | s | ≥ $T_{UE_re-establish_delay_CCA}$ | As defined in clause 6.2.1A in TS 38.133 [6] |

NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 3: For a UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.

#### 11.2.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell with CCA, is deactivated. The time period T3 starts after the occurrence of the radio link failure. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 11.2.2.1.3.5-1. The SS shall enable DL and UL CCA model according to Table 11.2.2.1.3.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.2.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1870 + MAX (800 ms, (10+ $K_1$) x 20) ms from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.2.2.1.3.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing in FR1**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, and Synchronous cells<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.2.2.1.3.4.3-2: *RLF-TimersAndConstants for intra-frequency RRC re-establishment***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 11.2.2.1.3.4.3-3: *MeasConfig* for NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing in FR1**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

#### 11.2.2.1.3.5 Test requirement

Table 11.2.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 RRC re-establishment without serving cell timing test case.

**Table 11.2.2.1.3.5-1: Cell specific test parameters for NR SA FR1 RRC re-establishment with CCA without serving cell timing**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| DL CCA probability $P_{CCA_DL}$ for dynamic channel access Note 4,6 | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| DL CCA probability $P_{CCA_DL}$ for semi-static channel access Note 5,6 | - | $P_{CCA_DL}$=0.9375 | | | $P_{CCA_DL}$=0.9375 | | |
| UL CCA probability $P_{CCA_UL}$ | - | 1 | | | 1 | | |
| PDSCH RMC configuration | | SR.1.1 CCA | | | SR.1.1 CCA | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RMSI CORESET RMC configuration | | CR.1.1 CCA | | | CR.1.1 CCA | | |
| Dedicated CORESET RMC configuration | | CCR.1.1 CCA | | | CCR.1.1 CCA | | |
| OCNG Pattern | | OP.1 | | | OP.1 | | |
| TRS configuration | | TRS.1.2 TDD | | | N/A | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| $N_{oc}$ Note2 | dBm/SCS | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| SS-RSRP Note3 | dBm/SCS | -91 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/38.16 MHz | -58.49 | -63.94 | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation Condition | | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{OC}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 5: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to an unknown NR intra-frequency cell without serving cell timing shall be less than 1350 + MAX (800 ms, (10+ $K_1$) x 20) ms.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish_delay_CCA} = T_{UE_re-establish_delay_CCA} + T_{UL_grant}$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay_CCA} = 50 \text{ ms} + T_{identify_intra_NR_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR_CCA,i} + T_{SI-NR_CCA} + T_{PRACH_CCA}$$

Where,

$N_{freq}$ = 1

$T_{identify_intra_NR}$ = MAX (800 ms, (10+ $K_1$) x $T_{SMTC}$), where

$K_1$ is the number of SMTC occasions not available at the UE due to DL CCA failures during RRC re-establishment period on the carrier with CCA.

$T_{SMTC}$ is the SMTC periodicity which is 20ms.

$T_{identify_inter_NR_CCA}$ = 0 ms

$T_{SI\text{-}NR_CCA}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

$T_{PRACH_CCA}$ = (1+ $K_3$)*$T_{SSB,RO}$ + 10 ms, where:

- $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [8]. It is 10 ms for FR1 PRACH configuration 1 under CCA.
- $K_3$ = 0.

This gives total $T_{UE_re-establish_delay_CCA}$=1350 + MAX (800 ms, (10+ $K_1$) x 20) ms, allow 1870 + MAX (800 ms, (10+ $K_1$) x 20) ms from the beginning of T2 in the test case.

### 11.2.2.1.4 NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA

#### 11.2.2.1.4.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay requirement for RRC re-establishment from NR FR1 carrier without CCA to NR FR1 inter-frequency carrier under CCA with unknown target cell. These tests will verify the requirements in clause 11.2.2.1.0.1.

#### 11.2.2.1.4.2 Test applicability

This test applies to all types of NR UE from release 16 and forward, supporting standalone NR-U, RRM measurements, support of MIB and SIB1 acquisition on shared spectrum and UL with a shared spectrum NR carrier.

#### 11.2.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.2.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.1.4.

#### 11.2.2.1.4.4 Test description

##### 11.2.2.1.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 11.2.2.1.4.4.1-1

**Table 11.2.2.1.4.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Configuration | Source cell without CCA | Target cell with CCA |
|---|---|---|
| 11.2.2.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 11.2.2.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 11.2.2.1.4-3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test requirement and the DUT according to the parameters in Table 11.2.2.1.4.4.1-2

**Table 11.2.2.1.4.4.1-2: Initial conditions for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.2.2.1.4.4.1-3.
2. Message contents are defined in clause 11.2.2.1.4.4.3.

The test scenario comprises of 2 cells on 2 different NR carriers where the second carrier is subject to CCA. UE camps on Cell 1 on carrier 1 whichis not subject to CCA and is the cell used for registration with the power levels set according to Annex C.1.2 and C.1.3 for this test.

**Table 11.2.2.1.4.4.1-3: General test parameters for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell1 | |
| | Neighbour cells | | Cell2 | |
| Final condition | Active cell | | Cell2 | |
| RF Channel Number | | | 1, 2 | |
| Time offset between cells | | | 3 μs | Synchronous cells |
| DL CCA model | Dynamic channel access Note 1,3 | - | As specified in clause D.7.2.1 | |
| | Semi-static channel access Note 2,3 | - | | |
| UL CCA model | Dynamic channel access Note 1,3 | - | As specified in clause D.7.2.2 | |
| | Semi-static channel access Note 2,3 | - | | |
| N310 | | - | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 0 | Radio link failure timer; T310 is disabled |
| T311 | | ms | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | OFF | |
| PRACH configuration | | | FR1 PRACH configuration 1 | Table A.7.1A.1 |
| T1 | | s | 5 | |
| T2 | | ms | 480 | Time for the UE to detect RLF |
| T3 | | s | ≥ $T_{UE_re\text{-}establish_delay_CCA}$ | As defined in clause 11.2.2.1.0.1 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | |

#### 11.2.2.1.4.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1. The CCA model (both DL and UL) is disabled on Cell 2 (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 11.2.2.1.4.5-1. The SS shall enable DL and UL CCA model on Cell 2 according to Table 11.2.2.1.4.5-1. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.1.4.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 11.2.2.1.4.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1350+MAX (800 ms, (10+ $K_1$) x 20) ms+MAX (800 ms, ([13]+$K_{2,2}$) x 20) ms from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. The SS shall disable the CCA model on Cell 2 (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.2.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

**Table 11.2.2.1.4.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 11.2.2.1.4-1 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 |
| Specific message contents exceptions for Test Configuration 11.2.2.1.4-2 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells |
| Specific message contents exceptions for Test Configuration 11.2.2.1.4-3 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells |

**Table 11.2.2.1.4.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 11.2.2.1.4.4.3-3: *MeasConfig* for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

### 11.2.2.1.4.5 Message contents

Table 11.2.2.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA test case.

**Table 11.2.2.1.4.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Parameter | | Test config | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | | N/A | | | TDDConf.1.1.CCA | | |
| | | 2 | | TDDConf.1.1 | | | TDDConf.1.1.CCA | | |
| | | 3 | | TDDConf.2.1 | | | TDDConf.1.1.CCA | | |
| PDSCH RMC configuration | | 1 | | SR.1.1 FDD | | | SR.1.1 CCA | | |
| | | 2 | | SR.1.1 TDD | | | SR.1.1 CCA | | |
| | | 3 | | SR.2.1 TDD | | | SR.1.1 CCA | | |
| RMSI CORESET RMC configuration | | 1 | | CR.1.1 FDD | | | CR.1.1 CCA | | |
| | | 2 | | CR.1.1 TDD | | | CR.1.1 CCA | | |
| | | 3 | | CR.2.1 TDD | | | CR.1.1 CCA | | |
| Dedicated CORESET RMC configuration | | 1 | | CCR.1.1 FDD | | | CCR.1.1 CCA | | |
| | | 2 | | CCR.1.1 TDD | | | CCR.1.1 CCA | | |
| | | 3 | | CCR.2.1 TDD | | | CCR.1.1 CCA | | |
| OCNG Pattern | | 1 | | OP.1 | | | OP.1 | | |
| TRS configuration | | 1 | | TRS.1.1 FDD | | | TRS.1.2 TDD | | |
| | | 2 | | TRS.1.1 TDD | | | TRS.1.2 TDD | | |
| | | 3 | | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| SMTC configuration | | 1,2,3 | | SMTC.1 | | | SMTC.1 | | |
| SSB configuration | Semi- static channel acces | 1,2 | | SSB.1 FR1 | | | SSB.1 CCA | | |
| | Semi- static channel acces | 3 | | SSB.2 FR1 | | | SSB.1 CCA | | |
| | Dymamic channel acces | 1,2 | | SSB.1 FR1 | | | SSB.2 CCA | | |
| | Dymamic channel acces | 3 | | SSB.2 FR1 | | | SSB.2 CCA | | |
| Initial DL BWP configuration | | 1,2,3 | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1,2,3 | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | 1,2,3 | | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1,2,3 | | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | 1,2,3 | | N/A | N/A | N/A | 1 | 1 | 0.9375 |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | 1,2,3 | | N/A | N/A | N/A | 1 | 1 | 0.75 |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | 1,2,3 | | N/A | N/A | N/A | 1 | 1 | 0.75 |
| UL CCA probability ($P_{CCA_UL}$) | 1,2,3 | | N/A | N/A | N/A | 1 | 1 | 1 |
| RLM-RS | 1,2,3 | | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | 1,2,3 | dB | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| $N_{oc}$ Note2 | 1,2,3 | dBm/15 kHz | -98 | | | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SCS | -98 | | | | | |
| | 3 | | -95 | | | | | |
| $\hat{E}_s/N_{oc}$ | 1,2,3 | dB | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| SS-RSRP Note3 | 1, 2 | dBm/SCS | -94 | -infinity | -infinity | -infinity | -infinity | -88 |
| | 3 | | -91 | -infinity | -infinity | -infinity | -infinity | -88 |
| Io | 1,2 | dBm/Ch BW | -64.59 | -70. 05 | -70. 05 | -63.94 | -63.94 | -56.15 |
| | 3 | dBm/Ch BW | -58.50 | -63.94 | -63.94 | -63.94 | -63.94 | -56.15 |
| Propagation Condition | 1,2,3 | | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 5: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter-frequency cell shall be less $T_{UE_re-establish_delay_CCA}$.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re-establish_delay_CCA} = T_{UE_re-establish_delay_CCA} + T_{UL_grant}$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay_CCA} = 50\text{ ms} + T_{identify_intra_NR_CCA} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR_CCA,i} + T_{SI-NR_CCA} + T_{PRACH_CCA}$$

$N_{freq}$ = 2

$T_{identify_intra_NR_CCA}$ = MAX (800 ms, (10+ $K_1$) x 20) ms

$T_{identify_inter_NR_CCA}$ = MAX (800 ms, (13+$K_{2,2}$) x 20) ms

$T_{SI-NR_CCA}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target inter-frequency NR cell.

$T_{PRACH_CCA}$ = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{PRACH_CCA}$ = (1+ $K_3$)*$T_{SSB,RO}$ + 10 ms; where $K_3$=0 and $T_{SSB,RO}$=10 ms for FR1 PRACH configuration 1 under CCA.

$K_1$ is the number of SMTC occasions not available at the UE due during RRC re-establishment period on the carrier with CCA and with RF channel number # 1.

$K_{2,2}$ is the number of SMTC occasions not available at the UE during RRC re-establishment period on the carrier with CCA and with RF channel number # 2.

This gives total $T_{UE_re-establish_delay_CCA}$=1350+MAX (800 ms, (10+ $K_1$) x 20) ms+MAX (800 ms, (13+$K_{2,2}$) x 20) ms.

## 11.2.2.2 Random Access

### 11.2.2.2.0 Minimum conformance requirements

#### 11.2.2.2.0.1 Minimum conformance requirements for 4-step RA type

##### 11.2.2.2.0.1.1 Minimum conformance requirements for Contention based random access

The random access procedure is used to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [8] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [12].

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2].

The UE shall indicate a random access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [12].

The UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [12].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [12].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH

occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], if the UL CCA is successful, and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission, if the UL CCA is successful,

If the UL CCA is successful, The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires and the UL CCA is successful, unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

#### 11.2.2.2.0.1.2 Minimum conformance requirements for Non-contention based random access

If the UL CCA is successful on the next available PRACH occasion and if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the UL CCA is successful, and if the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with SSBs configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure again, as specified in clause 5.1.3 in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for random access preamble transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [12].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion if the UL CCA is successful, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.2.

#### 11.2.2.2.0.2 Minimum conformance requirements for 2-step RA type

##### 11.2.2.2.0.2.1 Minimum conformance requirements for Contention based random access

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2]. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2].

The UE shall switch to 4-step RA type procedure if the MsgA transmission counter has exceeded *msgA-TransMax*, if configured, as specified in clause 5.1.4a of TS 38.321 [12]. The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4a in TS 38.321 [12].

The requirements in this clause apply for UE operating in a carrier frequency with CCA in SA operation mode or any MR-DC operation mode, in a carrier frequency with CCA.

With the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, the UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2a in TS 38.321 [12].

If the UL CCA is successful on the next available PRACH occasion, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB*, UE shall have the capability to transmit MsgA PRACH on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the

*msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured.

The PRACH preamble and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, if the UL CCA is successful, the UE shall be able to transmit MsgA PUSCH on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [12]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that PREAMBLE_TRANSMISSION_COUNTER = *msgA-TransMax* + 1.

The UE shall stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If the UL CCA is successful, the UE shall send ACK if Success RAR is received in MsgB and the Contention Resolution is successful, as defined in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, and monitor contention resolution as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power, if the UL CCA is successful on the next available PRACH occasion, when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12], and if the UL CCA is successful, transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion when the backoff time expires unless the Random Access Response reception is considered as successful, as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.3.

#### 11.2.2.2.0.2.2 Minimum conformance requirements for Non-contention based random access

If the UL CCA is successful, if the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *msgA-RSRP-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2a in TS 38.321 [12].

In association with the MsgA PRACH, the UE shall be able to transmit MsgA PUSCH, if the UL CCA is successful, on the corresponding PUSCH occasion associated with a DMRS resource, which is mapped from the MsgA PRACH occasion, and preamble index as defined in clause 8.1A in TS 38.213 [8].

If UE is configured *lbt-FailureRecoveryConfig* and is capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall have cancelled the transmission of the MsgA payload on the associated PUSCH resource and perform the Random Access Resource selection procedure, as specified in clause 5.1.3a in TS 38.321 [12].

If UE is not configured *lbt-FailureRecoveryConfig* or is not capable of *ul-LBT-FailureDetectionRecovery* [13] then upon detecting uplink CCA failure during the random access procedure for MsgA transmission, as outlined in Clause 5.21.2 of TS 38.321 [12], the UE shall cancel the transmission of the MsgA payload on the associated PUSCH resource and increment PREAMBLE_TRANSMISSION_COUNTER by 1. The UE shall again perform the Random Access Resource selection procedure if PREAMBLE_TRANSMISSION_COUNTER < *preambleTransMax* + 1, as specified in clause 5.1.3a in TS 38.321 [12]. If the Random Access Procedure is not complete and the UE is configured with *msgA-TransMax* then, as specified in clause 5.1.3a in TS 38.321 [12], the UE shall perform the Random Access Resource selection procedure with 4-step RA type provided that PREAMBLE_TRANSMISSION_COUNTER = *msgA-TransMax* + 1.

The UE may stop monitoring for MsgB, when the UE has successfully received the PDCCH addressed to UE as specified in clause 8.2A in TS 38.213 [8] containing a successRAR MAC subPDU or a fallbackRAR MAC subPDU as described in clause 5.1.4a in TS 38.321 [12].

If MsgB contains a fallbackRAR MAC subPDU the UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH if the UL CCA is successful, as described in clause 8.2A in TS 38.213 [8].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful, if all received MsgBs contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2a in TS 38.321 [12] for the next available PRACH occasion, and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power if the UL CCA is successful on the next available PRACH occasion, if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA* and the Random Access Response Reception has not been considered as successful as defined in clause 5.1.4a in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2A.3.

### 11.2.2.2.1 NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA

#### 11.2.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 11.2.2.2.0.1 and 38.133 [6] Clause 7.1.2 in an AWGN model.

#### 11.2.2.2.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL in shared channel access.

#### 11.2.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 11.2.2.2.0.1.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.11.2.2.2.1.

#### 11.2.2.2.1.4 Test description

The test consists of a single cell, configured as PCell in an unlicensed FR1 carrier. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

For all tests described in section 11.2.2.2.1, the following three requirements apply:

- The System Simulator shall implement the UL CCA model of D.7.2.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.

- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.

- In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### 11.2.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 11.2.2.2.1.4.1-1.

**Table 11.2.2.2.1.4.1-1: Supported test configurations for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Config | Description |
|---|---|
| 11.2.2.2.1-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: Void | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.2.1.4.1-2.

**Table 11.2.2.2.1.4.1-2: Initial conditions for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.2.1.4.3.

2. For this test a single NR cell is used which is subject to CCA. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. Table 11.3.1.1.5.1-1 defines the Cell specific test parameters to be configured and strength of the transmitted signals.

#### 11.2.2.2.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. When the CCA model is enabled, the following rules apply for all tests:

Rule 1: The UE shall transmit the preamble only if the UL CCA is successful.

Rule 2: The SS shall delay the transmission of Random Access Response if the DL CCA is not successful.

Rule 3: The UE shall transmit msg3 only if the UL CCA is successful.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 11.2.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test. The SS shall enable DL and UL CCA model according to Table 11.2.2.2.1.5-1.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

   4.2. Measure the power and timing of the first preamble and it shall not exceed the values specified in 11.2.2.2.1.5.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 11.2.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 11.2.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 11.2.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 11.2.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

   7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

#### 11.2.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.2.2.1.4.3-1: Common Exception messages for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.2.2.2.1.4.3-2: *FrequencyInfoUL-SIB* for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |
| } | | | |

**Table 11.2.2.2.1.4.3-3: RACH-ConfigCommon for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_51 | RSRP = -105dBm | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz30 | | |
| } | | | |

**Table 11.2.2.2.1.4.3-4: RACH-ConfigGeneric for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -114 | | |
| preambleTransMax | n20 | | |

| | | | |
|---|---|---|---|
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl20 | | |
| } | | | |

**Table 11.2.2.2.1.4.3-5: *ServingCellConfigCommonSIB* for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

11.2.2.2.1.5 Test requirement

Table 11.2.2.2.1.5-1 defines the primary level settings for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA.

**Table 11.2.2.2.1.5-1: General test parameters for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1 | | SSB.3 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1 | | SSB.4 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 1 | | Config 1 | | TDD | |
| TDD Configuration | | Config 1 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1. |
| PDSCH parameters Note 3 | | Config 1 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |

| | | | | |
|---|---|---|---|---|
| Io Note 2 | Config 1 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | FR1 PRACH configuration 1 under CCA | As defined in A.7.1A.1. |
| DL CCA probability | Note 4, 6 | | 0.9375 | |
| $P_{CCA_DL}$ | Note 5, 6 | | 0.75 / 0.75 | |
| $L_{CCA_DL}$ Note 7 | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | Inf | |
| UL CCA probability | Note 4, 6 | | 0.87 | |
| $P_{CCA_UL}$ | Note 5, 6 | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | ms | 2 | |
| Propagation Condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.

Note 7: $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$.

Note 8: A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run.

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 11.2.2.2.1.5-4.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.

**Table 11.2.2.2.1.5-2 Absolute power tolerance Test requirements for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.1.5-3 Relative power tolerance Test requirements for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 11.2.2.2.1.5-4: $T_e$ Timing error Test requirements for NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 11.2.2.2.2 NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA

### 11.2.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 11.2.2.2.0.1 and 38.133 [6] Clause 7.1.2 in an AWGN model.

### 11.2.2.2.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL in shared channel access.

### 11.2.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 11.2.2.2.0.1.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.11.2.2.2.2.

### 11.2.2.2.2.4 Test description

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

For all tests described in section 11.2.2.2.2, the following three requirements apply:

- The System Simulator shall implement the UL CCA model of D.7.2.2 for the RACH occasions where PRACH transmissions are expected. The System Simulator shall monitor the RACH occasions to detect if the UE is transmitting PRACH preambles. If a PRACH transmission is detected on a RACH occasion that is expected to have UL CCA failure, the test is considered as failed.

- In case of CCA DL failure, the test equipment should verify that the UE does not transmit PRACH for semi-static channel access mode; for dynamic channel access mode it is assumed that RACH occasions are always scheduled within a UE-initiated COT.

- In case of UL CCA failure, The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

Non-contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### 11.2.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 11.2.2.2.2.4.1-1.

**Table 11.2.2.2.2.4.1-1: Supported test configurations for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Config | Description |
|---|---|
| 11.2.2.2.2-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: Void | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.2.2.4.1-2.

**Table 11.2.2.2.2.4.1-2: Initial conditions for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.2.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.2.2.4.3.

2. For this test a single NR cell is used which is subject to CCA. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. Table 11.3.1.1.5.1-1 defines the Cell specific test parameters to be configured and strength of the transmitted signals.

#### 11.2.2.2.2.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. When the CCA model is enabled, the following rules apply for all tests:

Rule 1: The UE shall transmit the preamble only if the UL CCA is successful.

Rule 2: The SS shall delay the transmission of Random Access Response if the DL CCA is not successful.

Rule 3: The UE shall transmit msg3 only if the UL CCA is successful.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 11.2.2.2.2.5-1.

3. The SS shall signal a Random Access Preamble ID via a *RRCReconfiguration* message to the UE and initiate a Non-contention based Random Access procedure according to Table 11.2.2.2.2.4.3-3 and Table 11.2.2.2.2.4.3-4. The SS shall enable DL and UL CCA model according to Table 11.2.2.2.2.5-1.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

   4.2. Measure the power and timing of the first preamble and it shall not exceed the values specified in 11.2.2.2.2.5.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 11.2.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 11.2.2.2.2.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

11.2.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 11.2.2.2.2.4.3-1: Common Exception messages for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.2.2.2.2.4.3-2: *FrequencyInfoUL-SIB* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |
| } | | | |

**Table 11.2.2.2.2.4.3-3: *RACH-ConfigCommon* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | RSRP = -105dBm | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz30 | | |
| } | | | |

**Table 11.2.2.2.2.4.3-4: *CellGroupConfig* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicted | | | |
| uplink | RACH-ConfigDedicated for Non-contention Based Random Access | Table 11.2.2.2.2.4.3-5 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 11.2.2.2.2.4.3-5: *RACH-ConfigDedicated* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.2.2.2.2.4.3-6: *RACH-ConfigGeneric* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -114 | | |
| preambleTransMax | n20 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl20 | | |
| } | | | |

**Table 11.2.2.2.2.4.3-7: *ServingCellConfigCommon* for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '0011 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

11.2.2.2.2.5 Test requirement

Table 11.2.2.2.2.5-1 defines the primary level settings for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA.

**Table 11.2.2.2.2.5-1: General test parameters for NR SA FR1 4-step RA type non-contention based random access for NR PCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1 | | SSB.3 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1 | | SSB.4 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1 | | TDD | |
| TDD Configuration | | Config 1 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1. |
| PDSCH parameters Note 3 | | Config 1 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,\ f,\ c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | FR1 PRACH configuration 2 under CCA | As defined in A.7.1A.2. |
| DL CCA probability $P_{CCA_DL}$ | Note 4, 6 | | | 0.9375 | |
| | Note 5, 6 | | | 0.75 / 0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability $P_{CCA_UL}$ | Note 4, 6 | | | 0.87 | |
| | Note 5, 6 | | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. |
| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration. |
| Note 7: | $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$. |
| Note 8: | A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run. |

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.2.5-2.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.2.5-4.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.2.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.2.5-4.

**Table 11.2.2.2.2.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.2.5-3 Relative power tolerance Test requirements**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 3.2 |

**Table 11.2.2.2.2.5-4: $T_e$ Timing error Test requirements**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 11.2.2.2.3 NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA

### 11.2.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 11.2.2.2.0.2 and 38.133 [6] Clause 7.1.2 in an AWGN model.

### 11.2.2.2.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, supporting RRM measurements and UL in shared channel access, and supporting twoStepRACH-r16.

### 11.2.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 11.2.2.2.0.2.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.11.2.2.2.3.

### 11.2.2.2.3.4 Test description

The test consists of a single cell, configured as PCell in an unlicensed FR1 carrier. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

For all tests described in section 11.2.2.2.3, the following three requirements apply:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.

- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.

- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [12], and transmit with the calculated MsgA transmission power in case of UL CCA failure.

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### 11.2.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 11.2.2.2.3.4.1-1.

**Table 11.2.2.2.3.4.1-1: Supported test configurations for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Config | Description |
|---|---|
| 11.2.2.2.3-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: Void | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.2.3.4.1-2.

**Table 11.2.2.2.3.4.1-2: Initial conditions for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.2.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.2.3.4.3.

2. For this test a single NR cell is used which is subject to CCA. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. Table 11.3.1.1.5.1-1 defines the Cell specific test parameters to be configured and strength of the transmitted signals.

### 11.2.2.2.3.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. When the CCA model is enabled, the following rules apply for all tests:

Rule 1: The UE shall transmit the MsgA only if the UL CCA is successful.

Rule 2: The SS shall delay the transmission of MsgB if the DL CCA is not successful.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 11.2.2.2.3.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test. The SS shall enable DL and UL CCA model according to Table 11.2.2.2.3.5-1.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB_RP above the configured *msgA-RSRP-ThresholdSSB.*

   4.2 Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in 11.2.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send MsgA preambles to the System Simulator. In response to the first 4 MsgA preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in clause 11.2.2.2.3.5. Measure the relative power and timing applied to additional MsgA preambles (last 4 preambles) and they shall not exceed the values specified in clause 11.2.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6 Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in clause 11.2.2.2.3.5. Measure the relative power and timing applied to additional MsgA preambles (last 4 preambles) and they shall not exceed the values specified in clause 11.2.2.2.3.5.

#### 11.2.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 11.2.2.2.3.4.3-1: Common Exception messages for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-81A |

**Table 11.2.2.2.3.4.3-2: *RACH-ConfigCommonTwoStepRA* for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE { | | | |
| oneFourth | n48 | | |
| } | | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | 0 | | |
| msgA-TransMax-r16 | n20 | | |
| msgA-SubcarrierSpacing-r16 | Same as UL carrier SCS | | |

| | | | |
|---|---|---|---|
| ra-ContentionResolutionTimer-r16 | sf48 | | |
| } | | | |

**Table 11.2.2.2.3.4.3-3: *RACH-ConfigGenericTwoStepRA* for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 102 | | |
| msgA-RO-FDM-r16 | One | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -114 | | |
| msgB-ResponseWindow-r16 | sl20 | | |
| preambleTransMax-r16 | n20 | | |
| } | | | |

**Table 11.2.2.2.3.4.3-4: *ServingCellConfigCommonSIB* for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 11.2.2.2.3.5 Test requirement

Table 11.2.2.2.3.5-1 defines the primary level settings for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA.

**Table 11.2.2.2.3.5-1: General test parameters for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1 | | SSB.3 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1 | | SSB.4 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 2 | | Config 1 | | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 3 | | Config 1 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |

| | | | | | |
|---|---|---|---|---|---|
| SSB with index 0 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 1 under CCA | As defined in A.7A.1A.1. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| DL CCA probability | Note 4, 6 | | | 0.9375 | |
| $P_{CCA_DL}$ | Note 5, 6 | | | 0.75 / 0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability | Note 4, 6 | | | 0.87 | |
| $P_{CCA_UL}$ | Note 5, 6 | | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.

Note 7: $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$.

Note 8: A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run.

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.3.5-2.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.3.5-2A.

**Table 11.2.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.3.5-3: Relative power tolerance Test requirements for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| $2 \leq \Delta P < 3$ | ± 3.2 dB |

**Table 11.2.2.2.3.5-4: $T_e$ Timing error Test requirements for NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 11.2.2.2.4 NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA

### 11.2.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits when subject to CCA. This test will verify the requirements in Clause 11.2.2.2.0.2 and 38.133 [6] Clause 7.1.2 in an AWGN model.

#### 11.2.2.2.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, supporting RRM measurements and UL in shared channel access, and supporting twoStepRACH-r16.

#### 11.2.2.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 11.2.2.2.0.2.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.11.2.2.2.4.

#### 11.2.2.2.4.4 Test description

The test consists of a single cell, configured as PCell in an unlicensed FR1 carrier. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

For all tests described in section 11.2.2.2.4, the following three requirements apply:

- The System Simulator shall implement the UL CCA model for the MsgA occasions (i.e. both MsgA PRACH and MsgA PUSCH occasions) where MsgA transmissions are expected. The System Simulator shall monitor the MsgA occasions to detect if the UE is transmitting MsgA. If a MsgA transmission is detected on MsgA occasions that are expected to have UL CCA failure, the test is considered as failed.

- In case of CCA DL failure, the test equipment should verify that the UE does not transmit MsgA for semi-static channel access mode; for dynamic channel access mode it is assumed that MsgA occasions are always scheduled within a UE-initiated COT.

- The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA transmission power in case of UL CCA failure.

Non-contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

##### 11.2.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 11.2.2.2.4.4.1-1.

**Table 11.2.2.2.4.4.1-1: Supported test configurations for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Config | Description |
|---|---|
| 11.2.2.2.4-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: Void | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.2.4.4.1-2.

**Table 11.2.2.2.4.4.1-2: Initial conditions for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.2.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.2.4.4.3.

2. For this test a single NR cell is used which is subject to CCA. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. Table 11.3.1.1.5.1-1 defines the Cell specific test parameters to be configured and strength of the transmitted signals.

#### 11.2.2.2.4.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. When the CCA model is enabled, the following rules apply for all tests:

Rule 1: The UE shall transmit the MsgA only if the UL CCA is successful.

Rule 2: The SS shall delay the transmission of MsgB if the DL CCA is not successful.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 11.2.2.2.4.5-1.

3. The SS shall signal a Random Access Preamble ID via a *RRCReconfiguration* message to the UE and initiate a Non-contention based Random Access procedure according to Table 11.2.2.2.4.4.3-3 and Table 11.2.2.2.4.4.3-4. The SS shall enable DL and UL CCA model according to Table 11.2.2.2.4.5-1.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in 11.2.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send MsgA preambles to the System Simulator. In response to the first 4 MsgA preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   5.6. Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in clause 11.2.2.2.4.5. Measure the relative power and timing applied to additional MsgA preambles (last 4 preambles) and they shall not exceed the values specified in clause 11.2.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send MsgA preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6 Measure the power and timing of the first MsgA preamble and it shall not exceed the values specified in clause 11.2.2.2.4.5. Measure the relative power and timing applied to additional MsgA preambles (last 4 preambles) and they shall not exceed the values specified in clause 11.2.2.2.4.5.

#### 11.2.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

**Table 11.2.2.2.4.4.3-1: Common Exception messages for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-81A |

**Table 11.2.2.2.4.4.3-2: *RACH-ConfigCommonTwoStepRA* for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-128A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| msgA-TotalNumberOfRA-Preambles-r16 | 48 | | |
| msgA-PRACH-RootSequenceIndex-r16 CHOICE {} | 0 | | |
| msgA-TransMax-r16 | n20 | | |
| msgA-SubcarrierSpacing-r16 | Same as UL carrier SCS | | |
| ra-ContentionResolutionTimer-r16 | sf48 | | |
| } | | | |

**Table 11.2.2.2.4.4.3-3: *CellGroupConfig* for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicted | | | |
| uplink | RACH-ConfigDedicated for Non-contention Based Random Access | Table 11.2.2.2.4.4.3-4 | |

| | | | |
|---|---|---|---|
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.2.2.2.4.4.3-4: *RACH-ConfigDedicated* for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated ::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF CFRA-SSB-Resource { | 1 entry | | |
| CFRA-SSB-Resource[1] SEQUENCE { | | entry 1 | |
| ssb | SSB-Index | | |
| ra-PreambleIndex | 40 | | |
| } | | | |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| cfra-TwoStep-r16 SEQUENCE { | | | 2-step RA |
| occasionsTwoStepRA-r16 SEQUENCE { | | | |
| rach-ConfigGenericTwoStepRA-r16 | RACH-ConfigGenericTwoStepRA | | |
| ssb-PerRACH-OccasionTwoStepRA-r16 | oneFourth | | |
| } | | | |
| msgA-CFRA-PUSCH-r16 SEQUENCE { | | | |
| msgA-MCS-r16 | 1 | | |
| nrofSlotsMsgA-PUSCH-r16 | 1 | | |
| nrofMsgA-PO-PerSlot-r16 | one | | |
| msgA-PUSCH-TimeDomainOffset-r16 | 1 | | |
| nrofPRBs-PerMsgA-PO-r16 | 2 | | |
| nrofMsgA-PO-FDM-r16 | one | | |
| msgA-DMRS-Config-r16 SEQUENCE { | | | |
| msgA-DMRS-AdditionalPosition-r16 | Pos1 | | |
| msgA-PUSCH-NrofPorts-r16 | 1 | | |
| } | | | |
| msgA-Alpha-r16 | alpha1 | | |
| } | | | |
| resourcesTwoStep-r16 SEQUENCE { | | | |
| } | | | |
| } | | | |

**Table 11.2.2.2.4.4.3-5: *RACH-ConfigGenericTwoStepRA* for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14],Table 4.6.3-130A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE { | | | |
| msgA-PRACH-ConfigurationIndex-r16 | 102 | | |
| msgA-RO-FDM-r16 | One | | |
| msgA-ZeroCorrelationZoneConfig-r16 | 11 | | |
| msgA-PreamblePowerRampingStep-r16 | dB2 | | |
| msgA-PreambleReceivedTargetPower-r16 | -114 | | |
| msgB-ResponseWindow-r16 | sl20 | | |
| preambleTransMax-r16 | n20 | | |
| } | | | |

**Table 11.2.2.2.4.4.3-6: *ServingCellConfigCommon* for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '0011 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

11.2.2.2.4.5 Test requirement

Table 11.2.2.2.4.5-1 defines the primary level settings for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA.

**Table 11.2.2.2.4.5-1: General test parameters for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Parameter | | | Unit | Value | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Note 4, 6 | Config 1 | | SSB.3 CCA | As defined in A.3A.1 |
| | Note 5, 6 | Config 1 | | SSB.4 CCA | As defined in A.3A.1 |
| DBT Window Configuration | | Config 1 | | DBT.1 | As specified in A.12.1 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | |
| Duplex Mode for Cell 1 | | Config 1 | | TDD | |
| TDD Configuration | | Config 1 | | TDDConf.1.1 CCA | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 3 | | Config 1 | | SR.1.1 CCA | As defined in A.1A.1.1 |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | |
| msgA-*RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |

| | | | | | |
|---|---|---|---|---|---|
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured msgA-*RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured msgA-*RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15kHz | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1 | dBm/38.16MHz | -62.18 | For symbols without SSB index 1 |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,\ f,\ c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | FR1 MsgA configuration 2 under CCA | As defined in A.7A.1A.2. |
| DL CCA probability | | Note 4, 6 | | 0.9375 | |
| $P_{CCA_DL}$ | | Note 5, 6 | | 0.75 / 0.75 | |
| $L_{CCA_DL}$ Note 7 | | | | 4 | |
| $W_{CCA_DL}$ Note 8 | | | | Inf | |
| UL CCA probability | | Note 4, 6 | | 0.87 | |
| $P_{CCA_UL}$ | | Note 5, 6 | | 0.75 | |
| $L_{CCA_UL}$ Note 7 | | | | 5 | |
| $W_{CCA_UL}$ Note 8 | | | | Inf | |
| Semi-static channel access config period Note 4, 6 | | | ms | 2 | |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic channel occupancy and semi-static channel occupancy configuration.

Note 7: $L_{CCA_DL}$ and $L_{CCA_UL}$ are chosen such that preambleTransMax > 5 + $L_{CCA_DL}$ + $L_{CCA_UL}$.

Note 8: A window $W_{CCA_DL}$=$W_{CCA_UL}$=Inf is used to indicate that $L_{CCA_DL}$ and $L_{CCA_UL}$ are considered during the entire duration of a test run.

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.4.5-2.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.4.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -16 dBm within the accuracy specified in Table 11.2.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 11.2.2.2.4.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 11.2.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 9.6 dBm (= 0.6+3(μ=1+2))dBm and with accuracy specified in Table 11.2.2.2.4.5-2A.

**Table 11.2.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 19.1 dB |

**Table 11.2.2.2.4.5-3: Relative power tolerance Test requirements for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Power step ΔP (Up or down) (dB) | MsgA PRACH (dB) |
|---|---|
| $2 \leq \Delta P < 3$ | ± 3.2 dB |

**Table 11.2.2.2.4.5-4: $T_e$ Timing error Test requirements for NR SA FR1 2-step RA type non-contention based random access for NR PCell with CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 30 | $624*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

## 11.2.2.3 RRC connection release with redirection

### 11.2.2.3.0 Minimum conformance requirements

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell subject to CCA within $T_{connection_release_redirect_NR_CCA}$.

The time delay ($T_{connection_release_redirect_NR_CCA}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR_CCA}$) shall be less than:

$$T_{connection_release_redirect_NR_CCA} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_CCA} + T_{SI\text{-}NR_CCA} + T_{RACH_CCA}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- the conditions of SSB_RP and SSB Ês/Iot as defined in Annex B.2.5 of TS 38.133 for a corresponding NR band are fulfilled.

- $T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

- $T_{identify\text{-}NR_CCA}$: It is the time to identify the target NR cell and is defined as:

- $T_{identify\text{-}NR_CCA} = T_{PSS/SSS\text{-}sync} + T_{meas}$; $T_{PSS/SSS\text{-}sync}$ is the cell search time and $T_{meas}$ is the measurement time due to cell selection criteria evaluation.

- For FR1 target NR cell: $T_{identify\text{-}NR_CCA} = MAX\ (680\ ms, (L_1+11) \times T_{rs})$;

  - where $L_1$ is the number of SMTC occasions not available at the UE due to DL CCA failures and $L_1'$ is the number of SMTC occasion groups not available at the UE due to DL CCA failures. An SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. N is equal to 12. If $L_1 > L_{1,max}$ or $L_1' > L_{1,max}$ then the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [30]; where $L_{1,max}$ is defined in Table 11.2.2.3.0-1.

- $T_{SI\text{-}NR_CCA}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

- $T_{RACH_CCA}$: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell:

- $T_{RACH_CCA} = (1+L_2) \times T_{SSB,RO} + 10$ ms; where:

  - $L_2$ is the consecutive number of SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures. $L_2 = 0$ for Type 2C UL channel access procedure as defined in TS 37.213 [37]. $L_3 = 0$ if *ra-ChannelAccess-r17* is not configured in FR2-2.

  - $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in the table 8.1-1 of TS 38.213 [8].

  - The value of L2 is limited by *PREAMBLE_TRANSMISSION_COUNTER*, which is increased when PRACH occasion is unavailable for PRACH transmission due to UL CCA failure as specified in TS 38.321 [12]. The UE behaviour when *PREAMBLE_TRANSMISSION_COUNTER* reaches the *preambleTransMax* is specified in TS 38.321 [12].

- $T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with $T_{rs} = 20$ ms if the SSB transmission periodicity is not larger than 20 ms;

- otherwise, there is no requirement if the SSB transmission periodicity is larger than 20ms.

**Table 11.2.2.3.0-1: Maximum allowed number of missed SMTC occasions during cell identification**

| SMTC periodicity ($T_{rs}$) | Maximum allowed number of missed SMTC occasions ($L_{1,max}$) |
|---|---|
| $T_{rs} \leq 40$ | 8 |
| $T_{rs} > 40$ | 4 |

The normative reference for this requirement is TS 38.133 [6] clause 6.2.3.2.3.

## 11.2.2.3.1 NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA

### 11.2.2.3.1.1 Test purpose

The purpose of this test is to verify that UE shall perform RRC connection release with redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA within limits.

### 11.2.2.3.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U.

### 11.2.2.3.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.2.2.3.0

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.3.1.

### 11.2.2.3.1.4 Test description

#### 11.2.2.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.2.2.3.1.4.1-1.

**Table 11.2.2.3.1.4.1-1: Redirection from NR to NR test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.3.1.4.1-2.

**Table 11.2.2.3.1.4.1-2: NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.3.1.4.3.
2. There is one NR carrier and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.
3. The test parameters are given in Table 11.2.2.3.1.4.1-3.

**Table 11.2.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | On the carrier under CCA |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| Filter coefficient | | | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause A.3.26.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause A.3.26.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| T1 | | s | 5 | |
| T2 | | s | ≥ $T_{connection_release_redirect_NR_CCA}$ | $T_{connection_release_redirect_NR_CCA}$ is defined in clause 6.2.3.2.3 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

#### 11.2.2.3.1.4.2 Test Procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the beginning of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell
2. Set the parameters to T1 and enable the CCA model according to Table 11.2.2.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 in less than $T_{connection_release_redirect_NR_CCA}$ ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. Repeat steps 2-7 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.2.2.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.2.2.3.1.4.3-1: Common exceptions for NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.2.2.3.1.4.3-2: RRCRelease for NR RRC redirection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR | Frequency of Cell 2 | |
| ssbSubcarrierSpacing | kHz30 | | |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

11.2.2.3.1.5 Test Requirement

Table 11.2.2.3.1.5-1 defines the cell-specific test parameters for redirection from NR to NR test case.

**Table 11.2.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case**

| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | | 1 | | 2 | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | - | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | - | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | - | 1 | | 1 | |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | - | 1 | | 1 | |
| $L_{CCA_DL}$ Note 7 | | | N/A | | 8 | |
| $W_{CCA_DL}$ Note 7 | | ms | N/A | | $T_{identify-NR_CCA}$ | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference | Config 1 | | SR.1.1 CCA | | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 CCA | | | |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.1.1 CCA | | | |
| TRS configuration | Config 1 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| DBT configuration | | | DBT.1 | | | |
| SSB configuration for semi-static channel access Note 4, 6 | Config 1 | | SSB.1 CCA | | | |
| SSB configuration for dynamic channel access Note 5, 6 | Config 1 | | SSB.2 CCA | | | |
| ssb-PositionQCL | Config 1 | | [1] | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
Note 7: As defined in clause 6.2.3.2.3 for $T_{rs} \leq 40$ ms.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{connection_release_redirect_NR_CCA}$ ms from the beginning of time period T2, where $T_{connection_release_redirect_NR_CCA}$ is defined in clause 11.2.2.3.0.
The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR_CCA} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_CCA} + T_{SI\text{-}NR_CCA} + T_{RACH_CCA},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR_CCA}$ = 680 ms in the test.

$T_{SI\text{-}NR_CCA}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{RACH_CCA}$ = 20 ms in the test.

The total delay, $T_{connection_release_redirect_NR_CCA}$, shall be less than 2090 ms, allowing 2.2 s in the test case.

## 11.2.2.3.2 NR SA FR1 Redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA

### 11.2.2.3.2.1 Test purpose

The purpose of this test is to verify that UE shall perform RRC connection release with redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA within limits.

### 11.2.2.3.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U.

### 11.2.2.3.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.2.2.3.0

The normative reference for this requirement is TS 38.133 [6] clause A.11.2.2.3.2.

### 11.2.2.3.2.4 Test description

#### 11.2.2.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.2.2.3.2.4.1-1.

**Table 11.2.2.3.2.4.1-1: Redirection from NR to NR test configurations**

| Configuration | Source cell without CCA | Target cell with CCA |
|---|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD | 30 kHz SSB SCS, 40 MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test equipment and the DUT according to the parameters in Table 11.2.2.3.2.4.1-2.

**Table 11.2.2.3.2.4.1-2: NR SA FR1 Redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.2.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.2.2.3.2.4.3
2. There is one NR carrier and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.3. The test parameters are given in Table 11.2.2.3.2.4.1-3.

**Table 11.2.2.3.2.4.1-3: General test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | On the carrier without CCA |
| | Neighbouring cell | | Cell 2 | On the carrier under CCA |
| Final condition | Active cell | | Cell 2 | On the carrier under CCA |
| Filter coefficient | | | 0 | L3 filtering is not used |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| DL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause A.3.26.2.1 | |
| | Semi-static channel access Note 2, 3 | | | |
| UL CCA model | Dynamic channel access Note 1, 3 | | As specified in clause A.3.26.2.2 | |
| | Semi-static channel access Note 2,3 | | | |
| T1 | | s | 5 | |
| T2 | | s | ≥ $T_{connection_release_redirect_NR_CCA}$ | $T_{connection_release_redirect_NR_CCA}$ is defined in clause 6.2.3.2.3 |
| NOTE 1: For a UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 2: For a UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

### 11.2.2.3.2.4.2 Test Procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the beginning of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters to T1 and enable the CCA model according to Table 11.2.2.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 11.2.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 in less than $T_{connection_release_redirect_NR_CCA}$ ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. Repeat steps 2-7 until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.2.2.3.2.4.3 Message Contents

Same as 11.2.2.3.1.4.3 with the following exceptions:

**Table 11.2.2.3.2.4.3-1: RRCRelease for NR RRC redirection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR | Frequency of Cell 2 | |

| | | | | |
|---|---|---|---|---|
| ssbSubcarrierSpacing | kHz30 | | | |
| smtc SEQUENCE { | sf1 | | | SMTC.1 |
| duration | sf5 | | | SMTC.2 |
| | | | | |
| } | | | | |
| } | | | | |
| } | | | | |
| } | | | | |
| } | | | | |
| } | | | | |

11.2.2.3.2.5 Test Requirement

Table 11.2.2.3.2.5-1 defines the cell-specific test parameters for redirection from NR to NR test case.

**Table 11.2.2.3.2.5-1: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter | | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | | 1 | | 2 | |
| $P_{CCA_DL}$ for dynamic channel access Note 4,6 | | | | N/A | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| $P_{CCA_DL}$ for semi-static channel access Note 5,6 | | | | N/A | | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ for dynamic channel access Note 4,6 | | | | N/A | | 1 | 1 |
| $P_{CCA_UL}$ for semi-static channel access Note 5,6 | | | | N/A | | 1 | 1 |
| $L_{CCA_DL}$ Note 7 | | | | N/A | | 8 | |
| $W_{CCA_DL}$ Note 7 | | | ms | N/A | | $T_{identify\text{-}NR_CCA}$ | |
| Duplex mode | | Config 1 | | FDD | | TDD | |
| | | Config 2,3 | | TDD | | | |
| TDD configuration | | Config 1 | | Not Applicable | | TDDConf.1.1 CCA | |
| | | Config 2 | | TDDConf.1.1 | | TDDConf.1.1 CCA | |
| | | Config 3 | | TDDConf.2.1 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | Config 2 | | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | Config 2 | | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | |
| | | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD | | SR.1.1 CCA | |
| | | Config 2 | | SR.1.1 TDD | | SR.1.1 CCA | |
| | | Config 3 | | SR2.1 TDD | | SR.1.1 CCA | |
| RMSI CORESET RMC configuration | | Config 1 | | CR.1.1 FDD | | CR.1.1 CCA | |
| | | Config 2 | | CR.1.1 TDD | | CR.1.1 CCA | |
| | | Config 3 | | CR.2.1 TDD | | CR.1.1 CCA | |
| Dedicated CORESET RMC configuration | | Config 1 | | CCR.1.1 FDD | | CCR.1.1 CCA | |
| | | Config 2 | | CCR.1.1 TDD | | CCR.1.1 CCA | |
| | | Config 3 | | CCR.2.1 TDD | | CCR.1.1 CCA | |
| OCNG Patterns | | | | OP.1 | | | |
| SSB Configuration | Semi-static channel acces | Config 1,2 | | SSB.1 FR1 | | SSB.1 CCA | |
| | Dymamic channel acces | Config 3 | | SSB.2 FR1 | | SSB.2 CCA | |
| | Semi-static channel acces | Config 1,2 | | SSB.1 FR1 | | SSB.1 CCA | |
| | Dymamic channel acces | Config 3 | | SSB.2 FR1 | | SSB.2 CCA | |
| SMTC configuration | | Config 1,2 | | SMTC.1 FR1 | | SMTC.2 FR1 | |
| | | Config 3 | | SMTC.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | 30 kHz | |
| | | Config 3 | | 30 kHz | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | 30 kHz | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 under CCA in Table A.3.8A.2.1-1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -95 | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io Note3 | Config 1,2 | dBm/9.36 MHz | -64.59 | -64.59 | N/A | N/A |
| | | dBm/38.16 MHz | N/A | N/A | -63.94 | -58.49 |
| | Config 3 | dBm/38.16 MHz | -58.49 | -58.49 | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
Note 7: As defined in clause 6.2.3.2.3 for $T_{rs} \leq 40$ ms.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{connection_release_redirect_NR_CCA}$ ms from the beginning of time period T2, where $T_{connection_release_redirect_NR_CCA}$ is defined in clause 11.2.2.3.0.
The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR_CCA} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_CCA} + T_{SI\text{-}NR_CCA} + T_{RACH_CCA},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR_CCA}$ = 680 ms in the test.

$T_{SI\text{-}NR_CCA}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

$T_{RACH_CCA}$ = 20 ms in the test.

The total delay, $T_{connection_release_redirect_NR_CCA}$, shall be less than 2090 ms, allowing 2.2 s in the test case. .

# 11.3 Timing

## 11.3.1 UE transmit timing

### 11.3.1.0 Minimum conformance requirements

#### 11.3.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

Same as section 4.4.1.0.1 with the following additional considerations:

The term reference cell on a carrier frequency subject to CCA is not available at the UE refers to when at least one SSB is configured by gNB, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available during at least one discovery burst transmission window, at the UE due to DL CCA failures at gNB during the last 1280 ms; otherwise the reference cell on the carrier frequency subject to CCA is considered as available at the UE.

If the UE uses a reference cell on a carrier frequency subject to CCA for deriving the UE transmit timing, then the UE shall meet all the transmit timing requirements defined in TS 38.133 [6] clause 7.1.2 provided that the reference cell is available at the UE. If the reference cell is not available at the UE on a carrier frequency subject to CCA, then the UE is allowed to transmit in the uplink provided that the UE meets all the transmit timing requirements defined in TS 38.133 [6] clause 7.1.2; otherwise the UE shall not transmit any uplink signal.

If a reference cell on a carrier frequency belonging to the pTAG, which is subject to CCA, is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in pTAG as a new reference cell. If the SCell used as reference cell is deactivated, or becomes not available, the UE is allowed to use another active serving cell in pTAG as new reference cell.

If a reference cell on a carrier frequency belonging to the sTAG, which is subject to CCA is not available at the UE then the UE is allowed to use any of available activated SCell(s) at the UE in sTAG as a new reference cell.

The normative reference for this requirement is TS 38.133 [6] clause 7.1.2.

### 11.3.1.1 NR SA FR1 UE Transmit Timing Test with PCell under DL CCA

#### 11.3.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB when PSCell is subject to DL CCA and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1.2.

#### 11.3.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U with a UL shared spectrum NR carrier.

#### 11.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.3.1.1.

#### 11.3.1.1.4 Test Description

##### 11.3.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 11.3.1.1.4.1-1.

**Table 11.3.1.1.4.1-1: Supported test configurations for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Configuration | Description |
|---|---|
| 11.3.1.1.4.1-1 | With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.3.1.1.4.1-2

**Table 11.3.1.1.4.1-2: Initial conditions for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.3.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.3.1.1.4.3.

2. For this test a single NR cell is used which is subject to DL CCA. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2. Table 11.3.1.1.5.1-1 defines the Cell specific test parameters to be configured and strength of the transmitted signals.

### 11.3.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell) subject to CCA which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table 11.3.1.1.5.1-2, used as a measurement reference facilitating the SS timing estimation. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

The test sequence shall be carried out in RRC_CONNECTED for every test case.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set up NR Cell according to parameters given in Table 11.3.1.1.5-1.

3. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE with the message content defined in clause 11.3.1.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.3.1.1.5-1

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within ($N_{TA}$ + $N_{TA_offset}$) $\times T_c \pm T_e$ of the first detected path of DL SSB:

   a. The $N_{TA}$ offset value (in $T_c$ units) is 25600 for FR1.

   b. The $T_e$ values depend on the DL and UL SCS for which the test is being run and are given in Table 11.3.1.1.5-4.

6. The test system shall adjust the timing of the DL path by values given in Table 11.3.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

**Table 11.3.1.1.4.2-1: Adjustment Value for DL Timing for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 30 | +32*64$T_c$ | +16*64$T_c$ |

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 11.3.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size $T_q$ between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 11.3.1.0.1 and Table 11.3.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 11.3.1.0.1 and Table 11.3.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 11.3.1.0.1 and Table 11.3.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 11.3.1.0.1 and Table 11.3.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL_timing_change[Ts]/6.6Ts and DL_timing_change is specified in Table 11.3.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

### 11.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.3.1.1.4.3-0: Common Exception messages for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.3.1.1.4.3-1: *SRS-Config* : Additional test requirement for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | SCS15 |
| | 25 | | SCS30 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl320 | 3 | | Test 2 and SCS15 |
| sl640 | 5 | | Test 2 and SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.3.1.1.4.3-2: *DRX-Config* : Additional test requirement for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms6 | | |
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-HARQ-RTT-TimerDL | 56 | | |
| drx-HARQ-RTT-TimerUL | 56 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| shortDRX | | Not present | |
| } | | | |

11.3.1.1.5 Test Requirements

**Table 11.3.1.1.5-1: Cell Specific Test Parameters for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Parameter | | Unit | Configuration | Test1 | Test2 |
|---|---|---|---|---|---|
| SSB ARFCN | | | 1 | 1 | 1 |
| TDD configuration | | | 1 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | MHz | 1 | 40: $N_{RB,c}$ = 106 | |
| Initial BWP Configuration | | | 1 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | | 1 | DLBWP.1.1<br>ULBWP.1.1 | |
| DRX Cycle | | ms | 1 | N/A | DRX.8[Note5] |
| DL CCA model | | | 1 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1 | As specified in clause D.7.2.2 | |
| PDSCH Reference measurement channel | | | 1 | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | | 1 | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | | 1 | CCR.1.1 CCA | |
| OCNG Patterns | | | 1 | OP.1 | |
| SSB configuration | Semi- static channel acces | | 1 | SSB.1 CCA | |

| | | | | |
|---|---|---|---|---|
| Dymamic channel acces | | 1 | SSB.2 CCA | |
| SMTC Configuration | | 1 | SMTC.1 FR1 | |
| TRS configuration | | 1 | TRS.1.2 TDD | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1 | 0.9375 | 0.9375 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1 | 0.75 | 0.75 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1 | 0.75 | 0.75 |
| UL CCA probability ($P_{CCA_UL}$) | | 1 | 1 | 1 |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/30 kHz | 1 | -95 | -95 |
| $\hat{E}_s / I_{ot}$ | | 1 | 3 | 3 |
| $\hat{E}_s / N_{oc}$ | | 1 | 3 | 3 |
| SS-RSRP Note3 | dBm/30 kHz | 1 | -92 | -92 |
| Io Note3 | dBm/38.1MHz | 1 | -59.2 | -59.2 |
| Propagation condition | | 1 | AWGN | |
| SRS Config | | 1 | SRSConf.1 Note6 | SRSConf.2 Note6 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRX related parameters are given in Table 11.3.1.1.5-3

Note 6: SRS configs are given in Table 11.3.1.1.5-2

Note 7: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 8: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.3.1.1.5-2: SRS Configuration for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| *SRS-ResourceSet* | *srs-ResourceSetId* | 0 | 0 | |
| | *srs-ResourceIdList* | 0 | 0 | |
| | *resourceType* | Periodic | Periodic | |
| | *Usage* | Codebook | Codebook | |
| *SRS-Resource* | *SRS-ResourceId* | 0 | 0 | |
| | *nrofSRS-Ports* | Port1 | Port1 | |
| | *transmissionComb* | n2 | n2 | |
| | *combOffset-n2* | 0 | 0 | |
| | *cyclicShift-n2* | 0 | 0 | |
| | *resourceMapping startPosition* | 0 | 0 | |
| | *resourceMapping nrofSymbols* | n1 | n1 | |
| | *resourceMapping* | n1 | n1 | |

| | | | | |
|---|---|---|---|---|
| | *repetitionFactor* | | | |
| | *freqDomainPosition* | 0 | 0 | |
| | *freqDomainShift* | 0 | 0 | |
| | *freqHopping c-SRS* | 14 for test configuration 1,2 | 25 | Matches $N_{RB,c}$ |
| | *freqHopping b-SRS* | 0 | 0 | |
| | *freqHopping b-hop* | 0 | 0 | |
| | *groupOrSequenceHopping* | Neither | Neither | |
| | *resourceType* | Periodic | Periodic | |
| | *periodicityAndOffset-p* | sl1, 0 | sl640, 0 | Offset to align with DRX periodicity |
| | *sequenceId* | 0 | 0 | Any 10 bit number |

**Table 11.3.1.1.5-3: DRX-Configuration for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Field | Test 2 |
|---|---|
| | Value |
| *drx-onDurationTimer* | 6 ms |
| *drx-InactivityTimer* | 1 ms |
| *drx-RetransmissionTimerDL* | 1 slot |
| *drx-RetransmissionTimerUL* | 1 slot |
| *longDRX-CycleStartOffset* | 320 ms |
| *shortDRX* | disable |
| *TimeAlignmentTimer* | Infinity |
| NOTE: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | |

**Table 11.3.1.1.5-4: $T_e$ Timing Error Limit for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals s(kHz) | $T_e$ |
|---|---|---|---|
| 1 | 30 | 15 | $9.75*64*T_c$ |
| | | 30 | $9.75*64*T_c$ |
| | | 60 | $8.75*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 11.3.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate for NR SA FR1 UE Transmit Timing Test with PCell under DL CCA**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ | Maximum Adjustment Rate |
|---|---|---|---|---|
| 1 | 15 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 30 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| | 60 | $6*64*T_c$ | $1.9*64*T_c$ | $6.6*64*T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | | |

## 11.3.2 UE timing advance

### 11.3.2.0 Minimum conformance requirements

The timing advance is initiated from PSCell in EN-DC operation mode with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

#### 11.3.2.0.1 Minimum conformance requirements for timing advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot *n+ k+1* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

#### 11.3.2.0.2 Minimum conformance requirements for timing advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 11.3.2.0.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].

**Table 11.3.2.0.2-1: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 | 120 | 480 | 960 |
|---|---|---|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | ±128 $T_c$ | ±32 $T_c$ | ±10 $T_c$ | ±6 $T_c$ |

The normative reference for this requirement is TS 38.133 [6] clause 7.3.2.

### 11.3.2.1 NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA

#### 11.3.2.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

#### 11.3.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U with a UL shared spectrum NR carrier.

#### 11.3.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 11.3.2.0.1 and clause 11.3.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.3.2.1.

#### 11.3.2.1.4 Test description

##### 11.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.3.2.1.4.1-1.

**Table 11.3.2.1.4.1-1: Supported test configurations for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Config | Description |
|---|---|
| 11.3.2.1-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE supporting SA operation only on NR band(s) with shared spectrum access is required to be tested | |

Configure the test equipment and the DUT according to the parameters in Table 11.3.2.1.4.1-2

**Table 11.3.2.1.4.1-2: Initial conditions for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.3.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

**Table 11.3.2.1.4.1-3: General test parameters for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For 30 kHz SCS $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in clause 4.2 of TS 38.213 [8]) |
| T1 | s | 5 | |
| T2 | s | 5 | |

1. Message contents are defined in clause 11.3.2.1.4.3.

2. Single Cell is used, which is NR FR1 PCell under CCA. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

### 10.2.2.1.4.2 Test Procedure

The test consists of a single NR cell (PCell) subject to CCA that operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test consists of consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in able 11.3.2.1.5-1 and Table 11.3.2.1.5-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i} = P_{CCA_UL} = 1$) at the start of the test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to values in Tables 11.3.2.1.4.1-3 and Table 11.3.2.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.3.2.1.5-1.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table 11.3.2.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

7. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

8. The UE Time Alignment Timer, described in clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

9. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 11.3.2.0.2-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

10. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 11.3.2.0.2-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

11. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

12. After the RRC connection release, the SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 or if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4.

13. If Step 12 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

14. Repeat steps 3-13 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.3.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

**Table 11.3.2.1.4.3-0: Common Exception messages for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.9-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.3.2.1.4.3-1: *srs-Config* setup for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |

| Derivation Path: TS 38.508-1, Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | Config 1,2,4,5 |
| | 24 | | Config 3,6 |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 2 | Once every 5 Slots | SCS15 |
| sl5 | 4 | Once every 5 Slots | SCS30 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

11.3.2.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where k=5.

The Timing Advance adjustment accuracy shall be within the limits specified in Table 11.3.2.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

Table 11.3.2.1.5-1 and Table 11.3.2.1.5-2 define the primary level settings.

**Table 11.3.2.1.5-1: Cell specific test parameters for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| **Parameter** | | | **Unit** | **Test1** | |
|---|---|---|---|---|---|
| | | | | **T1** | **T2** |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | |
| DRX Cycle | | Config 1 | ms | Not Applicable | |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | |
| CORESET Reference Channel | | Config 1 | | CR.1.1 CCA | |
| TRS configuration | | Config 1 | | TRS.1.2 TDD | |
| OCNG Patterns | | Config 1 | | OP.1 | |
| SMTC configuration | | Config 1 | | SMTC.1 FR1 | |
| SSB configuration | Semi-static channel acces | Config 1 | | SSB.1 CCA | |
| | Dymamic channel acces | Config 1 | | SSB.2 CCA | |

| | | | |
|---|---|---|---|
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | Config 1 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | Config 1 | | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | Config 1 | | 1 |
| UL CCA probability $P_{CCA}$ | Config 1 | | 1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/30 kHz | -95 |
| $\hat{E}_s / I_{ot}$ | | dB | 3 |
| $\hat{E}_s / N_{oc}$ | | dB | 3 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -62.58 |
| Propagation condition | | - | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in clause D.7.2.

Note 5: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.3.2.1.5-2: Sounding Reference Symbol Configuration for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Field | Value | Comment |
|---|---|---|
| *c-SRS* | 24 | Frequency hopping is disabled |
| *b-SRS* | 0 | |
| *b-hop* | 0 | |
| *freqDomainPosition* | 0 | Frequency domain position of SRS |
| *freqDomainShift* | 0 | |
| *groupOrSequenceHopping* | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | sl5=4 for SCS 30kHz | Once every 5 slots |
| *pathlossReferenceRS* | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| *usage* | Codebook | Codebook based UL transmission |
| *startPosition* | 0 | resourceMapping setting: SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | n1 | |
| *repetitionFactor* | n1 | |
| *combOffset-n2* | 0 | transmissionComb setting |
| *cyclicShift-n2* | 0 | |

| | | |
|---|---|---|
| *nrofSRS-Ports* | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

**Table 11.3.2.1.5-3: UE Timing Advance adjustment accuracy for NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA**

| Sub Carrier Spacing, SCS | 15 | 30 | 60 |
|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±344 $T_c$ | ±344 $T_c$ | ±216 $T_c$ |

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95 %.

# 11.4 Signalling characteristics

## 11.4.1 Radio link monitoring

### 11.4.1.0 General

Same as in clause 10.3.1.0.

#### 11.4.1.0.1 Minimum conformance requirements for SSB based radio link monitoring under CCA

Same as in clause 10.3.1.0.1.

##### 11.4.1.0.1.1 Minimum requirement for SSB based Radio Link Monitoring under CCA

Same as in clause 10.3.1.0.1.1.

#### 11.4.1.0.1.2 Measurement restrictions for SSB based RLM under CCA

Same as in clause 10.3.1.0.1.2.

### 11.4.1.1 Requirements for determining UE in-sync or out-of-sync status

In the test cases specified in clause 11.4.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [2]) means uplink signal.
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [2]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.1.

## 11.4.1.2 NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA

### 11.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 11.4.1.0.

### 11.4.1.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM on shared channel access.

### 11.4.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 11.4.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.2.

### 11.4.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 11.4.1.2.4.1-1. The test parameters are given in Tables 11.4.1.2.4.1-3, 11.4.1.2.5-1, and 11.4.1.2.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 11.4.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

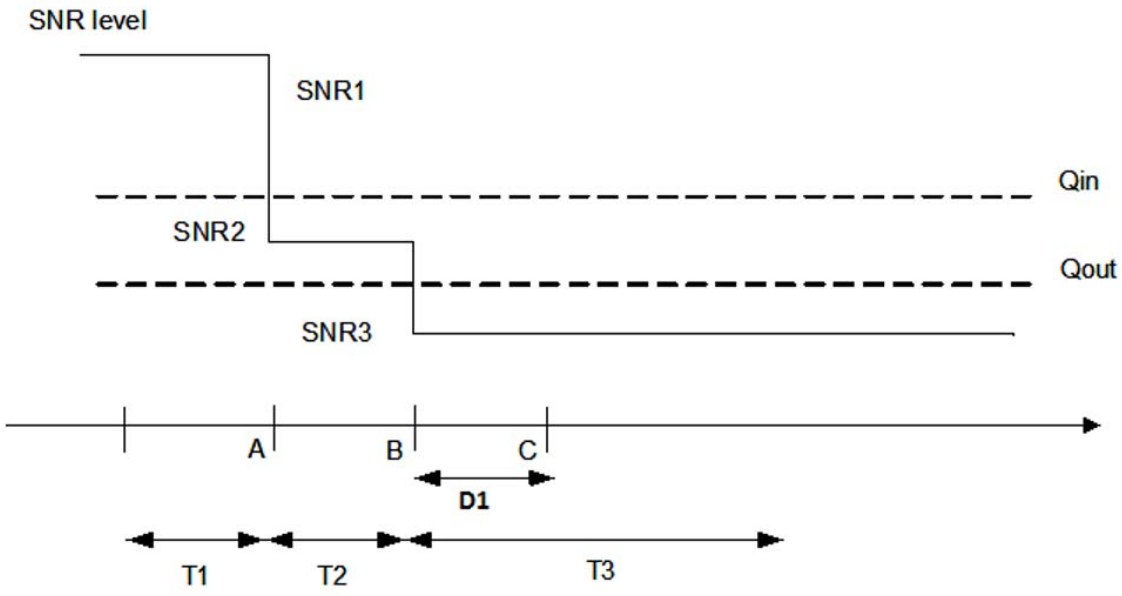



**Figure 11.4.1.2.4-1: SNR variation for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

#### 11.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.1.2.4.1-1.

**Table 11.4.1.2.4.1-1: Supported test configurations for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Configuration | Description |
|---|---|
| 11.4.1.2-1 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.4.1.2.4.1-2.

**Table 11.4.1.2.4.1-2: Initial conditions for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.4.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.1.2.4.1-3.

**Table 11.4.1.2.4.1-3: General test parameters for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| DL CCA model | | | As specified in clause D.7.2.1 |
| UL CCA model | | | As specified in clause D.7.2.2 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA |
| SSB configuration for semi-static channel access Note 3, 5 | Config 1 | | SSB.1 CCA |
| SSB configuration for dynamic channel access Note 4, 5 | Config 1 | | SSB.2 CCA |
| DBT window configuration | Config 1 | | DBT.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 30 kHz |

| | | | |
|---|---|---|---|
| PRACH Configuration | Config 1 | | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.04 |
| T3 | | s | 1.04 |
| D1 | | s | 1 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

### 11.4.1.2.4.2 Test Procedure

The test consists of a single NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 11.4.1.2.4.1-3.

The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 11.4.1.2.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 11.4.1.2.5-1. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.1.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.1.2.5-1. T3 starts.

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power, according to section 11.4.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power, according to section 11.4.1.1, from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 11.4.1.2.5-1.

9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.4.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 11.4.1.2.4.3-1: Common Exception messages for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 11.4.1.2.5 Test Requirement

Table 11.4.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA.

**Table 11.4.1.2.5-1: Cell-specific test parameters for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| DL CCA probability $P_{CCA_DL}$ | Note 6,8 | | $P_{CCA_DL}$=0.9375 | | |
| | Note 7,8 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |
| UL CCA probability $P_{CCA_UL}$ | | | 1 | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR[Note 3,4] on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| SNR on other channels and signals | Config 1 | dB | 1 | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -95 | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure 11.4.1.2.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.4.1.2.5-2: Measurement gap configuration for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Field | Test 1 | |
|---|---|---|
| | Value | |
| *gapOffset* | 0 | |
| NOTE: Ensure that RLM-RS is partially overlapped with measurement gap0 | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

## 11.4.1.3 NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

### 11.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 11.4.1.0.

### 11.4.1.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM on shared channel access.

### 11.4.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 11.4.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.3.

### 11.4.1.3.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in table 11.4.1.3.4.1-1. The test parameters are given in Tables 11.4.1.3.4.1-3 and 11.4.1.3.5-1. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 11.4.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

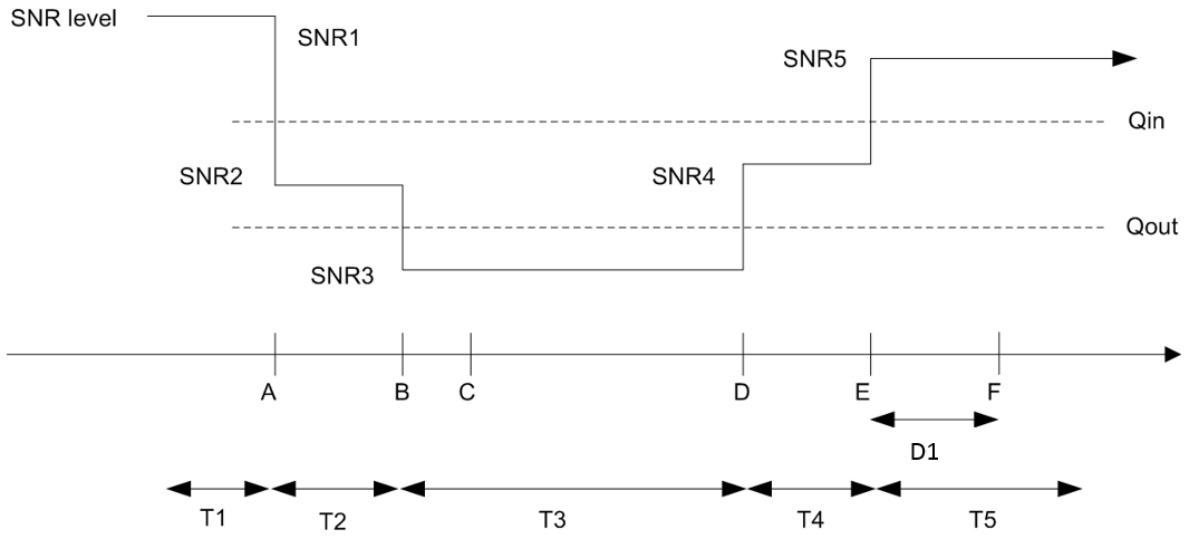



**Figure 11.4.1.3.4-1: SNR variation for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

#### 11.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.1.3.4.1-1.

**Table 11.4.1.3.4.1-1: Supported test configurations for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Configuration | Description |
|---|---|
| 11.4.1.3-1 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.4.1.3.4.1-2.

**Table 11.4.1.3.4.1-2: Initial conditions for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.4.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.1.3.4.1-3.

**Table 11.4.1.3.4.1-3: General test parameters for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| DL CCA model | | | As specified in clause D.7.2.1 |
| UL CCA model | | | As specified in clause D.7.2.2 |
| Duplex mode | Config 1 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | TDDConf.1.1 CCA |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA |
| SSB configuration for semi-static channel access Note 3, 5 | Config 1 | | SSB.1 CCA |
| SSB configuration for dynamic channel access Note 4,5 | Config 1 | | SSB.2 CCA |
| DBT window configuration | Config 1 | | DBT.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 30 kHz |

| | | | |
|---|---|---|---|
| PRACH Configuration | Config 1 | | FR1 PRACH configuration 1 under CCA |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | N/A |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.52 |
| T4 | | s | 0.2 |
| T5 | | s | 2.04 |
| D1 | | s | 2 |

NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.
NOTE 2: UE-specific PDCCH is not transmitted after T1 starts.
NOTE 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

#### 11.4.1.3.4.2 Test Procedure

The test consists of a single NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 11.4.1.3.4.1-3. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 11.4.1.3.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 11.4.1.3.5-1. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.1.3.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.1.3.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.1.3.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.1.3.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power, according to section 11.4.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.4.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 11.4.1.3.4.3-1: Common Exception messages for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.1.3.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |

| | | | |
|---|---|---|---|
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

11.4.1.3.5 Test Requirement

Table 11.4.1.3.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA.

**Table 11.4.1.3.5-1: Cell-specific test parameters for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode under CCA**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability $P_{CCA_DL}$ | Note 6,8 | | $P_{CCA_DL}$=0.9375 | | | | |
| | Note 7,8 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | |
| UL CCA probability $P_{CCA_UL}$ | | | 1 | | | | |
| $L_{CCA_DL}$ | | | 7 | | | | |
| $W_{CCA_DL}$ | | ms | $T_{Evaluate_in_SSB,CCA}$ NOTE 9 | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| SNR on other channels and signals | Config 1 | dB | 1 | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -95 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 11.4.1.3.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
NOTE 9: As defined in Table 11.4.1.0.1-1.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

- During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

## 11.4.2 Void

## 11.4.3 SCell activation and deactivation delay

### 11.4.3.0 Minimum conformance requirements

#### 11.4.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

Same as in clauses 10.3.3.0.1 for activation delay requirement and 10.3.3.0.2 for deactivation delay requirement.

### 11.4.3.1 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle

#### 11.4.3.1.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell both under CCA, are within the requirements stated in clause 11.4.3.0.1, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

#### 11.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting NR-U with a shared spectrum NR carrier and 2DL CA in NR.

#### 11.4.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.3.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.3.1.

#### 11.4.3.1.4 Test description

##### 11.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations are shown in Table 11.4.3.1.4.1-1.

**Table 11.4.3.1.4.1-1: Supported test configurations for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description |
|---|---|
| 11.4.3.1-1 | With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.4.3.1.4.1-2.

**Table 11.4.3.1.4.1-2: Initial conditions for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | |

**Table 11.4.3.1.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two radio channels (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every second subframe |
| SCell measurement cycle (*measCycleSCell*) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | 0 | |
| Time alignment error between cell2 and cell1 | µs | ≤ TAE as specified in TS 38.104 [28] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | $10 + 5 \cdot 2^{\mu_{DL}}$ | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214 [9]) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]<br>$\mu_{DL}$ is the subcarrier spacing configuration for DL |

1. Message contents are defined in clause 11.4.3.1.4.3.

2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is the PCell and Cell 2 is the deactivated SCell

### 11.4.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in NR with CCA, and Cell2 (SCell) on radio channel 2 (SCC) in NR with CCA. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2, as the UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted *m*, defines the start of time period T2. The UE shall be able to report a valid CSI in PCell for the activated SCell at latest in slot *m* +

($T_{HARQ}$+$T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, as defined in TS 38.133 [6] clause 8.3A.2. The UE shall start reporting CSI in PCell in first available uplink resource for CSI reporting after at least one CSI-RS transmission occasion for channel measurement and reporting following slot $m+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.2.

The point in time at which the MAC message is received by at the UE antenna connector, in a slot # denoted *n*, defines the start of time period T3. The UE shall complete the activation at latest in slot $n+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$. Any PCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.3.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 11.4.3.1.4.1-3 and 11.4.3.1.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2. The SS shall enable DL and UL CCA model according to Table 11.4.3.1.5-1.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 1 and provide measurement configurations with the message content exceptions defined in clause 11.4.3.1.4.3.

3a. The UE sends a *MeasurementReport* message. If the TE doesn't receive the *MeasurementReport* during T1, go to step 9.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{\mathrm{T_{HARQ}+3ms}+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting_withCCA}+T_X}{NR\ slot\ length}$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time_withCCA}}+T_{\mathrm{CSI_Reporting_withCCA}}}{\mathrm{NR\ slot\ length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$up to the end of T2

     - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
    or
    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G.2.7 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 11.4.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 11.4.3.1.4.3-1: Common Exception messages for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.4.3.1.4.3-2: *RRCReconfiguration*: SCell addition for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| measConfig | MeasConfig | Table 11.4.3.1.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 11.4.3.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.1.4.3-2A: *MeasConfig* (Table 11.4.3.1.4.3-2) for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2 Table 11.4.3.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 11.4.3.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.1.4.3-3: *MeasObjectNR* for SCell for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| *measCycleSCell*-v1530 | sf160 | | |
| } | | | |

**Table 11.4.3.1.4.3-4: *ReportConfigNR* for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.1.4.3-5: *CellGroupConfig-SCell* (Table 11.4.3.1.4.3-2) for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 11.4.3.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 11.4.3.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.1.4.3-6: *ServingCellConfig-SpCell* (Table 11.4.3.1.4.3-5) for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 11.4.3.1.4.3-7: *ServingCellConfig-SCell* (Table 11.4.3.1.4.3-5) for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

11.4.3.1.5 Test requirements

Table 11.4.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 11.4.3.1.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1 | | TDD | | | TDD | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |
| DL CCA probability for dynamic channel access | $P_{CCA_DL_1}$ | | 0.75 | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | | 0.75 | | |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | | | 0.87 | | |
| UL CCA probability | $P_{CCA_UL}$ | | 0.75 | | | 0.75 | | |
| $L_{CCA_DL}$ Note 8 | | | 2 | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | ms | $T_{activation_time_withCCA}$ | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1 | | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.3 CCA | | | SR.1.1 CCA | | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 CCA | | | SR.1.1 CCA | | |
| OCNG Patterns Note1 | | | OP.1 | | | OP.1 | | |
| SSB Configuration for semi-static channel access | Config 1 | | SSB.1 CCA | | | SSB.1 CCA | | |
| SSB Configuration for dynamic channel access | Config 1 | | SSB.2 CCA | | | SSB.2 CCA | | |
| SMTC configuration | | | SMTC.1 | | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | | | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/15kHz | -104 | | | -104 | | |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -101 | | | -101 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | | 17 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | | | 17 | | |
| SS-RSRP Note3 | Config 1 | dBm/SCS | -84 | | | -84 | | |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -52.87 | | | -52.87 | | |
| Propagation condition | | - | AWGN | | | | | |

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |
| Note 8: | As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$ |

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+$T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA}$ = $T_{FirstSSB}$ + $L_1$*$T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X$ = $T_{FirstSSB.}$

During T3, interruption on PCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 11.4.3.2 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle

### 11.4.3.2.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 11.4.3.0.1, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

### 11.4.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting NR-U with a shared spectrum NR carrier and 2DL CA in NR.

### 11.4.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.3.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.3.2.

### 11.4.3.2.4 Test description

#### 11.4.3.2.4.1 Initial conditions

Same initial conditions as described in section 11.4.3.1.4.1 with following exception:

- The listed parameter values in Tables 11.4.3.2.4.1-3 will replace the values of corresponding parameters in Tables 11.4.3.1.4.1-3.

**Table 11.4.3.2.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (*measCycleSCell*) | ms | 640 | |

### 11.4.3.2.4.2 Test procedure

Same test procedure as described in section 11.4.3.1.4.2.

### 11.4.3.2.4.3 Message contents

Same message contents as described in section 11.4.3.1.4.3 with following exception:

- Table 11.4.3.1.4.3-3 is replaced by Table 11.4.3.2.4.3-1.

**Table 11.4.3.2.4.3-1: MeasObjectNR for SCell**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

### 11.4.3.2.5 Test requirements

Table 11.4.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 11.4.3.2.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1 | | TDD | | | TDD | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access Note 5,7 | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |
| DL CCA probability for dynamic channel access Note 6,7 | $P_{CCA_DL_1}$ | | 0.75 | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | | 0.75 | | |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | | | 0.87 | | |
| UL CCA probability | $P_{CCA_UL}$ | | 0.75 | | | 0.75 | | |
| $L_{CCA_DL}$ Note 8 | | | 2 | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | ms | $T_{activation_time_withCCA}$ | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |

| | | | | |
|---|---|---|---|---|
| TRS Configuration | Config 1 | | TRS.1.2 TDD | TRS.1.2 TDD |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | SR.1.1 CCA |
| Dedicated CORESET parameters | Config 1 | | CCR.1.3 CCA | SR.1.1 CCA |
| RMSI CORESET parameters | Config 1 | | CR.1.1 CCA | SR.1.1 CCA |
| OCNG Patterns Note1 | | | OP.1 | OP.1 |
| SSB Configuration for semi-static channel access Note5,7 | Config 1 | | SSB.1 CCA | SSB.1 CCA |
| SSB Configuration for dynamic channel access Note6,7 | Config 1 | | SSB.2 CCA | SSB.2 CCA |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -101 | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1 | dBm/SCS | -84 | -84 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+$T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA}$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$*$T_{SMTC_MAX}$ + (1 +$L_{2,2}$)*$T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$* $T_{SMTC_MAX}$.

During T3, interruption on PCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

### 11.4.3.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA

#### 11.4.3.3.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 11.4.3.0.1, when the SCell is unknown to the UE at the time of activation.

#### 11.4.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting NR-U with a shared spectrum NR carrier and 2DL CA in NR.

#### 11.4.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.3.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.3.3.

#### 11.4.3.3.4 Test description

##### 11.4.3.3.4.1 Initial conditions

Same initial conditions as described in section 11.4.3.1.4.1 with following exception:

- The listed parameter values in Tables 11.4.3.3.4.1-3 will replace the values of corresponding parameters in Tables 11.4.3.1.4.1-3.

**Table 11.4.3.3.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| T1 | s | 0.1 | During this time period the PCell shall be known and the SCell configured, but not detected. |

##### 11.4.3.3.4.2 Test procedure

Same test procedure as described in section 11.4.3.1.4.2, except step 3 and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. The SCell (Cell 2) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell2), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

- Step 3a is removed.

##### 11.4.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 11.4.3.3.4.3-1: Common Exception messages for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 11.4.3.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 11.4.3.3.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.3.4.3-3: *CellGroupConfig* (Table 11.4.3.3.4.3-2) for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig-SpCell | Table 11.4.3.3.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 11.4.3.3.4.3-5 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.3.3.4.3-4: *ServingCellConfig-SpCell* (Table 11.4.3.3.4.3-3) for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 11.4.3.3.4.3-5: *ServingCellConfig-SCell* (Table 11.4.3.3.4.3-3) for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

11.4.3.3.5 Test requirements

Table 11.4.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 11.4.3.3.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1 | | TDD | | | TDD | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | 40: $N_{RB,c}$ = 106 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | As specified in clause D.7.2.2 | | |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | 0.9375 | | | 0.9375 | | |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | 0.75 | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | | 0.75 | | |
| UL CCA probability for semi-static channel access | $P_{CCA_UL}$ | | 0.87 | | | 0.87 | | |
| UL CCA probability | $P_{CCA_UL}$ | | 0.75 | | | 0.75 | | |
| $L_{CCA_DL}$ Note 8 | | | 2 | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | ms | $T_{activation_time_withCCA}$ | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1 | | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | | | SR.1.1 CCA | | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.3 CCA | | | SR.1.1 CCA | | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 CCA | | | SR.1.1 CCA | | |
| OCNG Patterns Note1 | | | OP.1 | | | OP.1 | | |
| SSB Configuration for semi-static channel access Note5,7 | Config 1 | | SSB.1 CCA | | | SSB.1 CCA | | |
| SSB Configuration for dynamic channel access Note6,7 | Config 1 | | SSB.2 CCA | | | SSB.2 CCA | | |
| SMTC configuration | | | SMTC.1 | | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1 | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1 | dBm/SCS | -101 | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1 | dBm/SCS | -84 | -84 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in the cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. OCNG is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+$T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA} = T_{FirstSSB_MAX} + (1 + L_{3,1})*T_{SMTC_MAX} + (2 + L_{3,2})*T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X = T_{FirstSSB_MAX} + L_{3,1}* T_{SMTC_MAX}$.

During T3, interruption on PCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 11.4.4 Beam failure detection and link recovery procedures

### 11.4.4.0 General

Same as in clause 10.3.4.0.

#### 11.4.4.0.1 Minimum conformance requirements for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.

##### 11.4.4.0.1.1 Minimum requirement for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.1.

#### 11.4.4.0.1.2 Measurement restriction for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.2.

### 11.4.4.0.2 Void

Same as in clause 10.3.4.0.2.

### 11.4.4.0.3 Scheduling availability of UE during beam failure detection under CCA

Same as in clause 10.3.4.0.3.

#### 11.4.4.0.3.1 Scheduling availability of UE performing beam failure detection under CCA with a same subcarrier spacing as PDSCH/PDCCH

Same as in clause 10.3.4.0.3.1.

### 11.4.4.0.4 Scheduling availability of UE during candidate beam detection under CCA

Same as in clause 10.3.4.0.4.

#### 11.4.4.0.4.1 Scheduling availability of UE performing L1-RSRP measurement under CCA with a same subcarrier spacing as PDSCH/PDCCH on FR1

Same as in clause 10.3.4.0.4.1.

## 11.4.4.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

### 11.4.4.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.1.

### 11.4.4.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access.

### 11.4.4.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.4.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.4.1.

### 11.4.4.1.4 Test description

The test parameters are given in Tables 11.4.4.1.4.1-3 and 11.4.4.1.5-1 below. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 11.4.4.1.4-1 shows the variation of the downlink SNR of the SSB in set $q_0$ in the active cell to emulate SSB based beam failure. Figure 11.4.4.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

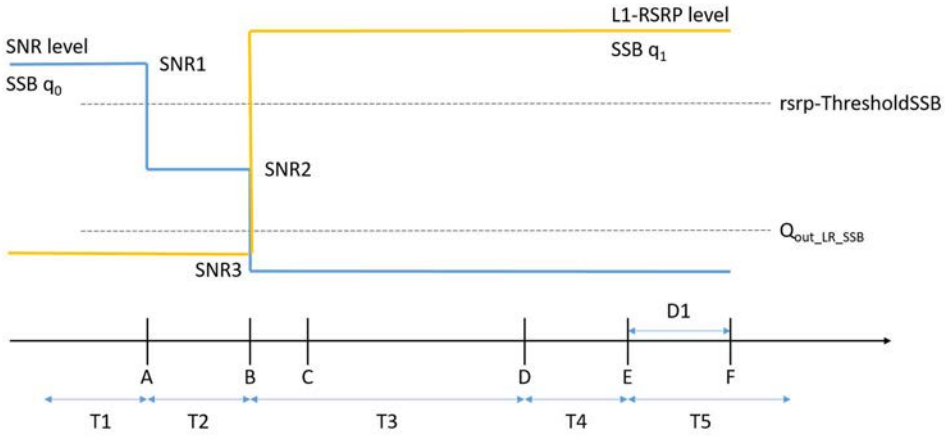



**Figure 11.4.4.1.4-1: SNR variation for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

### 11.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.4.1.4.1-1.

**Table 11.4.4.1.4.1-1: Supported test configurations for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Configuration | Description |
|---|---|
| 11.4.4.1-1 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.4.4.1.4.1-2.

**Table 11.4.4.1.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.4.4.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.4.1.4.1-3.

**Table 11.4.4.1.4.1-3: General test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |
| Active PSCell | | Cell 1 | |
| RF Channel Number | | 1 | |
| DL CCA model | | As specified in D.7.2.1 | |

| | | | | |
|---|---|---|---|---|
| UL CCA model | | | As specified in D.7.2.2 | |
| Duplex mode | Config 1 | | TDD | |
| BWchannel | Config 1 | MHz | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | TDDConf.1.1 CCA | |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA | |
| SSB Configuration | Config 1 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access | |
| DBT Window Configuration | Config 1 | | DBT.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 30 kHz | |
| PRACH Configuration | Config 1 | | Table A.7.1A.2-1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| *gapOffset* | | | 0 | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | *Config 1* | dBm/ SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |

| | | | | |
|---|---|---|---|---|
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0,1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.93 | |
| T3 | | s | 0.52 | |
| T4 | | s | 0 | |
| T5 | | s | 0.45 | |
| D1 | | s | 0.41 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 11.4.4.1.4.2 Test Procedure

There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 11.4.4.1.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 11.4.4.1.5-1. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.4.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.4.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.4.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.4.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one. Proceed with step 10.

   Otherwise, the number of failed tests is increased by one. Switch off and then on the UE and proceed with step 1.

10. Repeat steps 2-9 for all subtests until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.4.4.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 11.4.4.1.4.3-1: Common Exception messages for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and BFD<br>Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.4.4.1.4.3-2: PDCCH *Search Space* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.4.1.4.3-3: *RLF-TimersAndConstants* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n2 | | |
| } | | | |

**Table 11.4.4.1.4.3-4: *PDCCH-Config* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 11.4.4.1.4.3-5: *ControlResourceSet* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

### 11.4.4.1.5 Test Requirement

Table 11.4.4.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA.

**Table 11.4.4.1.5-1: Cell-specific test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability $P_{CCA,DL}$ | Note 10, 12 | | 1.0 | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| | Note 11, 12 | | 1.0/1.0 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA,UL}$ | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| $L_{CCA_DL}$ | | | N/A | 7 | | | |
| $W_{CCA_DL}$ | | ms | N/A | $T_{Evaluate_CBD_SSB_CCA}$ Note 13 | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 11.4.4.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.
Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.
Note 13: As defined in TS 38.133 [6] Table 8.5A.5.2-1.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 11.4.4.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

### 11.4.4.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is

to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.

#### 11.4.4.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access.

#### 11.4.4.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.4.0. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.4.2.

#### 11.4.4.2.4 Test description

The test parameters are given in Tables 11.4.4.2.4.1-3 and 11.4.4.2.5-1 below. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 11.4.4.2.4-1 shows the variation of the downlink SNR of the SSB in set $q_0$ in the active cell to emulate SSB based beam failure. Figure 11.4.4.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

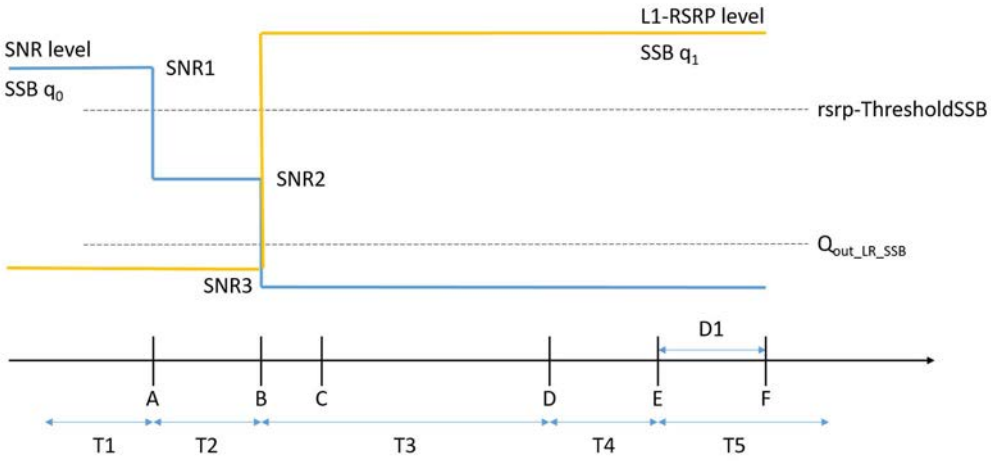



**Figure 11.4.4.2.4-1: SNR variation for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

#### 11.4.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.4.2.4.1-1.

**Table 11.4.4.2.4.1-1: Supported test configurations for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Configuration | Description |
|---|---|
| 11.4.4.2-1 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.4.4.2.4.1-2.

**Table 11.4.4.2.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. Message contents are defined in clause 11.4.4.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.4.2.4.1-3.

**Table 11.4.4.2.4.1-3: General test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| DL CCA model | | | As specified in D.7.2.1 | |
| UL CCA model | | | As specified in D.7.2.2 | |
| Duplex mode | Config 1 | | TDD | |
| BWchannel | Config 1 | MHz | 40: NRB,c = 106 | |
| DL initial BWP configuration | Config 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | TDDConf.1.1 CCA | |
| CORESET Reference Channel | Config 1 | | CR.1.1 CCA | |
| SSB Configuration | Config 1 | | SSB.3 CCA for semi-static channel access SSB.4 CCA for dynamic channel access | |
| DBT Window Configuration | Config 1 | | DBT.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 30 kHz | |
| PRACH Configuration | Config 1 | | Table A.7.1A.2-1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |

| | | | | |
|---|---|---|---|---|
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |
| Gap pattern ID | | | N.A. | |
| *gapOffset* | | | N.A. | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | *Config 1* | dBm/ SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0,1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 9.01 | |
| T3 | | s | 5.16 | |
| T4 | | s | 0 | |
| T5 | | s | 3.89 | |
| D1 | | s | 3.85 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 11.4.4.2.4.2 Test Procedure

There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment

timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure DRX and periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 11.4.4.2.5-1. Propagation conditions are set according to clause C.2.3. The SS shall enable DL and UL CCA model according to Table 11.4.4.2.5-1. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.4.2.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.4.2.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.4.2.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.4.2.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5), the number of successful tests is increased by one. Proceed with step 10.

   Otherwise, the number of failed tests is increased by one. Switch off and then on the UE and proceed with step 1.

10. Repeat steps 2-9 for all subtests until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.4.4.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 11.4.4.2.4.3-1: Common Exception messages for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table H.3.5-9<br>Table H.3.7-1 with Condition DRX.7<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.4.4.2.4.3-2: PDCCH *Search Space* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 3 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbols 0 and 1 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.4.2.4.3-3: *RLF-TimersAndConstants* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n2 | | |
| } | | | |

**Table 11.4.4.2.4.3-4: *PDCCH-Config* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 11.4.4.2.4.3-5: *ControlResourceSet* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

11.4.4.2.5 Test Requirement

Table 11.4.4.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA.

**Table 11.4.4.2.5-1: Cell-specific test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability $P_{CCA,DL}$ | Note 10, 12 | | 1.0 | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| | Note 11, 12 | | 1.0/1.0 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA,UL}$ | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| $L_{CCA_DL}$ | | | N/A | 7 | | | |
| $W_{CCA_DL}$ | | ms | N/A | $T_{Evaluate_CBD_SSB_CCA}$ Note 13 | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 11.4.4.2.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A. |
| Note 10: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 11: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |
| Note 12: | For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. |
| Note 13: | As defined in TS 38.133 [6] Table 8.5A.5.2-1. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 11.4.5 Active BWP switching

### 11.4.5.1 NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA

#### 11.4.5.1.1 Test purpose

The purpose of this test is to verify the UL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6.4.

#### 11.4.5.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 on shared channel access, and UL LBT detection and recovery.

#### 11.4.5.1.3 Minimum conformance requirements

Upon detection of consistent UL CCA failure is slot#n in PCell when UE detects *lbt-FailureInstanceMaxCount* number of CCA failure within *lbt-FailureDetectionTimer*, the UE shall switch the active UL BWP to an UL BWP configured with PRACH occasion and for which consistent CCA failure has not been triggered as defined in TS 38.321 [12] clause

5.21. The UE shall be ready to transmit PRACH on the new UL BWP of the PCell on the first UL slot occurs right after slot $n+T_{BWPswitchDelay}$ +1, where $T_{BWPswitchDelay}$ is defined in TS 38.133 [6] Table 8.6.2-1. The UE shall finish the UL BWP switch within the time duration $T_{BWPswitchDelay}$ depending on UE capability *bwp-SwitchingDelay* [13].

Note: Additional delay in acquiring the first available RACH occasion will be derived in a way similar to that in handover in TS 38.133 [6] clause 6.1B.1.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ on the PCell in the UL BWP switch. The UE is not required to follow the requirements defined in this clause when performing a UL BWP switch between the UL BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

The normative reference for this requirement is TS 38.133 [6] clause 8.6.4.

#### 11.4.5.1.4 Test description

The test scenario comprises of one NR PCell (Cell 1) as given in 11.4.5.1.4.1-3. Cell-specific parameters of NR PCell are specified in Table 11.4.5.1.5-1. SRS configuration used in the test is specified in Table 11.4.5.1.5-2.

The UE shall be configured with PRACH configuration on UL BWP on which the UE shall switch after the consistent UL LBT failure detection.

The test consists of 2 successive time periods, with durations of T1 and T2, respectively.

During T1,

- Time period T1 starts when the UE has received the SRS configuration for periodic SRS transmission on active UL BWP-1.
- The UE shall perform UL CCA before SRS transmission.
- The parameter UL CCA probability $P_{CCA}$ is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

During T2,

- T2 starts when the UE detects consistent UL LBT failures i.e. when total number of UL LBT failures in cell1 on active UL BWP-1 exceeds *lbt-FailureInstanceMaxCount* during *lbt-FailureDetectionTimer*.
- The UE upon detected consistent UL LBT failure starts the LBT recovery mechanism, which requires the UE to switch to active UL BWP-2 in Cell 1 and to send PRACH in the active UL BWP-2.
- Staring from T2, the UE shall be able to send PRACH in the active UL BWP-2 within the delay specified in TS 38.133 [6] clause 8.6.4.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.4.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.5.1.4.1-1.

**Table 11.4.5.1.4.1-1: Supported test configurations for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Config | Description |
|---|---|
| 11.4.5.1-1 | With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |

Configure the test equipment and the DUT according to the parameters in Table 11.4.5.1.4.1-2.

**Table 11.4.5.1.4.1-2: Initial conditions for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable Ues without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.4.5.1.4.1-3.

2. Message contents are defined in clause 11.4.5.1.4.3.

3. The test scenario comprises of one NR PCell (Cell 1) with CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 are configured according to clause C.1.2 and C.1.3.

4. Before the test starts:

   - UE is connected to Cell 1 on radio channel 1.

   - UE is configured with 2 different UE-specific downlink and uplink bandwidth parts: DL BWP-1, DL BWP-2, UL BWP-1 and UL BWP-2 before starting the test. DL BWP-1 and DL BWP-2 always include bandwidth of the initial DL BWP and SSB. UL BWP-1 and UL BWP-2 always include bandwidth of the SRS.

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is DL BWP-1.

   - UE is indicated in *firstActiveUplinkBWP-Id* that the active UL BWP is UL BWP-1.

   - UE is configured with *LBT-FailureRecoveryConfig* parameters for Cell 1.

All cells have constant signal levels throughout the test.

**Table 11.4.5.1.4.1-3: General test parameters for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *lbt-FailureDetectionTimer* | ms | 80 | Parameter configured by IE: *LBT-FailureRecoveryConfig* [13] |
| *lbt-FailureInstanceMaxCount* | | 4 | Parameter configured by IE: *LBT-FailureRecoveryConfig* [13] |
| T1 | s | 0.1 | During T1 consistent LBT failure is detected on active UL BWP-1 |
| T2 | s | 0.1 | During T2 UE sends PRACH on active UL BWP-2 |

### 11.4.5.1.4.2 Test procedure

Cell 1 has constant signal level throughout the test. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 11.4.5.1.4.1-3 and 11.4.5.1-5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth

parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, and as the active UL BWP using *firstActiveUplinkBWP-Id* according to Table 11.4.5.1.4.3-2. UE is configured with *LBT-FailureRecoverConfig* parameters for Cell 2 according to Table 11.4.5.1.4.3-5, PRACH configuration on UL BWP-2 according to Table 11.4.5.1.4.3-4 and periodic SRS transmissions on UL BWP-1 according to Tables 11.4.5.1.4.3-4 and 11.4.5.1.5-2.

4. The UE shall transmit an *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.4.5.1.5-1. T1 starts.

5. During T1 the UE shall perform UL CCA before each SRS transmission. The parameter UL CCA probability $P_{CCA}$ is set to 0 during T1. This requires the test system to set energy level above the detection level during portion of the UL slot where the UE performs UL CCA. This in turn forces the UE to fail the UL CCA. The UE consistently fails UL CCA during T1 and is therefore unable to transmit SRS.

6. When T1 expires T2 starts. The SS shall change the UL CCA probability $P_{CCA}$ to 1 during T2. This will make the SS to not occupy the channel anymore.

7. The UE shall attempt to recover the link by transmitting PRACH on UL BWP-2. If the UE transmits PRACH on UL BWP-2 within 21.5ms from the start of T2 (for UE capable of *bwp-SwitchingDelay type1*) or within 23ms from the start of T2 (for UE capable of *bwp-SwitchingDelay type2*), then the number of successful tests is increased by one. If the UE does not transmit PRACH on UL BWP-2 during the required time, the number of failures is increased by one.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1), then send an *RRCRelease* message to release the PCell, then the UE is switched OFF/ON, then proceed with step 1.

9. Repeat steps 2-8 for until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.4.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.4.5.1.4.3-1: Common Exception messages for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.5.1.4.3-1A: *RRCReconfiguration* (Step3) for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 11.4.5.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.1.4.3-1B: *CellGroupConfig* (Table 11.4.5.1.4.3-1A) for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 11.4.5.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 11.4.5.1.4.3-2: *ServingCellConfig* (Table 11.4.5.1.4.3-1B) for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 11.4.5.1.4.3-3 | BWP1 |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 11.4.5.1.4.3-3 | BWP2 |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 11.4.5.1.4.3-4 | BWP1 |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 11.4.5.1.4.3-4 | BWP2 |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.1.4.3-3: *BWP-Downlink* (Table 11.4.5.1.4.3-2) for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| } | | | |
| } | | | |

**Table 11.4.5.1.4.3-4: *BWP-Uplink* (Table 11.4.5.1.4.3-2) for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| rach-ConfigCommon CHOICE { | | | |
| setup | RACH-ConfigCommon | Table A.7.1A.1-1 | BWP2 |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| srs-Config CHOICE { | | | BWP1 |
| setup | SRS-Config | Table 11.4.5.1.5-2 | |
| } | | | |
| lbt-FailureRecoveryConfig-r16 CHOICE { | | | BWP2 |
| setup | LBT-FailureRecoveryConfig-r16 | Table 11.4.5.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.1.4.3-5: *LBT-FailureRecoveryConfig* for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA DC**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-64A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LBT-FailureRecoveryConfig-r16 ::= SEQUENCE { | | | |
| lbt-FailureInstanceMaxCount-r16 | n4 | | |
| lbt-FailureDetectionTimer-r16 | ms80 | | |
| } | | | |

### 11.4.5.1.5 Test requirements

Tables 11.4.5.1.5-1 and 11.4.5.1.5-2 define the primary level settings including test tolerances for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA.

**Table 11.4.5.1.5-1: NR Cell specific test parameters for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | Config 1, 2 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | Config 1, 2 | | 40 MHz: $N_{RB,c}$ = 106 | |

| | | | | | |
|---|---|---|---|---|---|
| DL CCA model | | Config 1, 2 | | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1, 2 | | As specified in clause D.7.2.2 | |
| Active BWP ID | | Config 1, 2 | | 1, 2 | |
| Initial DL BWP Configuration | | Config 1, 2 | | DLBWP.0.2 Note 4 | |
| Active DL BWP-1 Configuration | | Config 1, 2 | | DLBWP.1.1 Note 4 | |
| Active DL BWP-2 Configuration | | Config 1, 2 | | DLBWP.1.3 Note 4 | |
| Initial UL BWP Configuration | | Config 1, 2 | | ULBWP.0.2 Note 4 | |
| Active UL BWP-1 Configuration | | Config 1, 2 | | ULBWP.1.1 Note 4 | |
| Active UL BWP-2 Configuration | | Config 1, 2 | | ULBWP.1.3 Note 4 | |
| PDSCH Reference measurement channel | | Config 1, 2 | | SR.1.1 CCA | |
| RMSI CORESET parameters | | Config 1, 2 | | CR.1.1 CCA | |
| Dedicated CORESET parameters | | Config 1, 2 | | CCR.1.1 CCA | |
| OCNG Patterns | | Config 1, 2 | | OP.1 | |
| SSB Configuration | Semi- static channel access | Config 1, 2 | | SSB.1 CCA | |
| | Dynamic channel access | Config 1, 2 | | SSB.2 CCA | |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 FR1 | |
| Correlation Matrix and Antenna Configuration | | Config 1, 2 | | 1x2 Low | |
| TRS Configuration | | Config 1, 2 | | TRS.1.2 TDD | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | Config 1, 2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_1}$) | | Config 1, 2 | | 1 | 1 |
| DL CCA model probability for dynamic static channel access ($P_{CCA_DL_2}$) | | Config 1, 2 | | 1 | 1 |
| UL CCA probability ($P_{CCA_UL}$) | | Config 1, 2 | | 0 | 1 |
| PRACH configuration | | Config 1, 2 | | N/A | Table A.7.1A.1-1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note 2 | | Config 1, 2 | dBm/SCS | -101 | |
| SS-RSRP Note 3 | | Config 1, 2 | dBm/SCS | -84 | |
| $\hat{E}_s/I_{ot}$ | | Config 1, 2 | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | Config 1, 2 | dB | 17 | |
| Io Note3 | | Config 1, 2 | dBm/ 38.16MHz | -52.86 | |
| Propagation Condition | | | | AWGN | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Note 5: Parameters $P_{CCA_DL}$, $P_{CCA_DL_1}$, $P_{CCA_DL_2}$ and $P_{CCA_UL}$ are defined in section D.7.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.4.5.1.5-2: Sounding Reference Symbol Configuration for NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA**

| Field | Value | Comment |
|---|---|---|
| *c-SRS* | 24 | Frequency hopping is disabled |
| *b-SRS* | 0 | |
| *b-hop* | 0 | |
| *freqDomainPosition* | 0 | Frequency domain position of SRS |
| *freqDomainShift* | 0 | |
| *groupOrSequenceHopping* | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | sl5=4 for SCS 30kHz | Once every 5 slots |
| *pathlossReferenceRS* | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| *usage* | Codebook | Codebook based UL transmission |
| *startPosition* | 0 | resourceMapping setting: SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | n1 | |
| *repetitionFactor* | n1 | |
| *combOffset-n2* | 0 | transmissionComb setting |
| *cyclicShift-n2* | 0 | |
| *nrofSRS-Ports* | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

The UE capable of *bwp-SwitchingDelay type1* [13] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PCell) less than 21.5 ms from the beginning of time period T1.

The UE capable of *bwp-SwitchingDelay type2* [13] shall start to transmit the PRACH on active UL BWP-2 of Cell 2 (PCell) less than 23 ms from the beginning of time period T1.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The above delay is calculated as follows:

The active UL BWP switch delay from UL BWP-1 to UL BWP-2 can be expressed as:

$$T_{BWPswitchDelay} * T_{slot} + 1 * T_{slot} + (1 + L_3) * T_{SSB,RO} + 10 \text{ ms}$$

Where:

- $T_{BWPswitchDelay}$ = 1 ms (2 slots) and 2.5 ms (5 slots) for *bwp-SwitchingDelay* [13] *type1* and *type2* UE capabilities according to 38.133 [6] clause 8.6.4.
- $T_{slot}$ = It is the slot length. It is 0.5 ms for 30 kHz.
- L3 = It is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. L3= 0 during T2 since $P_{CCA} = 1$.
- $T_{SSB,RO}$ = 10 ms according to FR1 PRACH configuration 1.

This gives a total of 21.5 ms and 23 ms for *type1* and *type2* UE respectively.

## 11.4.5.2 DCI-based and Timer-based Active BWP Switch

### 11.4.5.2.0 Minimum conformance requirements

#### 11.4.5.2.0.1 Minimum conformance requirements for DCI-based and timer-based active BWP switch

Same as section 10.3.5.2.0.1.

#### 11.4.5.2.0.2 Minimum conformance requirements for Interruptions due to Active BWP switching

The requirements for DCI-based BWP switch, timer-based BWP switch or UL BWP switch triggered by consistent uplink CCA failures in this clause apply to the case that the BWP switch is performed on a single CC or multiple CCs.

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this clause apply for each BWP switch. Further, the requirements in this clause are applicable to UE capable of independent beam management in FR2 inter-band CA and UE capable of FR2 intra-band CA and FR1.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 11.4.5.2.0.2-2, the UE is allowed to cause interruption of up to X slots to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 11.4.5.2.0.2-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 11.4.5.2.0.2-1. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ +Y as defined in TS 38.133 [6] clause 8.6.2A.1 when BWP switch occurs on multiple CCs. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 11.4.5.2.0.2-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 11.4.5.2.0.2-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 11.4.5.2.0.2-1. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2 when BWP switch occurs on a single CC. The starting time of interruption caused by each BWP switch is only allowed within the BWP switch delay $T_{MultipleBWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2B.1 when BWP switch occurs on multiple CCs simultaneously or $T_{MultipleBWPswitchDelayTotal}$ as defined in TS 38.133 [6] clause 8.6.2B.2 when BWP switch occurs on multiple CCs over partially overlapping time period. Interruptions are not allowed during BWP switch involving any other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 11.4.5.2.0.2-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 11.4.5.2.0.2-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 11.4.5.2.0.2-1. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ defined in TS 38.133 [6] clause 8.6.3 when BWP switch occurs on a single CC. The interruption is only allowed within the delay $T_{RRCprocessingDelay}$ + $T_{BWPswitchDelayRRC}$ + $D_{RRC}$*(N-1) as defined in TS 38.133 [6] clause 8.6.3A when BWP switch occurs on multiple CCs.

When UL BWP switch is triggered by consistent uplink CCA failures [12], UE is allowed to cause interruption of up to X slots to other active serving cells due to switching its active UL BWP involving changes in any of the parameters listed in Table 11.4.5.2.0.2-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the UL BWP switch imposes changes in any of the parameters listed in Table 11.4.5.2.0.2-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range wherein the UE is performing UL BWP switching. X is defined in Table 11.4.5.2.0.2-1. The starting time of interruption is only allowed within the UL BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

**Table 11.4.5.2.0.2-1: Interruption length X**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |
| 2 | 0.25 | 3 |
| 3 | 0.125 | 5 |
| 5 | 0.03125 | 17 |
| 6 | 0.015625 | 33 |

| Note1: void |
|---|

**Table 11.4.5.2.0.2-2: Parameters which cause interruption other than SCS**

| Parameters | Comment |
|---|---|
| *locationAndBandwidth* | From TS 38.331 [13] |
| *nrofSRS-Ports* | |
| *maxMIMO-Layers-r16* | |

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.5.

## 11.4.5.2.1 NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA

### 11.4.5.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay and interruption requirements on other active serving cell defined in clause 11.4.5.2.0.

### 11.4.5.2.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 on shared channel access and 2 DL CA.

### 11.4.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.5.2.1.

### 11.4.5.2.1.4 Test description

The test scenario comprises of one PCell (Cell 1) and one SCell (Cell 2) as given in Table 11.4.5.2.4.1-3. NR Cell-specific parameters are specified in Table 11.4.5.2.1.5-1 below.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

> Time period T1 starts when a DCI format 1_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.
>
> The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 11.4.5.2.0 and starts to report valid ACK/NACK for the PCell no later than the first UL slot that occurs after the beginning of slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PCell's BWP-2 no later than the first DL slot that occurs after the beginning of slot ($i+T_{BWPswitchDelay}$).
>
> The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment will not transmit DCI format for PDSCH reception on PCell (Cell 1).

During T3,

> The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the first DL slot that occurs after the beginning of PCell's slot ($j+T_{BWPswitchDelay}$) as defined in clause 11.4.5.2.0 and starts to report valid ACK/NACK for the SCell at latest on the first UL slot that occurs after the beginning of slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PCell's BWP-1 no later than the first DL slot that occurs after the beginning of slot ($j+T_{BWPswitchDelay}$).

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

#### 11.4.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.5.2.1.4.1-1.

**Table 11.4.5.2.1.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Config | Description |
|---|---|
| 11.4.5.2.1-1 | With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 11.4.5.2.1.4.1-2.

**Table 11.4.5.2.1.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.4.5.2.1.4.1-3.
2. Message contents are defined in clause 11.4.5.2.1.4.3.
3. The test scenario comprises of two NR Cells, PCell (Cell 1) and SCell (Cell 2), both with CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 and Cell 2 is configured according to clause C.1.2 and C.1.3.
4. Before the test starts:
   - UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
   - UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
   - UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 2 before starting the test.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PCell.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

**Table 11.4.5.2.1.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two NR radio channels are used in this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| Active SCell | | Cell 2 | SCell on RF channel number 2. |
| CP length | | Normal | |
| DRX | | OFF | For both PCell and SCell |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| *bwp-InactivityTimer* | ms | 200 | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1. |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 11.4.5.2.1.4.2 Test procedure

The test consists of three successive time periods, with durations of T1, T2, and T3, respectively. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 11.4.5.2.1.4.1-3 and 11.4.5.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 11.4.5.2.1.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PCell.
4. The UE shall transmit an *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.4.5.2.1.5-1.
5. The SS shall send a DCI format 1_1 command for PCell DL BWP switch.
6. The UE shall receive the DCI format 1_1 command in PCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:
   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$); and

b) During the BWP switch delay interval checked in a), if the number of consecutive missing ACK/NACK for SCell is no more than 1 (based on Table 11.4.5.2.0.2-1).

Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. Once the UE sends valid ACK/NACK for the PCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1 on PCell:

   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$); and

   b) During the BWP switch delay interval checked in a), if the number of consecutive missing ACK/NACK for SCell is no more than 1 (based on Table 11.4.5.2.0.2-1).

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

9. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1), then send an *RRCRelease* message to release the PCell, then the UE is switched OFF/ON, then proceed with step 1.

10. Repeat steps 5-9 until the confidence level according to Annex G clause G.2.7 is achieved.

If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 11.4.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.4.5.2.1.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.5.2.1.4.3-1A: *RRCReconfiguration* (Step3) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 11.4.5.2.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-1B: *CellGroupConfig* (Table 11.4.5.2.1.4.3-1A) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 11.4.5.2.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-2: *ServingCellConfig* (Table 11.4.5.2.1.4.3-1B) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 11.4.5.2.1.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 11.4.5.2.1.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 11.4.5.2.1.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 11.4.5.2.1.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-3: *BWP-Downlink* (Table 11.4.5.2.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 11.4.5.2.1.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-4: *BWP-Uplink* (Table 11.4.5.2.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-5: *PDSCH-TimeDomainResourceAllocationList* (Table 11.4.5.2.1.4.3-6) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 11.4.5.2.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 11.4.5.2.1.4.3-6: *PDSCH-ConfigCommon* (Table 11.4.5.2.1.4.3-3) for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 11.4.5.2.1.4.3-5 | |
| } | | | |

## 11.4.5.2.1.5 Test requirements

Tables 11.4.5.2.1.4.1-3 and 11.4.5.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA.

**Table 11.4.5.2.1.5-1: NR Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA**

| **Parameter** | | | **Unit** | **Cell 1** | **Cell2** |
|---|---|---|---|---|---|
| Frequency Range | | | | FR1 | |
| Duplex mode | | Config 1 | | TDD | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 | |
| Active BWP ID | | | | 1, 2 | 0 |
| Initial DL BWP Configuration | | | | DLBWP.0.2[Note4] | |
| Initial UL BWP Configuration | | | | ULBWP.0.2[Note4] | |
| Active DL BWP-0 Configuration | | | | N.A. | DLBWP.0.2[Note4] |
| Active DL BWP-1 Configuration | | | | DLBWP.1.1[Note4] | N.A. |
| Active DL BWP-2 Configuration | | | | DLBWP.1.3[Note4] | N.A. |
| Active UL BWP-0 Configuration | | | | N.A. | ULBWP.0.2[Note4] |
| Active UL BWP-1 Configuration | | | | ULBWP.1.1[Note4] | N.A. |
| Active UL BWP-2 Configuration | | | | ULBWP.1.3[Note4] | N.A. |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 CCA | |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.3 CCA | |
| OCNG Patterns | | | | OP.1 | |
| SSB Configuration | Semi- static channel access | Config 1 | | SSB.1 CCA | |
| | Dynamic channel access | Config 1 | | SSB.2 CCA | |
| SMTC Configuration | | Config 1 | | SMTC.1 | |
| DL CCA probability ($P_{CCA_DL}$) | | Config 1 | | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| UL CCA probability ($P_{CCA_UL}$) | Config 1 | | 1 | 1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 | -101 |
| SS-RSRP Note 3 | Config 1 | dBm/SCS | -84 | -84 |
| $\hat{E}_s/I_{ot}$ | Config 1 | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | Config 1 | dB | 17 | 17 |
| Io Note3 | Config 1 | dBm/38.16MHz | -52.86 | -52.86 |
| Propagation Condition | | | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [12].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 11.4.5.2.0.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first DL slot that occurs after the beginning of DL slot ($i+ T_{BWPswitchDelay}+k1$), ($j+ T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 11.4.5.2.2 NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA

#### 11.4.5.2.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay and interruption requirements on other active serving cell defined in clause 11.4.5.2.0.

#### 11.4.5.2.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 on shared channel access.

#### 11.4.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.5.2.2.

#### 11.4.5.2.2.4 Test description

The test scenario comprises of one PCell (Cell 1) as given in Table 11.4.5.2.4.1-3. NR Cell-specific parameters are specified in Table 11.4.5.2.2.5-1 below.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

> Time period T1 starts when a DCI format 1_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.
>
> The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 11.4.5.2.0 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on Cell1's BWP-2 starting from the first DL slot that occurs after the beginning of slot ($i+T_{BWPswitchDelay}$).

During T2, the test equipment will not transmit DCI format for PDSCH reception on Cell1.

During T3,

> The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.
>
> The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's slot ($j+T_{BWPswitchDelay}$) as defined in clause 11.4.5.2.0 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on Cell1's BWP-1 starting from the first DL slot that occurs after the beginning of slot ($j+T_{BWPswitchDelay}$).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

#### 11.4.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.5.2.2.4.1-1.

**Table 11.4.5.2.2.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Config | Description |
|---|---|
| 11.4.5.2.2-1 | With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: A UE which fulfils the requirements in test case 11.4.5.2.1 can skip test case 11.4.5.2.2.<br>Note 3: The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 11.4.5.2.2.4.1-2.

**Table 11.4.5.2.2.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.4.5.2.2.4.1-3.
2. Message contents are defined in clause 11.4.5.2.2.4.3.
3. The test scenario comprises of one NR Cell, PCell (Cell 1), under CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 is configured according to clause C.1.2 and C.1.3.
4. Before the test starts:
   - UE is connected to Cell 1 on radio channel 1.
   - UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
   - UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

The cell has constant signal levels throughout the test.

**Table 11.4.5.2.2.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| *bwp-InactivityTimer* | ms | 200 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 11.4.5.2.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 11.4.5.2.2.4.1-3 and 11.4.5.2.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 11.4.5.2.2.4.3-2. UE is configured with a *bwp-InactivityTimer* timer value for PCell.

4. The UE shall transmit an *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.4.5.2.2.5-1.

5. The SS shall send a DCI format 1_1 command for PCell DL BWP switch.

6. The UE shall receive the DCI format 1_1 command in PCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2. If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($i+T_{BWPswitchDelay}+k_1$), the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

7. Once the UE sends valid ACK/NACK for the PCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PCell.

8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1 on PCell. If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot ($j+T_{BWPswitchDelay}+k_1$), the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$).

9. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$), then send an *RRCRelease* message to release the PCell, then the UE is switched OFF/ON, then proceed with step 1.

10. Repeat steps 5-9 until the confidence level according to Annex G clause G.2.7 is achieved.

If all subtests pass, the test passes. If one subtest fails, the test fails.

### 11.4.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.4.5.2.2.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.5.2.2.4.3-1A: *RRCReconfiguration* (Step3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 11.4.5.2.2.4.3-1B | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-1B: *CellGroupConfig* (Table 11.4.5.2.2.4.3-1A) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 11.4.5.2.2.4.3-2 | |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-2: *ServingCellConfig* (Table 11.4.5.2.2.4.3-1B) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 11.4.5.2.2.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 11.4.5.2.2.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |

| | | | |
|---|---|---|---|
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 11.4.5.2.2.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 11.4.5.2.2.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-3: *BWP-Downlink* (Table 11.4.5.2.2.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 11.4.5.2.2.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-4: *BWP-Uplink* (Table 11.4.5.2.2.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-5: *PDSCH-TimeDomainResourceAllocationList* (Table 11.4.5.2.2.4.3-6) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 11.4.5.2.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 11.4.5.2.2.4.3-6: *PDSCH-ConfigCommon* (Table 11.4.5.2.2.4.3-3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 11.4.5.2.2.4.3-5 | |
| } | | | |

### 11.4.5.2.2.5 Test requirements

Tables 11.4.5.2.2.4.1-3 and 11.4.5.2.2.5-1 define the primary level settings including test tolerances for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA.

**Table 11.4.5.2.2.5-1: NR Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | TDD |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | Config 1 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | Config 1 | | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | Config 1 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | Config 1 | | ULBWP.1.1 Note 4 |

| | | | | |
|---|---|---|---|---|
| Active UL BWP-2 Configuration | | Config 1 | | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 CCA |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.3 CCA |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | Semi- static channel access | Config 1 | | SSB.1 CCA |
| | Dynamic channel access | Config 1 | | SSB.2 CCA |
| SMTC Configuration | | Config 1 | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | | 1x2 Low |
| TRS Configuration | | Config 1 | | TRS.1.2 TDD |
| DL CCA probability ($P_{CCA_DL}$) | | Config 1 | | 1 |
| UL CCA probability ($P_{CCA_UL}$) | | Config 1 | | 1 |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1 | dBm/SCS | -101 |
| SS-RSRP Note 3 | | Config 1 | dBm/SCS | -84 |
| $\hat{E}_s/I_{ot}$ | | Config 1 | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | Config 1 | dB | 17 |
| Io Note3 | | Config 1 | dBm/38.16 MHz | -52.86 |
| Propagation Condition | | | | AWGN |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed Cell1 active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 11.4.5.3 RRC-based Active BWP Switch

### 11.4.5.3.0 Minimum conformance requirements

#### 11.4.5.3.0.1 Minimum conformance requirements for RRC-based active BWP switch

Same as section 10.3.5.3.0.1.

### 11.4.5.3.1 NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA

#### 11.4.5.3.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch under CCA defined in clause 11.4.5.3.0.1.

#### 11.4.5.3.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier, BWP adaptation of at least 2BWPs on shared channel access.

#### 11.4.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.5.3.1.

#### 11.4.5.3.1.4 Test description

One cell is deployed in the test, the NR PCell (Cell 1) under CCA transmitting SSBs in DBT windows according to DL CCA model. The test parameters for the cell is given in Table 11.4.5.3.1.4.1-3 and 11.4.5.3.1.5-1 below.

The test consists of 1 time period, with duration of T1.

During T1,

> Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.
>
> The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ as defined in clause 11.4.5.3.0.1 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ + k1 on BWP-1 of final condition. The UE shall be continuously scheduled on PCell's BWP-1 of final condition starting from the first DL slot right after slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$.
>
> $T_{\text{RRCprocessingDelay}}$ and $T_{\text{BWPswitchDelayRRC}}$ are defined in clause 11.4.5.3.0.1.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received is received.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.4.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.5.3.1.4.1-1.

**Table 11.4.5.3.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Config | Description |
|---|---|
| 11.4.5.3.1-1 | With CCA: NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE supporting SA operation with only NR band(s) with shared spectrum access is required to be tested. | |

Configure the test equipment and the DUT according to the parameters in Table 11.4.5.3.1.4.1-2.

**Table 11.4.5.3.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.4.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.4.5.3.1.4.1-3.
2. Message contents are defined in clause 11.4.5.3.1.4.3.
3. The test scenario comprises of one NR Cell, PCell (Cell 1), under CCA transmitting SSBs in DBT windows according to DL CCA model. The power levels and settings for Cell 1 is configured according to clause C.1.2 and C.1.3.

4. Before the test starts:

   - UE is connected to Cell 1 on radio channel 1.
   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 1.

All cells have constant signal levels throughout the test.

**Table 11.4.5.3.1.4.1-3: General test parameters for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DL CCA model | | As specified in clause D.7.2.1 | |
| UL CCA model | | As specified in clause D.7.2.2 | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

#### 11.4.5.3.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 11.4.5.3.1.4.1-3 and 11.4.5.3.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 11.4.5.3.1.5-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.4.5.3.1.5-1.

5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for PCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 11.4.5.3.1.5-1. T1 starts.

6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration:

7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i+X+k_1$ then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where,

   - X = 52 for test configuration 11.4.5.3.1-1 and 11.4.5.3.1-2;

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1), then send an *RRCRelease* message to release the PCell, then the UE is switched OFF/ON, then proceed with step 1.

9. Repeat steps 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.4.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.4.5.3.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.4.5.3.1.4.3-1A: *RRCReconfiguration* (Step 3, Step 5) for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---|---|---|
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | Table 11.4.5.3.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |

**Table 11.4.5.3.1.4.3-1B: *CellGroupConfig* (Table 11.4.5.3.1.4.3-1A) for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR PCell | | |
| spCellConfigDedicated | ServingCellConfig | Table 11.4.5.3.1.4.3-1C | |
| } | | | |
| } | | | |

**Table 11.4.5.3.1.4.3-1C: *ServingCellConfig* (Table 11.4.5.3.1.4.3-1B) for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 11.4.5.3.1.4.3-1D | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 11.4.5.3.1.4.3-1E | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

**Table 11.4.5.3.1.4.3-1D: *BWP-Downlink* (Table 11.4.5.3.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 11.4.5.3.1.4.3-1E: *BWP-Uplink* (Table 11.4.5.3.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

### 11.4.5.3.1.5 Test requirements

Tables 11.4.5.3.1.4.1-3 and 11.4.5.3.1.5-1 define the primary level settings including test tolerances for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA.

**Table 11.4.5.3.1.5-1: NR Cell specific test parameters for NR SA FR1 RRC-based DL active BWP switch of Cell with non-DRX under CCA**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1 | | TDD |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1 | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1 | | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | Config 1 | | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | Config 1 | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | Config 1 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA |
| RMSI CORESET parameters | | Config 1 | | CR.1.1 CCA |
| Dedicated CORESET parameters | | Config 1 | | CCR.1.3 CCA |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | Semi-static channel access | Config 1 | | SSB.1 CCA |

| | | | |
|---|---|---|---|
| Dynamic channel access | Config 1 | | SSB.2 CCA |
| SMTC Configuration | | | SMTC.1 |
| TRS Configuration | Config 1 | | TRS.1.2 TDD |
| DL CCA probability ($P_{CCA_DL}$) | Config 1 | | 1 |
| UL CCA probability ($P_{CCA_UL}$) | Config 1 | | 1 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 |
| SS-RSRP Note 3 | Config 1 | dBm/SCS | -84 |
| $\hat{E}_s/I_{ot}$ | Config 1 | dB | 17 |
| $\hat{E}_s/N_{oc}$ | Config 1 | dB | 17 |
| Io Note3 | Config 1 | dBm/38.16MHz | -52.86 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where,

$T_{RRCprocessingDelay}$ = 10 ms, is the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13];

$T_{BWPSwitchDelayRRC}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 0.5 ms for SCS = 30kHz.

*k1* is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ =

16 ms (32 slots), for SCS = 30kHz.

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

# 11.5 Measurement procedure

## 11.5.1 Intra-frequency measurements

### 11.5.1.0 Minimum Conformance Requirements

#### 11.5.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

##### 11.5.1.0.1.1 Intra-frequency cell identification

Same Minimum Conformance Requirements as in clause 10.4.1.0.1.1.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.1.

##### 11.5.1.0.1.2 Measurement period

Same Minimum Conformance Requirements as in clause 10.4.1.0.1.2.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.2.

#### 11.5.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

##### 11.5.1.0.2.1 Intra-frequency cell identification

Same Minimum Conformance Requirements as in clause 10.4.1.0.2.1

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.1.

##### 11.5.1.0.2.2 Intra-frequency measurement period

Same Minimum Conformance Requirements as in clause 10.4.1.0.2.2

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.2.

#### 11.5.1.0.3 Minimum conformance requitements for intra-frequency RSSI and channel occupancy measurements

##### 11.5.1.0.3.1 Intra-frequency RSSI measurements

Same Minimum Conformance Requirements as in clause 10.4.1.0.3.1.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.1.

##### 11.5.1.0.3.2 Intra-frequency channel occupancy measurements

Same Minimum Conformance Requirements as in clause 10.4.1.0.3.2.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.2.

### 11.5.1.1 SA FR1 Event-triggered reporting tests on PCC without gaps under non-DRX

#### 11.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event without gaps in non DRX with CCA. This test will partly verify the intra-frequency cell search requirements.

#### 11.5.1.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and intra-frequency measurements on shared channel access.

#### 11.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.1.1.

#### 11.5.1.1.4 Test description

Two cells are deployed in the test on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PCell (Cell 1) and a neighbour cell (Cell 2). The test parameters for the two cells are given in Table 11.5.1.1.4.1-1 and 11.5.1.1.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

.

##### 11.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.1.1.4.1-1.

**Table 11.5.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 11.5.1.1-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.1.1.4.1-2.

**Table 11.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.1.1.4.1-3.
2. Message contents are defined in clause 11.5.1.1.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.1.1.4.1-3 General test parameters**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Active cell | | | 1 | Cell 1 | |
| Neighbour cell | | | 1 | Cell 2 | Cell to be identified. |
| RF Channel Number | | | 1 | 1: Cell 1 and Cell 2 | |
| DL CCA model | | | 1 | As specified in clause D.7.2.1 | |
| UL CCA model | | | 1 | As specified in clause D.7.2.12 | |
| SSB configuration | Semi-static channel access Note 1,3 | | 1 | SSB.1 CCA | |

| | | | | | |
|---|---|---|---|---|---|
| | Dynamic channel access Note 2,3 | | 1 | SSB.2 CCA | |
| SMTC configuration | | | 1 | SMTC.1 | |
| A3-Offset | | dB | 1 | -4.5 | |
| CP length | | | 1 | Normal | |
| Hysteresis | | dB | 1 | 0 | |
| Time To Trigger | | s | 1 | 0 | |
| Filter coefficient | | | 1 | 0 | L3 filtering is not used |
| DRX | | | 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | | 1 | 3 μs | Synchronous cells |
| T1 | | s | 1 | 5 | |
| T2 | | s | 1 | 5 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. | | | | | |

#### 11.5.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.1.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message with event A3 with the corresponding offset according to Table 11.5.1.1.4.1-3.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.1.1.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in 11.5.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 842ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   Or

- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.1.1.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset set as per Table 11.5.1.1.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

#### 11.5.1.1.5 Test requirements

Table 11.5.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.1.1.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1 | $P_{CCA_DL_1}$=0.75 | | $P_{CCA_DL_1}$=0.75 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1 | $P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | | 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | 1 | 7 | | 7 | |
| $W_{CCA_DL}$ | ms | 1 | 600 | | 600 | |
| PDSCH RMC configuration | | 1 | SR.1.1 CCA | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 CCA | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 CCA | | N/A | |
| OCNG Patterns | | 1 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1 | -91 | -91 | -Infinity | -91 |
| Io | dBm/38.16 MHz | 1 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

The UE shall send one Event A3 triggered measurement report with a measurement reporting delay less than 840 ms from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.5.1.2 SA FR1 Event-triggered reporting tests on PCC without gaps under DRX

### 11.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event without gaps in DRX and with CCA. This test will partly verify the intra-frequency cell search requirements.

### 11.5.1.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U, long DRX and intra-frequency measurements on shared channel access.

#### 11.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.1.2.

#### 11.5.1.2.4 Test description

Two cells are deployed in the test on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PCell (Cell 1) and a neighbour cell (Cell 2). The test parameters for the two cells are given in Table 10.5.1.1.4.1-1 and 10.5.1.1.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.1.2.4.1-1.

**Table 11.5.1.2.4.1-1: Supported test configuration**

| Configuration | Description |
|---|---|
| 11.5.1.2-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.1.2.4.1-2.

**Table 11.5.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.1.2.4.1-3.
2. Message contents are defined in clause 11.5.1.2.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.1.2.4.1-3 General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test | |
| Active cell | | 1 | Cell 1 | | |
| Neighbour cell | | 1 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1 | 1: Cell 1 and Cell 2 | | |
| DL CCA model | | 1 | As specified in clause D.7.2.1 | | |
| UL CCA model | | 1 | As specified in clause D.7.2.2 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SSB configuration | Semi-static channel access Note 1,3 | | 1 | SSB.1 CCA | | |
| | Dynamic channel access Note 2,3 | | 1 | SSB.2 CCA | | |
| SMTC configuration | | | 1 | SMTC.1 | | |
| A3-Offset | | dB | 1 | -4.5 | | |
| CP length | | | 1 | Normal | | |
| Hysteresis | | dB | 1 | 0 | | |
| Time To Trigger | | s | 1 | 0 | | |
| Filter coefficient | | | 1 | 0 | | L3 filtering is not used |
| DRX | | | 1 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | | 1 | 3 μs | | Synchronous cells |
| T1 | | s | 1 | 5 | | |
| T2 | | s | 1 | 5 | 15 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. | | | | | | |

#### 11.5.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.1.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message with event A3 with the corresponding offset according to Table 11.5.1.2.4.1-3.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.1.2.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in 11.5.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1202ms in test 1 and10242 ms in test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

Or
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.1.2.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-4 with A3-offset set as per Table 11.5.1.1.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.7-1 with Condition DRX.1 and Offset for test 1<br>Table H.3.7-1 with Condition DRX.7 and Offset for test 2 |

#### 11.5.1.2.5 Test requirements

Table 11.5.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.1.2.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1 | $P_{CCA_DL_1}$=0.75 | | $P_{CCA_DL_1}$=0.75 | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1 | $P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | | 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | 1 | Test 1: $L_{CCA_DL}$ = 5<br>Test 2: $L_{CCA_DL}$ = 3 | | Test 1: $L_{CCA_DL}$ = 5<br>Test 2: $L_{CCA_DL}$ = 3 | |
| $W_{CCA_DL}$ | ms | 1 | Test 1:<br>$W_{CCA_DL}$ = 600<br>Test 2:<br>$W_{CCA_DL}$ = 5120 | | Test 1:<br>$W_{CCA_DL}$ = 600<br>Test 2:<br>$W_{CCA_DL}$ = 5120 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH RMC configuration | | 1 | SR.1.1 CCA | | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 CCA | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 CCA | | N/A | |
| OCNG Patterns | | 1 | OP.1 | | OP.1 | |
| TRS Configuration | | 1 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1 | -91 | -91 | -Infinity | -91 |
| Io | dBm/38.16 MHz | 1 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition | | 1 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

In test 1, the UE shall send one Event A3 triggered measurement report with a measurement reporting delay less than 1200 ms from the beginning of time period T2.

In test 2, the UE shall send one Event A3 triggered measurement report with a measurement reporting delay less than 10240 ms from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.5.2 Inter-frequency measurements

### 11.5.2.0 Minimum Conformance Requirements

#### 11.5.2.0.1 Inter-frequency cell identification

Same Minimum Conformance Requirements as in clause 10.4.2.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.4.

#### 11.5.2.0.2 Inter-frequency measurements

Same Minimum Conformance Requirements as in clause 10.4.2.0.2

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.5.

#### 11.5.2.0.3 Inter-frequency RSSI measurements

Same Minimum Conformance Requirements as in clause 10.4.2.0.3

The normative reference for this requirement is TS 38.133 [6] clause 9.3A.9.

### 11.5.2.1 Void

### 11.5.2.2 Void

### 11.5.2.3 NR SA FR1-FR1 Event triggered reporting tests with CCA without SSB time index detection when DRX is not used

#### 11.5.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non DRX without SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA.

#### 11.5.2.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

#### 11.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.3.

#### 11.5.2.3.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.3.4.1-1 and 11.5.2.3.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.3.4.1-1.

**Table 11.5.2.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 11.5.2.3-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.3.4.1-2.

**Table 11.5.2.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.3.4.1-3.
2. Message contents are defined in clause 11.5.2.3.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.3.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells | | Config 1 | NR cell 1 with CCA (PCell) | | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1 | NR cell 2 with CCA | | NR cell 2 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1 | As specified in clause A.3.26.2.1 | | |
| UL CCA model | | Config 1 | As specified in clause A.3.26.2.2 | | |
| Gap Pattern Id | | Config 1 | 0 | | |
| Measurement gap offset | | Config 1 | 9 | | |
| A3-Offset | dB | Config 1 | -6 | | |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 1.7 | | |

### 11.5.2.3.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e.

$P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

11. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.3.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.3.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1602 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.3.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.3.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

11.5.2.3.5 Test requirements

Table 11.5.2.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.3.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|---|
| | | | | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | Config 1 | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | Config 1 | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | Config 1 | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1 | As defined in A.3.28.1 | | As defined in A.3.28.1 | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.4 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in table 9.3A.4-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in table 9.3A.5-1.

MGRP = 40 ms.

SMTC period = 20 ms.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is used

### 11.5.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA.

### 11.5.2.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.4.

### 11.5.2.4.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.4.4.1-1 and 11.5.2.4.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 11.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.4.4.1-1.

**Table 11.5.2.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 11.5.2.4-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.4.4.1-2.

**Table 11.5.2.4.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9 -1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.4.4.1-3.
2. Message contents are defined in clause 11.5.2.4.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.4.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells | | Config 1 | NR cell 1 with CCA (PCell) | | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1 | NR cell 2 with CCA | | NR cell 2 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1 | As specified in TS 38.133 [6] clause A.3.26.2.1 | | |
| UL CCA model | | Config 1 | As specified in TS 38.133 [6] clause A.3.26.2.2 | | |
| Gap Pattern Id | | Config 1 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 9 | | |
| A3-Offset | dB | Config 1 | -6 | | |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.2 | As specified in clause TS 38.133 [6] A.3.3 |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 2.5 | 17 | |

**Table 11.5.2.4.4.1-4: DRX-Configuration**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | Ms640 | |

| | | | |
|---|---|---|---|
| shortDRX | disable | disable | |

**Table 11.5.2.4.4.1-5: *TimeAlignmentTimer* -Configuration**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 11.5.2.4.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.4.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.4.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for Test 1 or 16642 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.4.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 or DRX.2 for Test 2<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.4.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

## 11.5.2.4.5 Test requirements

Table 11.5.2.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.4.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | Config 1 | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | Config 1 | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | Config 1 | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1 | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel access Note 6,7 | | Config 1 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1 | As defined in A.3.28.1 | | As defined in A.3.28.1 | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.4 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used

### 11.5.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX with SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA.

### 11.5.2.5.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.5.

### 11.5.2.5.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.5.4.1-1 and 11.5.2.5.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 11.5.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.5.4.1-1.

**Table 11.5.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 11.5.2.5-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.5.4.1-2.

**Table 11.5.2.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.5.4.1-3.
2. Message contents are defined in clause 11.5.2.5.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.5.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells | | Config 1 | NR cell 1 with CCA (PCell) | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1 | NR cell 2 with CCA | NR cell 2 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1 | As specified in clause A.3.26.2.1 | |
| UL CCA model | | Config 1 | As specified in clause A.3.26.2.2 | |
| Gap Pattern Id | | Config 1 | 0 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 9 | |
| A3-Offset | dB | Config 1 | -6 | |
| Hysteresis | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |

| | | | | |
|---|---|---|---|---|
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 2 | |

#### 11.5.2.5.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

12. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.5.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.5.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.5.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

11. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

12. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

13. Depending on the choice in Step 7, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

14. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.5.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.5.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |

11.5.2.5.5 Test requirements

Table 11.5.2.5.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.5.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | Config 1 | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | Config 1 | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | Config 1 | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 CCA | | | |
| SSB parameters | | | Config 1 | SSB.1 CCA | | SSB.1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Semi-static channel access Note 5,7 | | | | | | |
| | Semi-static channel access Note 5,7 | | Config 1 | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1 | As defined in A.3.28.1 | | As defined in A.3.28.1 | |
| SMTC configuration | | | Config 1 | SMTC.1 | | SMTC.4 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1 | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used

### 11.5.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX with SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA.

### 11.5.2.6.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.6.

### 11.5.2.6.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.6.4.1-1 and 11.5.2.6.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

11.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.6.4.1-1.

**Table 11.5.2.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 11.5.2.6-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.6.4.1-2.

**Table 11.5.2.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.6.4.1-3.
2. Message contents are defined in clause 11.5.2.6.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.6.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR1 NR carrier frequencies are used. Channels 1 and 2 are with CCA. |
| Active cells | | Config 1 | NR cell 1 with CCA (PCell) | | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1 | NR cell 2 with CCA | | NR cell 2 is on NR RF channel number 2 with CCA. |
| DL CCA model | | Config 1 | As specified in clause A.3.26.2.1 | | |
| UL CCA model | | Config 1 | As specified in clause A.3.26.2.2 | | |
| Gap Pattern Id | | Config 1 | 0 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 9 | | |
| A3-Offset | dB | Config 1 | -6 | | |
| Hysteresis | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.2 | As specified in clause A.3.3 |

| | | | | | |
|---|---|---|---|---|---|
| Time offset between serving and neighbour cells | | Config 1 | 3μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 3 | 20 | |

**Table 11.5.2.6.4.1-4: DRX-Configuration**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | Ms640 | |
| shortDRX | disable | disable | |

**Table 11.5.2.6.4.1-5: *TimeAlignmentTimer* -Configuration**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 11.5.2.6.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

13. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.6.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.6.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.6.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2882 ms for Test 1 or 19842 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

15. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

16. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

17. Depending on the choice in Step 7, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

18. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.6.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 for Test 1 or DRX.2 for Test 2<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.6.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |

#### 11.5.2.6.5 Test requirements

Table 11.5.2.6.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.6.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1 | 1 | | 2 | |

| | | | | | |
|---|---|---|---|---|---|
| Duplex mode | | | Config 1 | TDD | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1 | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | Config 1 | Config 1 | DLBWP.0.1 | NA |
| | Initial UL BWP | Config 1 | | ULBWP.0.1 | NA |
| | Dedicated DL BWP | Config 1 | | DLBWP.1.1 | NA |
| | Dedicated UL BWP | Config 1 | | ULBWP.1.1 | NA |
| TRS configuration | | | Config 1 | TRS.1.2 TDD | NA |
| OCNG Patterns | | | Config 1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 CCA | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1 | SSB.1 CCA | SSB.1 CCA |
| | Semi-static channel access Note 5,7 | | Config 1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1 | As defined in A.3.28.1 | As defined in A.3.28.1 |
| SMTC configuration | | | Config 1 | SMTC.1 | SMTC.4 |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1 | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| | Dynamic channel access Note 6,7 | | Config 1 | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| $L_{CCA_DL}$ | | | Config 1 | 2 | 2 |
| $W_{CCA_DL}$ | | ms | Config 1 | $T_{PSS/SSS_sync_inter_cca}$ | $T_{PSS/SSS_sync_inter_cca}$ |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 30 | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1 | -98 | -98 |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1 | -95 | -95 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SS-RSRP Note 3 | dBm/SCS | Config 1 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.7 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

### 11.5.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX without SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements for NR cell with CCA.

### 11.5.2.7.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.7.

#### 11.5.2.7.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.7.4.1-1 and 11.5.2.7.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.5.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.7.4.1-1.

**Table 11.5.2.7.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 11.5.2.7-1 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.5.2.7-2 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.5.2.7-3 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.7.4.1-2.

**Table 11.5.2.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | WithoutLTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.7.4.1-3.
2. Message contents are defined in clause 11.5.2.7.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.7.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |

| | | | | |
|---|---|---|---|---|
| DL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.1 | |
| UL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.2 | |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 1,2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1.7 | |

#### 11.5.2.7.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

14. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.7.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.5.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.7.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

19. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

20. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

21. Depending on the choice in Step 7, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including

PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

22. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.7.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.7.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |

#### 11.5.2.7.5 Test requirements

Table 11.5.2.7.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.7.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | Config 1 | TDD | | FDD | |
| | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | Config 1 | TDDConf.1.1 CCA | | Not Applicable | |
| | | Config 2 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | Config 3 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2,3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2,3 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1,2,3 | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 3 | SSB.1 CCA | | SSB.1 FR1 | |
| | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3 | As defined in A.3.28.1 | | Not applicable | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 30 | | 15 | |
| | | | Config 3 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_DL}$=0.9375 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | NA | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91 | -91 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io[Note3] | dBm/9.36MHz | Config 1,2 | -58.49 | -58.49 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.8 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used

### 11.5.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX without SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements.

### 11.5.2.8.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.8.

#### 11.5.2.8.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.8.4.1-1 and 11.5.2.8.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.8.4.1-1.

**Table 11.5.2.8.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 11.5.2.8-1 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.5.2.8-2 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.5.2.8-3 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.8.4.1-2.

**Table 11.5.2.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9 -1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.8.4.1-3.
2. Message contents are defined in clause 11.5.2.8.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.8.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |

| | | | | | |
|---|---|---|---|---|---|
| DL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.1 | | |
| UL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.2 | | |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | DRX.2 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 1,2,3 | 3µs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 2.5 | 17 | |

**Table 11.5.2.8.4.1-4: DRX-Configuration**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | Ms640 | |
| shortDRX | disable | disable | |

**Table 11.5.2.8.4.1-5: *TimeAlignmentTimer* -Configuration**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 11.5.2.8.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

15. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.8.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.8.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.8.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2402 ms for Test 1 and 16642 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

23. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

24. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

25. Depending on the choice in Step 7, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

26. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.8.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.8.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |

| | | | |
|---|---|---|---|
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |

### 11.5.2.8.5 Test requirements

Table 11.5.2.8.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.8.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | | Unit | Test configuration | Cell 1 | | | | Cell 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | | | 2 | | | |
| Duplex mode | | | Config 1 | TDD | | | | FDD | | | |
| | | | Config 2,3 | TDD | | | | TDD | | | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | | | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 CCA | | | | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.1.1 CCA | | | | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | | | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | | | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | | | NA | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | NA | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | NA | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | NA | | | |
| TRS configuration | | | Config 1,2,3 | TRS.1.2 TDD | | | | NA | | | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | | | OP.1 | | | |
| PDSCH Reference measurement channel | | | Config 1,2,3 | SR.1.1 CCA | | | | | | | |
| CORESET Reference Channel | | | Config 1,2,3 | CR.1.1 CCA | | | | | | | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | | | SSB.1 FR1 | | | |
| | | | Config 3 | SSB.1 CCA | | | | SSB.2 FR1 | | | |
| | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.2 CCA | | | | SSB.1 FR1 | | | |
| | | | Config 3 | SSB.2 CCA | | | | SSB.2 FR1 | | | |
| DBT window configuration | | | Config 1,2,3 | As defined in A.3.28.1 | | | | Not applicable | | | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | | | SMTC.4 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 30 | | | | 15 | | | |
| | | | Config 3 | 30 | | | | 30 | | | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_DL}$=0.9375 | | | | NA | | | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | NA | | | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | | | NA | | | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | | | NA | | | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | 5 | | | | 5 | | | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | $T_{PSS/SSS_sync_inter_cca}$ | | | | $T_{PSS/SSS_sync_inter_cca}$ | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -91 | -91 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -58.49 | -58.49 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1 and  UE is not required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.9 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

### 11.5.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX with SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements.

### 11.5.2.9.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.9.

### 11.5.2.9.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.9.4.1-1 and 11.5.2.9.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 11.5.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.9.4.1-1.

**Table 11.5.2.9.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 11.5.2.9-1 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.5.2.9-2 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.5.2.9-3 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.9.4.1-2.

**Table 11.5.2.9.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9 -1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.9.4.1-3.
2. Message contents are defined in clause 11.5.2.9.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.9.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.1 | |
| UL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.2 | |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 1,2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 2 | |

### 11.5.2.9.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

16. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 11.5.2.9.5-1.
3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.
4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.5.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.9.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

27. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

    - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

    OR

    - switch the UE off.

28. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

29. Depending on the choice in Step 7, the SS:
    - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
    OR
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

30. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.9.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.9.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

11.5.2.9.5 Test requirements

Table 11.5.2.9.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.9.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | FDD | |
| | | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | Not Applicable | |
| | | | Config 2 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | | Config 3 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2,3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2,3 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1,2,3 | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.1 CCA | | SSB.1 FR1 | |
| | | | Config 3 | SSB.1 CCA | | SSB.2 FR1 | |
| | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3 | As defined in A.3.28.1 | | Not applicable | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 30 | | 15 | |
| | | | Config 3 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_DL}$=0.9375 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | NA | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -91 | -91 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -58.49 | -58.49 | -70.05 | -62.26 |
| | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The UE is required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.2.10 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used

### 11.5.2.10.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX with SSB time index detection with CCA. This test will partly verify the SA inter-frequency NR cell search requirements.

### 11.5.2.10.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and inter-frequency measurements on shared channel access.

### 11.5.2.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.2.0.1 and 11.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.2.10.

### 11.5.2.10.4 Test description

Two cells are deployed in the test. NR cell 1 with CCA as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 with CCA on NR RF channel 2. The test parameters for the two cells are given in Table 11.5.2.10.4.1-1 and 11.5.2.10.4.1-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

#### 11.5.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.2.10.4.1-1.

**Table 11.5.2.10.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 11.5.2.10-1 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 11.5.2.10-2 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 11.5.2.10-3 | NR cell with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR cell without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.2.10.4.1-2.

**Table 11.5.2.10.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2a | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE part. For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part. | | |

1. The general test parameter settings are set up according to Table 11.5.2.10.4.1-3.

2. Message contents are defined in clause 11.5.2.10.4.3.

3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

**Table 11.5.2.10.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies are used. NR channel 1 is with CCA. |
| Active cell | | Config 1,2,3 | NR cell 1 (PCell) | | NR cell 1 is on NR RF channel number 1 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR cell 2 | | NR cell 2 is on NR RF channel number 2. |
| DL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.1 | | |
| UL CCA model | | Config 1,2,3 | As specified in clause A.3.26.2.2 | | |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | DRX.12 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | Config 1,2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 3 | 20 | |

**Table 11.5.2.10.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | Ms640 | |
| shortDRX | disable | disable | |

**Table 11.5.2.10.4.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Value | Comment |
|---|---|---|

| | | |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

#### 11.5.2.10.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

17. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 11.5.2.10.5-1.

3. The SS shall transmit an *RRCReconfiguration* message with event A3 configured on Cell 1.

4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.2.10.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 11.5.2.10.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2882 ms for Test 1 and 9842 ms for Test2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) and set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.2.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.2.10.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurements**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition Gap, INTER-FREQ, DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

**Table 11.5.2.10.4.3-2: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 9 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |

11.5.2.10.5 Test requirements

Table 11.5.2.10.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurements.

**Table 11.5.2.10.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurements**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | FDD | |
| | | | Config 2,3 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.1.1 CCA | | Not Applicable | |
| | | | Config 2 | TDDConf.1.1 CCA | | TDDConf.1.1 | |
| | | | Config 3 | TDDConf.1.1 CCA | | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 40: $N_{RB,c}$ = 106 | | 10: $N_{RB,c}$ = 52 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2,3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns | | | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2,3 | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1,2,3 | CR.1.1 CCA | | | |
| SSB parameters | | | Config 1,2 | SSB.1 CCA | | SSB.1 FR1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Semi-static channel access Note 5,7 | | Config 3 | SSB.1 CCA | | SSB.2 FR1 | |
| | Semi-static channel access Note 5,7 | | Config 1,2 | SSB.2 CCA | | SSB.1 FR1 | |
| | | | Config 3 | SSB.2 CCA | | SSB.2 FR1 | |
| DBT window configuration | | | Config 1,2,3 | As defined in A.3.28.1 | | Not applicable | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 30 | | 15 | |
| | | | Config 3 | 30 | | 30 | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_DL}$=0.9375 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | NA | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | $P_{CCA_UL}$=1 | | NA | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | 2 | | 2 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -91 | -91 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -58.49 | -58.49 | -70.05 | -62.26 |
| | | dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | | Config 1,2,3 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1 and 2 UE is required to report SSB time index.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.3 Inter-RAT E-UTRAN measurements

### 11.5.3.0 Minimum conformance requirements

Same minimum conformance requirements as in 6.6.3.0.

### 11.5.3.1 NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX

#### 11.5.3.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1.

#### 11.5.3.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting RRM measurements with a shared spectrum NR carrier.

#### 11.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.3.1.

#### 11.5.3.1.4 Test description

Two cells are deployed in the test. Cell 1 is the NR PCell on a frequency carrier with CCA and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Each test consists of two consecutive time periods, with durations T1 and T2, respectively.

#### 11.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.3.1.4.1-1.

**Table 11.5.3.1.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|
| 11.5.3.1-1 | NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 11.5.3.1-2 | NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.3.1.4.1-2.

**Table 11.5.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.3.1.4.1-3.
2. Message contents are defined in clause 11.5.3.1.4.3.
3. Cell specific test parameters are set up according to Table 11.5.3.2.5-1.

**Table 11.5.3.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 11.5.3.1.5-1 and 11.5.3.1.5-2 | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | As specified in TS 38.11 [6]Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in TS 38.133 [6] Table A.11.5.3.1.1-3 | | | |

#### 11.5.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of E-UTRA cell 2. The CCA model (both DL and UL) is disabled (i.e. PCCA_DL_i= PCCA_UL=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 11.5.3.1.5-1 and 11.5.3.1.5-2. Propagation conditions are set according to Annex C clause C.2.2.
3. SS shall transmit an *RRCReconfiguration* message with event B2 configured on Cell 1.
4. The UE shall transmit *RRCReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 11.5.3.1.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in tables 11.5.3.1.5-1 and 11.5.3.1.5-2. T2 starts.
6. The UE shall transmit a MeasurementReport message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.
7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5,
     OR

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 11.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.3.1.4.3-1: Common Exception messages for NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT<br>Table H.3.1-3A<br>Table H.3.1-4A<br>Table H.3.1-5 with Condition INTER-RAT<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-RATTable H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access |

#### 11.5.3.1.5 Test requirements

Table 11.5.3.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX in FR1.

**Table 11.5.3.1.5-1: PCell specific test parameters for NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 1 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Patterns | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -106 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -103 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -83.45 | -105 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 19.55 | -2 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 19.55 | -2 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -52.35 | -69.82 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.5.3.1.5-2: E-UTRAN neighbour cell specific test parameters for NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1,2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1,2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2 | -104 | |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | -Infinity | 18.55 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -Infinity | -85.45 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -Infinity | -85.45 |
| Io Note5 | dBm/9MHz | 1, 2 | -73.21+10log ($N_{RB,c}$ /50) | -56.12+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.3.2 NR SA FR1 - E-UTRAN event-triggered reporting in DRX

### 11.5.3.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1.

### 11.5.3.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting RRM measurements with a shared spectrum NR carrier and long DRX cycle.

### 11.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.3.2.

### 11.5.3.2.4 Test description

Two cells are deployed in the test. Cell 1 is the NR PCell on a frequency carrier with CCA and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Each test consists of two consecutive time periods, with durations T1 and T2, respectively.

#### 11.5.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.3.2.4.1-1.

**Table 11.5.3.2.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|
| 11.5.3.2-1 | NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 11.5.3.2-2 | NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |

| Note: The UE is only required to be tested in one of the supported test configurations |
|---|

Configure the test equipment and the DUT according to the parameters in Table 11.5.3.2.4.1-2.

**Table 11.5.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.3.2.4.1-3.
2. Message contents are defined in clause 11.5.3.2.4.3.
3. Cell specific test parameters are set up according to Table 11.5.3.2.5-1.

**Table 11.5.3.2.4.1-3: General test parameters**

| Parameter | Unit | Test 1 | Test 2 | Comment |
|---|---|---|---|---|
| | | Value | | |
| NR RF Channel Number | | 1 | | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 11.5.3.2.5-1 and 11.5.3.2.5-2 | | |
| Active cell | | Cell 1 | | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | | As specified in TS 38.11 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis | dB | 0 | | |
| TimeToTrigger | s | 0 | | |
| Filter coefficient | | 0 | | L3 filtering is not used |
| DRX | | DRX.1 | DRX.7 | DRX cycle configurations DRX.1 and DRX.7 are defined in Table A.5-1 |
| T1 | s | 5 | | |
| T2 | s | 5 | 15 | |
| Note 1: Values are defined in TS 38.11 [6] Table A.11.5.3.2.1-3 | | | | |

### 11.5.3.2.4.2 Test procedure

Same test proccedure as in 11.5.3.1.4.2 with the following exception in step 6:

6. The UE shall transmit a MeasurementReport message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms for test 1 and less than 12802ms for test 2, the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

#### 11.5.3.2.4.3 Message contents

Same message content as in 11.5.3.1.4.3 with the following exceptions:

**Table 11.5.3.2.4.3-1: Common Exception messages NR SA FR1 – E-UTRAN event-triggered reporting in DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with Condition DRX.1 and Gap for Test 1<br>Table H.3.7-1 with Condition DRX.7 and OFFSET for Test 2 |

### 11.5.3.2.5 Test requirements

Table 11.5.3.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX in FR1.

**Table 11.5.3.2.5-1: PCell specific test parameters for NR SA FR1 - E-UTRAN event-triggered reporting in DRX**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 1 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Patterns | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -106 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -103 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -83.45 | -105 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | 19.55 | -2 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | 19.55 | -2 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -52.35 | -69.82 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.5.3.2.5-2: E-UTRAN neighbour cell specific test parameters for NR SA FR1 - E-UTRAN event-triggered reporting in DRX**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1,2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1,2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | -Infinity | 18.55 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -Infinity | -85.45 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -Infinity | -85.45 |
| Io Note5 | dBm/9MHz | 1, 2 | -73.21+10log ($N_{RB,c}$ /50) | -56.12+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.4 L1-RSRP measurements for beam reporting

### 11.5.4.0 Minimum conformance requirements

Same minimum conformance requirements as in 10.4.3.0.

### 11.5.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used

#### 11.5.4.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is not used.

#### 11.5.4.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL with a shared spectrum NR carrier.

#### 11.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.4.1.

#### 11.5.4.1.4 Test description

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of two consecutive time periods, with durations T1 and T2, respectively.

##### 11.5.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.4.1.4.1-1.

**Table 11.5.4.1.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|
| 11.5.4.1-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.4.1.4.1-2.

**Table 11.5.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.4.1.4.1-3.
2. Message contents are defined in clause 11.5.4.1.4.3.

**Table 11.5.4.1.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| DL CCA model | 1 | | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 | | As specified in A.3.20.2.2 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 CCA |
| SSB configuration | 1 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1 |

| | | | |
|---|---|---|---|
| | | | ULBWP.1.1 |
| DBT Window Configuration | 1 | | DBT.1 |
| TRS Configuration | 1 | | TRS.1.2 TDD |
| DRX configuration | 1 | | Off |
| *reportConfigType* | 1 | | periodic |
| *reportQuantity* | 1 | | ssb-Index-RSRP |
| Number of reported RS | 1 | | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1 | | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

#### 11.5.4.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 11.5.4.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 11.5.4.1.4.1-3.

2. Set the parameters according to T1 in Table 11.5.4.1.5-1. The SS shall enable DL and UL CCA model according to Table 11.5.4.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 11.5.4.1.5-1. T2 starts.

5. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 680 ms for configuration 1 and 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 in Table 11.5.4.1.5-2 and the relative L1-RSRP requirement for SSB#0 in Table 11.5.4.1.5-3. If the first

valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 11.5.4.1.5-2 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 11.5.4.1.5-3 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. After T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 11.5.4.1.4.1-3, OR

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.5.4.1.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.5.4.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

11.5.4.1.5 Test requirements

Table 11.5.4.1.5-1 defines the primary level settings including test tolerances for SSB based L1-RSRP measurement in non-DRX.

**Table 11.5.4.1.5-1: SSB specific test parameters for NR SA FR1 SSB based L1-RSRP measurement when DRX is not used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

| | |
|---|---|
| Note 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$. |

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in and relative accuracy requirement in Table 11.5.4.1.5-2 and 11.5.4.1.5-3.

**Table 11.5.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 11.5.4.1.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is used

### 11.5.4.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement under CCA when DRX is used.

### 11.5.4.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL with a shared spectrum NR carrier and long DRX cycle.

### 11.5.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.5.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.4.2.

### 11.5.4.2.4 Test description

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of two consecutive time periods, with durations T1 and T2, respectively.

#### 11.5.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.4.2.4.1-1.

**Table 11.5.4.2.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|

| | |
|---|---|
| 11.5.4.2-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.4.2.4.1-2.

**Table 11.5.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.4.2.4.1-3.
2. Message contents are defined in clause 11.5.4.2.4.3.

**Table 11.5.4.2.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| DL CCA model | 1 | | As specified in A.3.20.2.1 |
| UL CCA model | 1 | | As specified in A.3.20.2.2 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 CCA |
| SSB configuration | 1 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1 | | DBT.1 |
| TRS Configuration | 1 | | TRS.1.2 TDD |
| DRX configuration | 1 | | DRX.3 |
| *reportConfigType* | 1 | | periodic |
| *reportQuantity* | 1 | | ssb-Index-RSRP |
| Number of reported RS | 1 | | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1 | | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

#### 11.5.4.2.4.2 Test procedure

Same test procedure as in subclause 11.5.4.1.4.2 with tables 11.5.4.1.4.1-2 and 11.5.4.1.5-1 replaced by tables 11.5.4.2.4.1-2 and 11.5.4.2.5-1.

#### 11.5.4.2.4.3 Message contents

Same message content as in subclause11.5.4.1.4.3 with the following exceptions:

**Table 11.5.4.2.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

#### 11.5.4.2.5 Test requirements

Table 11.5.4.2.5-1 defines the primary level settings including test tolerances for SSB based L1-RSRP measurement in DRX.

**Table 11.5.4.2.5-1: SSB specific test parameters for NR SA FR1 SSB based L1-RSRP measurement when DRX is used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -91.65 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s/N_{oc}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement and relative accuracy requirement in Table 11.5.4.2.5-2 and 11.5.4.2.5-3.

**Table 11.5.4.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 11.5.4.2.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.4.3 NR SA FR1 SSB based L1-RSRP measurement on SCC when DRX is not used

### 11.5.4.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement on SCC under CCA when DRX is not used.

### 11.5.4.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL with a shared spectrum NR carrier.

#### 11.5.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.5.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.4.3.

#### 11.5.4.3.4 Test description

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of two consecutive time periods, with durations T1 and T2, respectively.

##### 11.5.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.4.3.4.1-1.

**Table 11.5.4.3.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|
| 11.5.4.3-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.4.3.4.1-2.

**Table 11.5.4.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.8-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.4.3.4.1-3.
2. Message contents are defined in clause 11.5.4.3.4.3.

**Table 11.5.4.3.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| Active PCell | 1 | | Cell 1 |
| Active SCell | 1 | | Cell 2 |
| RF Channel Number | 1 | | 1: Cell 1<br>2: Cell 2 |
| DL CCA model | 1 | | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 | | As specified in A.3.20.2.2 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 CCA |

| | | | |
|---|---|---|---|
| SSB configuration | 1 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1 | | DBT.1 |
| TRS Configuration | 1 | | TRS.1.2 TDD |
| DRX configuration | 1 | | Off |
| *reportConfigType* | 1 | | periodic |
| *reportQuantity* | 1 | | ssb-Index-RSRP |
| Number of reported RS | 1 | | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1 | | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

### 11.5.4.3.4.2 Test procedure

Same test procedure as in subclause 11.5.4.1.4.2 with tables 11.5.4.1.4.1-2 and 11.5.4.1.5-1 replaced by tables 11.5.4.3.4.1-2 and 11.5.4.3.5-1.

### 11.5.4.3.4.3 Message contents

Same message content as in subclause11.5.4.1.4.3.

### 11.5.4.3.5 Test requirements

Table 11.5.4.3.5-1 defines the primary level settings including test tolerances for SSB based L1-RSRP measurement on SCC in non-DRX.

**Table 11.5.4.3.5-1: SSB specific test parameters for NR SA FR1 SSB based L1-RSRP measurement on SCC when DRX is not used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,7 | 1 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1 | dBm/15kHz | -94.65s | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.

Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement and relative accuracy requirement in TS 38.133 [6] in Table 11.5.4.3.5-2 and 11.5.4.3.5-3.

**Table 11.5.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 11.5.4.3.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 11.5.4.4 NR SA FR1 SSB based L1-RSRP measurement on SCC when DRX is used

### 11.5.4.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP on SCC measurement under CCA when DRX is used.

### 11.5.4.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM measurements and UL with a shared spectrum NR carrier and long DRX cycle.

### 11.5.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.5.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.5.4.4.

### 11.5.4.4.4 Test description

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of two consecutive time periods, with durations T1 and T2, respectively.

#### 11.5.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.5.4.4.4.1-1.

**Table 11.5.4.4.4.1-1: Supported test configurations**

| Test ID | Description |
|---|---|
| 11.5.4-1 | With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.5.4.4.4.1-2.

**Table 11.5.4.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.9-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 10.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.3 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

1. The general test parameter settings are set up according to Table 11.5.4.4.4.1-3.
2. Message contents are defined in clause 11.5.4.4.4.3.

**Table 11.5.4.4.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| Active PCell | 1 | | Cell 1 |
| Active SCell | 1 | | Cell 2 |
| RF Channel Number | 1 | | 1: Cell 1 |

| | | | |
|---|---|---|---|
| | | | 2: Cell 2 |
| DL CCA model | 1 | | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 | | As specified in A.3.20.2.2 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1 | MHz | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1 | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 CCA |
| SSB configuration | 1 | | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| DBT Window Configuration | 1 | | DBT.1 |
| TRS Configuration | 1 | | TRS.1.2 TDD |
| DRX configuration | 1 | | DRX.3 |
| *reportConfigType* | 1 | | periodic |
| *reportQuantity* | 1 | | ssb-Index-RSRP |
| Number of reported RS | 1 | | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1 | | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

#### 11.5.4.4.4.2 Test procedure

Same test procedure as in subclause 11.5.4.1.4.2 with tables 11.5.4.1.4.1-2 and 11.5.4.1.5-1 replaced by tables 11.5.4.4.4.1-2 and 11.5.4.4.5-1.

#### 11.5.4.4.4.3 Message contents

Same message content as in subclause11.5.4.1.4.3 with the following exceptions:

**Table 11.5.4.4.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement on SCC when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

11.5.4.4.5 Test requirements

Table 11.5.4.4.5-1 defines the primary level settings including test tolerances for SSB based L1-RSRP measurement on SCC in DRX.

**Table 11.5.4.4.5-1: Cell specific test parameters for NR SA FR1 SSB based L1-RSRP measurement on SCC when DRX is used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement and relative accuracy requirement Table 11.5.4.4.5-2 and 11.5.4.4.5-3.

**Table 11.5.4.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|

| | | |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 11.5.4.4.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 11.6 Measurement Performance

## 11.6.1 SS-RSRP

### 11.6.1.0 Minimum Conformance Requirements

#### 11.6.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements under CCA

Same as in clause 10.5.1.0.1.

#### 11.6.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements under CCA

Same as in clause 10.5.1.0.2.

#### 11.6.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements under CCA

Same as in clause 10.5.1.0.3.

#### 11.6.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements under CCA

Same as in clause 10.5.1.0.4.

### 11.6.1.1 NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA

#### 11.6.1.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will verify the requirements in clauses 11.6.1.0.1 and 11.6.1.0.2 for intra-frequency measurements under CCA.

#### 11.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U, UL in shared spectrum and RRM measurements in dynamic channel access or in semi-static channel access.

#### 11.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.1.0.1 and 11.6.1.0.2 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.1.1.

#### 11.6.1.1.4 Test description

Supported test configurations are shown in Table 11.6.1.1.4.1-1. Both absolute and relative accuracies of SS-RSRP intra-frequency measurements are tested by using the parameters in Table 11.6.1.1.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

##### 11.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.1.1.4.1-1.

**Table 11.6.1.1.4.1-1: Supported test configurations for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.1.1-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.1.1.4.1-2.

**Table 11.6.1.1.4.1-2: Initial conditions for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.1.1.5-1.
2. Message contents are defined in clause 11.6.1.1.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test.

##### 11.6.1.1.4.2 Test procedure

In this set of test cases all cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 11.6.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.1.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.1.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport*. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 11.6.1.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each subtest defined in Table 11.6.1.1.5-1.

### 11.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.1.1.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable H.3.10-2 with Condition SMTC.1 |

**Table 11.6.1.1.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

11.6.1.1.5 Test requirements

Table 11.6.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA. Table 11.6.1.1.5-2 and Table 11.6.1.1.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 11.6.1.1.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | | freq1 | | freq1 | | freq1 | |
| TDD configuration | Config 1 | | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | Config 1 | | MHz | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | | 40: $N_{RB,c}$ = 106 | | | | | |
| DL CCA model | | | | As specified in clause D.7.2.1 | | | | | |
| UL CCA model | | | | As specified in clause D.7.2.2 | | | | | |
| $P_{CCA_DL}$ for dynamic channel access Note 7,9 | | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | | |
| $P_{CCA_DL}$ for semi-static channel access Note 8,9 | | | | $P_{CCA_DL}$=0.9375 | | | | | |
| $P_{CCA_UL}$ | | | | 1 | | | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | | SR.1.1 CCA | - | SR.1.1 CCA | - | SR.1.1 CCA | - |
| RMSI CORESET Reference Channel | Config 1 | | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| Control channel RMC | Config 1 | | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| SSB configuration for semi-static channel access | Config 1 | | | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA |
| SSB configuration for dynamic channel access | Config 1 | | | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | Config 1,2,3 | | | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 |
| Time offset with Cell 1 | Config 1 | | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1 | | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | kHz | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | | Not applicable Note 5 | | -94 | | -111 | |
| | | NR_CCA_FR1_J | | | | | | -111 | |
| | Config 1 | NR_CCA_FR1_I | dBm/SCS | Not applicable Note 5 | | -91 | | -108 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | | NR_CCA_FR1_J | | | | | | -108 | |
| $\hat{E}_s/I_{ot}$ Note6 | | | dB | Not applicable Note 5 | Not applicable Note 5 | 2.23 | -5.57 | -2.11 | -3.34 |
| $\hat{E}_s/N_{oc}$ Note6 | | | dB | Not applicable Note 5 | Not applicable Note 5 | 6 | 1.4 | 1 | 0.20 |
| SS-RSRP Note3,6 | Config 1 | NR_CCA_FR1_I | dBm/SCS | Not applicable Note 5 | Not applicable Note 5 | -85 | -89.6 | -107 | -107.8 |
| | | NR_CCA_FR1_J | | | | | | -107 | -107.8 |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | Not applicable Note 5 | | -51.91 | | -71.75 | |
| | | NR_CCA_FR1_J | | | | | | -71.75 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.6.1.1.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest SS-RSRP reported value (cell 2) | 57 | Bands NR_CCA_FR1_I | 43 |
| | | Bands NR_CCA_FR1_J | 43 |
| Highest SS-RSRP reported value (cell 2) | 76 | Bands NR_CCA_FR1_I | 55 |
| | | Bands NR_CCA_FR1_J | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest SS-RSRP reported value (cell 2) | 54 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |
| Highest SS-RSRP reported value (cell 2) | 79 | Bands NR_CCA_FR1_I | 59 |
| | | Bands NR_CCA_FR1_J | 59 |

**Table 11.6.1.1.5-3: Relative accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 2) | RSRP_x – 1 | RSRP_x + 1 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 1 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.1.2 NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA

### 11.6.1.2.1 Test purpose

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will verify the requirements in clauses 11.6.1.0.1 and 11.6.1.0.2 for intra-frequency measurements under CCA.

### 11.6.1.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone 2DL CA NR-U, UL in shared spectrum and RRM measurements in dynamic channel access or in semi-static channel access.

### 11.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.1.0.1 and 11.6.1.0.2 for absolute and relative accuracy, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.1.2.

### 11.6.1.2.4 Test description

Supported test configurations are shown in Table 11.6.1.2.4.1-1. Both absolute and relative accuracies of SS-RSRP intra-frequency measurements are tested by using the parameters in Table 11.6.1.2.5-1. In all test cases, Cell 1 is the PCell, Cell 2 is the SCell, and Cell 3 is the target cell.

#### 11.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.1.2.4.1-1.

**Table 11.6.1.2.4.1-1: Supported test configurations for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.1.2-1 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.1.2.4.1-2.

**Table 11.6.1.2.4.1-2: Initial conditions for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |

| | | | |
|---|---|---|---|
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.1.2.5-1.
2. Message contents are defined in clause 11.6.1.2.4.3.
3. Cell 1 is the NR PCell, Cell 2 is the NR SCell, Cell 3 is the NR target cell, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test.

### 11.6.1.2.4.2 Test procedure

Three cells are deployed in the test, which are FR1 PCell (Cell 1) on the carrier frequency with CCA, and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.
2. Set the parameters according to Table 11.6.1.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.1.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.1.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport*. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 11.6.1.2.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.8. Repeat steps 1-7 for each subtest defined in Table 11.6.1.2.5-1.

### 11.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.1.2.4.3-1: Common Exception messages for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable H.3.10-2 with Condition SMTC.1 |

**Table 11.6.1.2.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

11.6.1.2.5 Test requirements

Table 11.6.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA. Table 11.6.1.2.5-2 and Table 11.6.1.2.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 11.6.1.2.5-1: Cell specific test parameters for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | | | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | | | | |
| $P_{CCA_DL}$ for dynamic channel access Note 7,9 | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | | |
| $P_{CCA_DL}$ for semi-static channel access Note 8,9 | | | $P_{CCA_DL}$=0.9375 | | | | | |
| $P_{CCA_UL}$ | | | 1 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | - | SR.1.1 CCA | - | SR.1.1 CCA | - |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| Control channel RMC | Config 1 | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| SSB configuration for semi-static channel access | Config 1 | | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA |
| SSB configuration for dynamic channel access | Config 1 | | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | Config 1,2,3 | | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Time offset with Cell 1 | Config 1 | | μs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1 | | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | kHz | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | | Not applicable Note 5 | | -94 | | -111 | |
| | | NR_CCA_FR1_J | | | | | | -111 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | Not applicable Note 5 | | -91 | | -108 | |
| | | NR_CCA_FR1_J | | | | | | -108 | |
| $\hat{E}_s/I_{ot}$ Note6 | | | dB | 2.23 | -5.57 | 2.23 | -5.57 | -2.11 | -3.34 |
| $\hat{E}_s/N_{oc}$ Note6 | | | dB | 6 | 1.4 | 6 | 1.4 | 1 | 0.2 |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | Not applicable Note 5 | Not applicable Note 5 | -85 | -89.6 | -107 | -107.8 |
| | | NR_CCA_FR1_J | | | | | | -107 | -107.8 |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | Not applicable Note 5 | | -51.91 | | -71.75 | |
| | | NR_CCA_FR1_J | | | | | | -71.75 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.
NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.6.1.2.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest SS-RSRP reported value (cell 3) | 57 | Bands NR_CCA_FR1_I | 43 |
| | | Bands NR_CCA_FR1_J | 43 |
| Highest SS-RSRP reported value (cell 3) | 76 | Bands NR_CCA_FR1_I | 55 |
| | | Bands NR_CCA_FR1_J | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest SS-RSRP reported value (cell 3) | 54 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |
| Highest SS-RSRP reported value (cell 3) | 79 | Bands NR_CCA_FR1_I | 59 |
| | | Bands NR_CCA_FR1_J | 59 |
| Note 1: NR operating band groups are defined in [clause 3A.4, Table 3A.4.1-2] | | | |

**Table 11.6.1.2.5-3: Relative accuracy requirements for the reported values for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x – 1 | RSRP_x + 1 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 1 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.2 SS-RSRQ

### 11.6.2.0 Minimum Conformance Requirements

#### 11.6.2.0.1 Intra-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

Same as in clause 10.5.2.0.1.

#### 11.6.2.0.2 Void

#### 11.6.2.0.3 Inter-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

Same as in clause 10.5.2.0.3.

#### 11.6.2.0.4 Inter-frequency relative SS-RSRQ measurement accuracy requirements under CCA

Same as in clause 10.5.2.0.4.

### 11.6.2.1 NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA

#### 11.6.2.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy on the carrier frequency with CCA is within the specified limits.

#### 11.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U, UL in shared spectrum and RRM measurements in dynamic channel access or in semi-static channel access.

#### 11.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.2.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.2.1.

#### 11.6.2.1.4 Test description

Supported test configurations are shown in Table 11.6.2.1.4.1-1. Absolute SS-RSRQ accuracy intra-frequency measurements are tested by using the parameters in Table 11.6.2.1.5-1. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is the target cell with CCA.

##### 11.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.2.1.4.1-1.

**Table 11.6.2.1.4.1-1: Supported test configurations for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.2.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.6.2.1.4.1-2.

**Table 11.6.2.1.4.1-2: Initial conditions for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.2.1.5-1.
2. Message contents are defined in clause 11.6.2.1.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test. All cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model.

##### 11.6.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.2.1.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.2.1.4.3.

4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.2.1.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 11.6.2.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.2.1.5-1.

#### 11.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.2.1.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable<br>H.3.10-2 with Condition SMTC.1 |

**Table 11.6.2.1.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 11.6.2.1.5 Test requirements

Table 11.6.2.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA. Table 11.6.2.1.5-2 define the absolute accuracy requirements.

**Table 11.6.2.1.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Parameter | | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | | freq1 | | | |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | | | |
| DL CCA probability for semi-static channel access Note 7, 8 | | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| | | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | | Config 1 | | TDD | | | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | | Initial DL BWP | | DLBWP.0.1 | | | |
| | | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | | Initial UL BWP | | ULBWP.0.1 | | | |
| | | Dedicated UL BWP | | ULBWP.1.1 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Control Channel RMC | | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS configuration | | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP. 1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 1 | | Config 1 | µs | - | 3 | - | 3 |
| DBT Window Configuration | | Config 1 | | DBT.1 (As defined in A.12.1) | | | |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30kHz | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | Config1 | NR_CCA_FR1_I | dBm/15kHz | -92.6 | | -110 | |
| | | NR_CCA_FR1_J | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -89.6 | | -107 | |
| | | NR_CCA_FR1_J | | | | -106.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.76 | | -5.46 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 3 | 3 | -4 | -4 |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -86.59 | -86.59 | -111 | -111 |
| | | NR_CCA_FR1_J | | | | -110.5 | -110.5 |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.77 | -14.77 | -17.34 | -17.34 |
| | | NR_CCA_FR1_J | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Io[Note3] | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.56 | | -73.4 | -73.4 |
| | | NR_CCA_FR1_J | | | | -72.9 | -72.9 |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2.
Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.2.1.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_44 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_59 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_43 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.2.2 NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA

### 11.6.2.2.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy on the carrier frequency with CCA is within the specified limits.

### 11.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U, UL in shared spectrum and RRM measurements in dynamic channel access or in semi-static channel access.

### 11.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.2.0.3 and 11.6.2.0.4 for absolute and relative accuracy under CCA, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.2.2.

#### 11.6.2.2.4 Test description

Supported test configurations are shown in Table 11.6.2.2.4.1-1. Both absolute and relative accuracies of SS-RSRQ inter-frequency measurements are tested by using the parameters in Table 11.6.2.2.5-1. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is target cell with CCA. The inter-frequency measurements are supported by a measurement gap.

##### 11.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.2.2.4.1-1.

**Table 11.6.2.2.4.1-1: Supported test configurations for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.2.2-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.6.2.2.4.1-2.

**Table 11.6.2.2.4.1-2: Initial conditions for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.2.2.5-1.
2. Message contents are defined in clause 11.6.2.2.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test. The two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies, with CCA and transmit SSBs in DBT windows according to DL CCA model.

##### 11.6.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1.
2. Set the parameters according to Table 11.6.2.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 11.6.2.2.4.3.

4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.2.2.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 11.6.2.2.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.2.2.5-1.

#### 11.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.2.2.4.3-1: Common Exception messages for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable<br>H.3.10-2 with Condition SMTC.1 |

**Table 11.6.2.2.4.3-2: *ReportConfigNR* for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 11.6.2.2.5 Test requirements

Table 11.6.2.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA. Table 11.6.2.2.5-2 and Table 11.6.2.2.5-3 define the absolute and relative accuracy requirements, correspondingly.

**Table 11.6.2.2.5-1: Cell specific test parameters for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | | | | | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | | | | | |
| UL CCA probability | | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| | | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| Duplex mode | | Config 1 | | TDD | | | | | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | | | |
| Gap pattern ID | | Config 1 | | 0 | | | | | |
| BWP BW | | Config 1 | | 40: NRB,c = 106 | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS Configuration | | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP.1 | | | | | |
| Time offset with Cell 1 | | Config 1 | µs | - | 3 | - | 3 | - | 3 |
| DBT Window configuration | | Config 1 | | DBT.1 | | | | | |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | | | |
| SMTC configuration | | Config 1 | | SMTC.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -87.80 | | -113 | | -112 | |
| | | NR_CCA_FR1_J | | | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -84.80 | | -110 | | -109 | |
| | | NR_CCA_FR1_J | | | | | | -108.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | | -1.75 | | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | | -1.75 | | 3 | -1.75 |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | | -86.54 | -86.54 | -111.74 | -111.74 | -105.99 | -110.74 |
| | | NR_CCA_FR1_J | | | | | | -105.49 | -110.24 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SS-RSRQ[Note3] | | NR_CCA_FR1_I | dB | -14.76 | -14.76 | -14.76 | -14.76 | 12.56 | 14.76 |
| | | NR_CCA_FR1_J | | | | | | | |
| Io[Note3] | Config 1 | NR_CCA_FR1_I | dBm/SCS | -51.52 | | -76.72 | | -73.18 | -75.72 |
| | | NR_CCA_FR1_J | | | | | | -72.68 | -75.22 |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in clause 3.5.2.
Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.
Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.2.2.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_52 | SS-RSRQ_52 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_62 | SS-RSRQ_62 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_49 | SS-RSRQ_49 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_65 | SS-RSRQ_65 |

**Table 11.6.2.2.5-3: Relative accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 7 | SS-RSRQ_x - 7 | SS-RSRQ_x - 11 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 7 | SS-RSRQ_x + 7 | SS-RSRQ_x + 2 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x - 13 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| RSRQ_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.2.3 NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA

### 11.6.2.3.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy on the carrier frequency with CCA is within the specified limits.

#### 11.6.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone 2DL CA NR-U and RRM measurements in dynamic channel access or in semi-static channel access.

#### 11.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.2.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.2.3.

#### 11.6.2.3.4 Test description

Supported test configurations are shown in Table 11.6.2.3.4.1-1. Absolute SS-RSRQ accuracy intra-frequency measurements are tested by using the parameters in Table 11.6.2.3.5-1. In all test cases, Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA.

##### 11.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.2.3.4.1-1.

**Table 11.6.2.3.4.1-1: Supported test configurations for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.2.3-1 | SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.2.3.4.1-2.

**Table 11.6.2.3.4.1-2: Initial conditions for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.2.3.5-1.
2. Message contents are defined in clause 11.6.2.3.4.3.
3. Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. PCell (Cell 1) is on one carrier frequency with CCA, Cell 2 and Cell 3 are both on a different carrier frequency than Cell 1.

##### 11.6.2.3.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

2. Set the parameters according to Table 11.6.2.3.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.2.3.4.3.

4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.2.3.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 11.6.2.3.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.2.3.5-1.

### 11.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.2.3.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 CCA |

**Table 11.6.2.3.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

11.6.2.3.5 Test requirements

Table 11.6.2.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA. Table 11.6.2.3.5-2 defines the absolute accuracy requirements.

**Table 11.6.2.3.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|---|
| | | | | Cell 1 / Cell 2 | Cell 3 | Cell 1 / Cell 2 | Cell 3 |
| SSB ARFCN | | | | freq1 for Cell 1 freq2 for Cell 2 | freq2 | freq1 for Cell 1 freq2 for Cell 2 | freq2 |
| DL CCA model | | Config 1 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | | Config 1 | | As specified in clause D.7.2.2 | | | |
| DL CCA probability for semi-static channel access Note 7, 8 | | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| | | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | | Config 1 | | TDD | | | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | | Config 1 | MHz | 40: $N_{RB,c}$ = 106 | | | |
| BWP configuration | | Initial DL BWP | | DLBWP.0.1 | | | |
| | | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | | Initial UL BWP | | ULBWP.0.1 | | | |
| | | Dedicated UL BWP | | ULBWP.1.1 | | | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Control Channel RMC | | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS configuration | | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP. 1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 1 | | Config 1 | µs | - | 3 | - | 3 |
| DBT Window Configuration | | Config 1 | | DBT.1 (As defined in A.12.1) | | | |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1 | | SMTC.1 | | | |
| CSI-RS for tracking | | Config 1 | | TRS.1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30kHz | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | Config1 | NR_CCA_FR1_I | dBm/15kHz | -92.6 | | -110 | |
| | | NR_CCA_FR1_J | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -89.6 | | -107 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | NR_CCA_FR1_J | | | | -106.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.76 | | -5.46 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 3 | 3 | -4 | -4 |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -86.59 | -86.59 | -111 | -111 |
| | | NR_CCA_FR1_J | | | | -110.5 | -110.5 |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.77 | -14.77 | -17.34 | -17.34 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.56 | | -73.4 | -73.4 |
| | | NR_CCA_FR1_J | | | | -72.9 | -72.9 |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in Clause 3.5.2.
Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.2.3.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on SCC on a carrier frequency with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_44 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_59 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_43 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 11.6.2.4 NR SA FR1 Inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA

Editor's Note:

- MU and TT analysis is incomplete

#### 11.6.2.4.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy on the carrier frequency with CCA is within the specified limits.

#### 11.6.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U, UL in shared spectrum and RRM measurements in dynamic channel access or in semi-static channel access.

#### 11.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.2.0.3 and 11.6.2.0.4 for absolute and relative accuracy under CCA, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.2.4.

#### 11.6.2.4.4 Test description

Supported test configurations are shown in Table 11.6.2.4.4.1-1. Both absolute and relative accuracies of SS-RSRQ inter-frequency measurements are tested by using the parameters in Table 11.6.2.4.5-1. In all test cases, Cell 1 is the PCell and Cell 2 is target cell with CCA. The inter-frequency measurements are supported by a measurement gap.

##### 11.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.2.4.4.1-1.

**Table 11.6.2.4.4.1-1: Supported test configurations for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Configuration | Description |
|---|---|
| 11.6.2.4-1 | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.6.2.4-2 | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.6.2.4-3 | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.6.2.4.4.1-2.

**Table 11.6.2.4.4.1-2: Initial conditions for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.2.4.5-1.
2. Message contents are defined in clause 11.6.2.4.4.3.
3. Cell 1 is the PCell and Cell 2 is target cell with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. The two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies, Cell 2 is with CCA and transmit SSBs in DBT windows according to DL CCA model.

### 11.6.2.4.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.2.4.5-1 and Table 11.6.2.4.5-2 appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 11.6.2.4.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.2.4.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 11.6.2.4.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each subtest defined in Table 11.6.2.4.5-1.

### 11.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.2.4.4.3-1: Common Exception messages for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER -FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 CCA |

**Table 11.6.2.4.4.3-2: *ReportConfigNR* for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 11.6.2.4.5 Test requirements

Table 11.6.2.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA. Table 11.6.2.4.5-3 and Table 11.6.2.4.5-4 define the absolute and relative accuracy requirements, correspondingly.

**Table 11.6.2.4.5-1: Cell specific test parameters for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA for target cell**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| | | | Cell 2 | Cell 2 | Cell 2 |
| SSB ARFCN | | | freq2 | freq2 | freq2 |
| DL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.1 | | |
| UL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.2 | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | | |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | | |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | 0.75 | | |
| Duplex mode | Config 1, 2, 3 | | TDD | | |
| TDD configuration | Config 1, 2, 3 | | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | Config 1, 2, 3 | MHz | 40: $N_{RB,c}$ = 106 | | |
| Gap pattern ID | Config 1, 2, 3 | | 0 | | |
| BWP BW | Config 1, 2, 3 | | 40: NRB,c = 106 | | |
| DRX Cycle | | ms | Not Applicable | | |
| OCNG Patterns | | | OP.1 | | |
| Time offset with Cell 1 | Config 1, 2, 3 | µs | 3 | | |
| DBT Window configuration | Config 1, 2, 3 | | DBT.1 | | |
| SSB configuration | Config 1, 2, 3 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | |
| SMTC configuration | Config 1, 2, 3 | | SMTC.1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 3 | kHz | 30 kHz | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | NR_CCA_FR1_I | dBm/15kHz | -86.27+TT | -113+TT | -112 |
| | NR_CCA_FR1_J | | | | -111.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/SCS | -83.27+TT | -110+TT | -109 |
| | | NR_CCA_FR1_J | | | | -108.5 |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75+TT | -1.75+TT | -1.75+TT |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75+TT | | -1.75+TT |
| SS-RSRP Note3 | Config 1, 2, 3 | NR_CCA_FR1_I | | -85.02+TT | -111.75+TT | -110.75+TT |
| | | NR_CCA_FR1_J | | | | -110-.25+TT |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.77+TT | -40.59+TT | 14.76+TT |
| | | NR_CCA_FR1_J | | | | |
| Io Note3 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/SCS | -50 | -76.73 | -75.73 |
| | | NR_CCA_FR1_J | | | | -75.23 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in clause 3.5.2.
Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.
Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.2.4.5-2: Cell specific test parameters for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA for NR PCell**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| | | | Cell 1 | Cell 1 | Cell 1 |
| SSB ARFCN | | | freq1 | | |
| Duplex mode | Config 1 | | FDD | | |
| | Config 2,3 | | TDD | | |
| TDD configuration | Config 1 | | Not Applicable | | |
| | Config 2 | | TDDConf.1.1 | | |
| | Config 3 | | TDDConf.2.1 | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | |
| Gap Pattern ID | | | 0 | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | |
| | Initial UL BWP | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 2 | | SR.1.1 TDD | | |
| | | Config 3 | | SR2.1 TDD | | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | | |
| | | Config 2 | | CR.1.1 TDD | | |
| | | Config 3 | | CR.2.1 TDD | | |
| Control Channel RMC | | Config 1 | | CCR.1.1 FDD | | |
| | | Config 2 | | CCR.1.1 TDD | | |
| | | Config 3 | | CCR.2.1 TDD | | |
| TRS Configuration | | Config 1 | | TRS.1.1 FDD | | |
| | | Config 2 | | TRS.1.1 TDD | | |
| | | Config 3 | | TRS.1.2 TDD | | |
| OCNG Patterns | | | | OP. 1 | | |
| SS-RSSI-Measurement | | | | Not Applicable | | |
| SMTC configuration | | Config 1 | | SMTC.2 | | |
| | | Config 2,3 | | SMTC.1 | | |
| SSB configuration | | Config 1,2 | | SSB.1 FR1 | | |
| | | Config 3 | | SSB.2 FR1 | | |
| CSI-RS for tracking | | Config 1 | | TRS.1.1 FDD | | |
| | | Config 2 | | TRS.1.1 TDD | | |
| | | Config 3 | | TRS.1.2 TDD | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | |
| | | Config 3 | | 30 kHz | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group NOTE 6 | dBm/15kHz | -85+TT | -101 +TT | -114 + $\Delta_{BG_offset}$ +TT |
| | Config 3 | Depending on band group NOTE 6 | | -91 +TT | - | -114 + $\Delta_{BG_offset}$ +TT |
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group NOTE 6 | dBm/SCS | -85 +TT | -101 +TT | -114+ $\Delta_{BG_offset}$ +TT |
| | Config 3 | Depending on band group NOTE 6 | | -88 +TT | - | -111+ $\Delta_{BG_offset}$ +TT |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 +TT | -4.7 +TT | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 +TT | -2.9 +TT | -4 |
| SS-RSRP Note 3 | Config 1,2 | Depending on band group NOTE 6 | dBm/SCS | -82 +TT | -103.9 +TT | -118 + $\Delta_{BG_offset}$ +TT |
| | Config 3 | Depending on band group NOTE 6 | | -85 +TT | - | -115 + $\Delta_{BG_offset}$ +TT |
| SS-RSRQ Note3 | | Depending on band group NOTE 6 | dB | -14.77 +TT | -16.76 +TT | -17.34 + $\Delta_{BG_offset}$ +TT |
| Io Note3 | Config 1,2 | Depending on band group NOTE 6 | dBm/ 9.36MHz | -50 | -70 | -83.5 + $\Delta_{BG_offset}$ +TT |
| | Config 3 | Depending on band group NOTE 6 | dBm/ 38.16MHz | -50 | - | -77.4 + $\Delta_{BG_offset}$ +TT |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | | 1x2 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | NR operating band groups are as defined in clause 3.5.2. |
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |
| Note 7: | $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2 |

**Table 11.6.2.4.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest SS-RSRQ reported value | FFS | FFS | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| Highest SS-RSRQ reported value | FFS | FFS | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | | | | |

**Table 11.6.2.4.5-4: Relative accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | RSRQ_x – FFS | RSRQ_x – FFS | RSRQ_x – FFS |
| Highest reported value (Cell 3) | RSRQ_x – FFS | RSRQ_x + FFS | RSRQ_x + FFS |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | RSRQ_x – FFS | RSRQ_x – FFS | RSRQ_x – FFS |
| Highest reported value (Cell 3) | RSRQ_x – FFS | RSRQ_x + FFS | RSRQ_x + FFS |
| RSRQ_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.3 SS-SINR

### 11.6.3.0 Minimum Conformance Requirements

#### 11.6.3.0.1 Intra-frequency absolute SS-SINR measurement accuracy requirements under CCA

Same as in clause 10.5.3.0.1.

#### 11.6.3.0.2 Void

#### 11.6.3.0.3 Inter-frequency absolute SS-SINR measurement accuracy requirements under CCA

Same as in clause 10.5.3.0.3.

#### 11.6.3.0.4 Inter-frequency relative SS-SINR measurement accuracy requirements under CCA

Same as in clause 10.5.230.4.

### 11.6.3.1 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA

#### 11.6.3.1.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy on the carrier frequency with CCA is within the specified limits.

#### 11.6.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum.

#### 11.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.3.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.3.1.

#### 11.6.3.1.4 Test description

Supported test configurations are shown in Table 11.6.3.1.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 11.6.3.1.5-1. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is the target cell with CCA.

##### 11.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.3.1.4.1-1.

**Table 11.6.3.1.4.1-1: Supported test configurations for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.3.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.3.1.4.1-2.

**Table 11.6.3.1.4.1-2: Initial conditions for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.3.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.3.1.5-1.
2. Message contents are defined in clause 11.6.3.1.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test. All cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model.

### 11.6.3.1.4.2 Test procedure

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*], according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.3.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.3.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 11.6.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each subtest defined in Table 11.6.3.1.5-1.

### 11.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.3.1.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 CCA |

**Table 11.6.3.1.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

11.6.3.1.5 Test requirements

Table 11.6.3.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA. Table 11.6.3.1.5-2 defines the absolute accuracy requirements.

**Table 11.6.3.1.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | | freq1 | | freq1 | |
| DL CCA model | Config 1 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1 | | As specified in clause D.7.2.2 | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | Config 1 | | TDD | | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | | OP.1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| DBT Window configuration | | Config 1 | | DBT.1 | | | |
| Time offset with Cell 1 | | Config 1 | µs | - | 3 | - | 3 |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -93.20 | | -112 | |
| | | NR_CCA_FR1_J | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -90.20 | | -109 | |
| | | NR_CCA_FR1_J | | | | -108.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| SS-RSRP Note 3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -85.65 | -87.53 | -112.50 | -112.50 |
| | | NR_CCA_FR1_J | | | | -112 | -112 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | 0 | -3.19 | -5.10 | -5.10 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/38.16MHz | -51.41 | | -75.41 | |
| | | NR_CCA_FR1_J | | | | -74.91 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3.5.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.

Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.3.1.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 3) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 3) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.3.2 NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA

### 11.6.3.2.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA is within the specified limits.

### 11.6.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U, UL in shared spectrum, RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum.

### 11.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.3.0.3 and 11.6.3.0.4 for absolute and relative accuracy under CCA, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.3.2.

### 11.6.3.2.4 Test description

Supported test configurations are shown in Table 11.6.3.2.4.1-1. The absolute accuracy of SS-SINR Inter-frequency measurement is tested by using the parameters in Table 11.6.3.2.5-1. In all test cases, Cell 1 is the PCell with CCA and Cell 2 is the target cell with CCA. The inter-frequency measurements are supported by a measurement gap.

#### 11.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.3.2.4.1-1.

**Table 11.6.3.2.4.1-1: Supported test configurations for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Configuration | Description |
|---|---|
| 11.6.3.2-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.3.2.4.1-2.

**Table 11.6.3.2.4.1-2: Initial conditions for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.3.2.5-1.
2. Message contents are defined in clause 11.6.3.2.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is the NR neighbour cell also with the power level set according to clauses C.1.2 and C.1.3 for this test. All cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model.

### 11.6.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.3.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 11.6.3.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.3.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 11.6.3.2.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each subtest defined in Table 11.6.3.2.5-1.

### 11.6.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.3.2.4.3-1: Common Exception messages for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessTable<br>H.3.10-2 with Condition SMTC.1 |

**Table 11.6.3.2.4.3-2: *ReportConfigNR* for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

11.6.3.2.5 Test requirements

Table 11.6.3.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA. Table 11.6.3.2.5-2 defines the absolute accuracy requirements.

**Table 11.6.3.2.5-1: Cell specific test parameters for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|---|---|---|---|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| DL CCA model | Config 1 | | As specified in clause D.7.2.1 | | | | | |
| UL CCA model | Config 1 | | As specified in clause D.7.2.2 | | | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - | 0.75 | - |
| Duplex mode | Config 1 | | TDD | | | | | |
| TDD configuration | Config 1 | | TDDConf.1.1 CCA | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | | SR.1.1 CCA | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1 | µs | - | 3 | - | 3 | - | 3 |
| DBT Window configuration | Config 1 | | DBT.1 | | | | | |
| SSB configuration | Config 1 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | | | |
| SMTC configuration | Config 1 | | SMTC.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 30 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -88 | -108.5 | | -115.5 | |
| | | NR_CCA_FR1_J | | | | | -115 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -85 | -105.5 | | -112.5 | |
| | | NR_CCA_FR1_J | | | | | -112 | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -3.2 | -3.2 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | 20 | | -3.2 | |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -86.74 | -85.49 | | -115.69 | |
| | | NR_CCA_FR1_J | | | | | -115.19 | |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | -1.75 | 20 | | -3.2 | |
| | | NR_CCA_FR1_J | | | | | | |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.72 | -54.40 | | -79.75 | |
| | | NR_CCA_FR1_J | | | | | -79.25 | |
| Propagation condition | | | - | AWGN | | | | |
| Antenna configuration | | | - | 1x2 | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3.5.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.

Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 11.6.3.2.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|

| | All bands | All bands | All bands |
|---|---|---|---|
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_35 | SS-SINR_79 | SS-SINR_32 |
| Highest reported value (Cell 2) | SS-SINR_51 | SS-SINR_94 | SS-SINR_49 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_33 | SS-SINR_77 | SS-SINR_31 |
| Highest reported value (Cell 2) | SS-SINR_53 | SS-SINR_96 | SS-SINR_50 |

**Table 11.6.3.2.5-3: Relative accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| SS-SINR_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.3.3 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA

### 11.6.3.3.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy on the carrier frequency with CCA is within the specified limits.

### 11.6.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone 2DL CA NR-U and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum, and 2DL CA.

### 11.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.3.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.3.3.

### 11.6.3.3.4 Test description

Supported test configurations are shown in Table 11.6.3.3.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 11.6.3.3.5-1. In all test cases, Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA.

#### 11.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.3.3.4.1-1.

**Table 11.6.3.3.4.1-1: Supported test configurations for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| **Configuration** | **Description** |
|---|---|
| 11.6.3.3-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.3.3.4.1-2.

**Table 11.6.3.3.4.1-2: Initial conditions for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.3.3.5-1.
2. Message contents are defined in clause 11.6.3.3.4.3.
3. Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. PCell (Cell 1) is on one carrier frequency with CCA, Cell 2 and Cell 3 are both on a different carrier frequency than Cell 1.

### 11.6.3.3.4.2 Test procedure

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*], according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.3.3.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 11.6.3.3.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.3.3.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 11.6.3.3.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each subtest defined in Table 11.6.3.3.5-1.

### 11.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.3.3.4.3-1: Common Exception messages for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 CCA |

**Table 11.6.3.3.4.3-2: *ReportConfigNR* for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

## 11.6.3.3.5 Test requirements

Table 11.6.3.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 intra-frequency measurement accuracy on SCC on a carrier frequency with CCA. Table 11.6.3.3.5-2 defines the absolute accuracy requirements, correspondingly.

**Table 11.6.3.3.5-1: Cell specific test parameters for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 / Cell 2 | Cell 3 | Cell 1 / Cell 2 | Cell 3 |
| SSB ARFCN | | | freq1 for Cell 1 freq2 for Cell 2 | freq2 | freq1 for Cell 1 freq2 for Cell 2 | freq2 |
| DL CCA model | Config 1 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1 | | As specified in clause D.7.2.2 | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Duplex mode | | Config 1 | | TDD | | | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | |
| TRS configuration | | Config 1 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | | OP.1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| DBT Window configuration | | Config 1 | | DBT.1 | | | |
| Time offset with Cell 1 | | Config 1 | µs | 3 (for Cell 2) | 3 | 3 (for Cell 2) | 3 |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -93.20 | | -112 | |
| | | NR_CCA_FR1_J | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -90.20 | | -109 | |
| | | NR_CCA_FR1_J | | | | -108. | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| SS-RSRP Note 3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -85.65 | -87.53 | -112.50 | --112.50 |
| | | NR_CCA_FR1_J | | | | -112 | -112 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | 0 | -3.19 | -5.10 | -5.10 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/38.16MHz | -51.41 | | -75.41 | |
| | | NR_CCA_FR1_J | | | | -74.91 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

| | |
|---|---|
| Note 4: | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | NR operating band groups are as defined in clause 3.5.2. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration. |
| Note 7: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 8: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 9: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

**Table 11.6.3.3.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 3) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 3) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.3.4 NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA

Editor's Note:

- MU and TT analysis is incomplete

### 11.6.3.4.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA is within the specified limits.

### 11.6.3.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U and RRM measurements in dynamic channel access or in semi-static channel access and SS-SINR measurements on shared spectrum.

### 11.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.3.0.3 and 11.6.3.0.4 for absolute and relative accuracy under CCA, correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.3.4.

### 11.6.3.4.4 Test description

Supported test configurations are shown in Table 11.6.3.4.4.1-1. The absolute accuracy of SS-SINR Inter-frequency measurement is tested by using the parameters in Table 11.6.3.4.5-1. In all test cases, Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, and Cell 3 is the target cell with CCA. The inter-frequency measurements are supported by a measurement gap.

#### 11.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.3.4.4.1-1.

**Table 11.6.3.4.4.1-1: Supported test configurations for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Config | Description |
|---|---|
| 11.6.3.4-1 | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.6.3.4-2 | Without CCA: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 11.6.3.4-3 | Without CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 11.6.3.4.4.1-2.

**Table 11.6.3.4.4.1-2: Initial conditions for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.3.4.5-1.
2. Message contents are defined in clause 11.6.3.4.4.3.
3. Cell 1 is the PCell and Cell 2 is target cell with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. The two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies, Cell 2 is with CCA and transmit SSBs in DBT windows according to DL CCA model.

#### 11.6.3.4.4.2 Test procedure

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*], according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.3.4.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 11.6.3.4.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.3.4.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 11.6.3.4.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.3.4.5-1.

#### 11.6.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.3.4.4.3-1: Common Exception messages for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 CCA |

**Table 11.6.3.4.4.3-2: *ReportConfigNR* for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 11.6.3.4.5 Test requirements

Table 11.6.3.4.5-1 and 11.6.3.4.5-2 define the primary level settings including test tolerances for NR SA FR1 Inter-frequency measurement accuracy on a carrier frequency with CCA. Table 11.6.3.4.5-3 and Table 11.6.3.4.5-4 define the absolute and relative accuracy requirements, correspondingly.

**Table 11.6.3.4.5-1: Cell specific test parameters for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA for target cell**

| **Parameter** | | **Unit** | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|---|---|
| | | | **Cell 2** | **Cell 2** | **Cell 2** |
| SSB ARFCN | | | freq2 | freq2 | freq2 |
| DL CCA model | Config 1 | | As specified in clause D.7.2.1 | | |
| UL CCA model | Config 1 | | As specified in clause D.7.2.2 | | |

| | | | | | |
|---|---|---|---|---|---|
| UL CCA probability | | $P_{CCA_UL}$ | | 1.0 | |
| DL CCA probability for semi-static channel access Note 7, 8 | | $P_{CCA_DL}$ | | 0.9375 | |
| DL CCA probability for dynamic channel access Note 8, 9 | | $P_{CCA_DL_1}$ | | 0.75 | |
| | | $P_{CCA_DL_2}$ | | 0.75 | |
| Duplex mode | | Config 1 | | TDD | |
| TDD configuration | | Config 1 | | TDDConf.1.1 CCA | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| Gap pattern ID | | | | - | |
| OCNG Patterns | | | | OP.1 | |
| SS-RSSI-Measurement | | | | Not Applicable | |
| Time offset with Cell 1 | | Config 1 | µs | 3 | |
| DBT Window configuration | | Config 1 | | DBT.1 | |
| SSB configuration | | Config 1 | | SSB.1 CCA for semi-static channel access SSB.2 CCA for dynamic channel access | |
| SMTC configuration | | Config 1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | kHz | 30 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -88+TT | -108.5+TT | -115.5+TT |
| | | NR_CCA_FR1_J | | | | -115+TT |
| $N_{oc}$ Note2 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -85+TT | -105.5+TT | -112.5+TT |
| | | NR_CCA_FR1_J | | | | -112+TT |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | 20 | -4.0 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | 20 | -4.0 |
| SS-RSRP Note3 | Config 1 | NR_CCA_FR1_I | dBm/SCS | -86.75+TT | -85.5+TT | -116.5+TT |
| | | NR_CCA_FR1_J | | | | -116+TT |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | -1.75+TT | 20+TT | -4.0+TT |
| | | NR_CCA_FR1_J | | | | |
| Io Note3 | Config 1 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.73 | -54.41 | -80 |
| | | NR_CCA_FR1_J | | | | -79.5 |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

| | |
|---|---|
| Note 5: | NR operating band groups are as defined in clause 3.5.2. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration. |
| Note 7: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 8: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 9: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

**Table 11.6.3.4.5-2: Cell specific test parameters for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA for NR PCell**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| | | | Cell 1 | Cell 1 | Cell 1 |
| SSB ARFCN | | | freq1 | freq1 | freq1 |
| Duplex mode | Config 1 | | FDD | | |
| | Config 2,3 | | TDD | | |
| TDD configuration | Config 1 | | Not Applicable | | |
| | Config 2 | | TDDConf.1.1 | | |
| | Config 3 | | TDDConf.2.1 | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | |
| DRX Cycle configuration | | ms | Not Applicable | | |
| Gap pattern ID | | | 0 | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | |
| | Config 2 | | TRS.1.1 TDD | | |
| | Config 3 | | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | |
| | Config 2 | | SR.1.1 TDD | | |
| | Config 3 | | SR2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | |
| | Config 2 | | CR.1.1 TDD | | |
| | Config 3 | | CR2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | | |
| | Config 2 | | CCR.1.1 TDD | | |
| | Config 3 | | CCR2.1 TDD | | |
| OCNG Patterns | | | OP.1 | | |
| SS-RSSI-Measurement | | | Not Applicable | | |
| SMTC configuration | Config 1 | | SMTC.2 | | |
| | Config 2,3 | | SMTC.1 | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | |
| | Config 3 | | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | |
| | Config 3 | | 30 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1,2 | Depending on band group NOTE 6 | dBm/15 kHz | -88+TT | -108.5+TT | -119.5+ $\Delta_{BG_offset}$ +TT |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -88+TT | -108.5+TT | Same as Noc for 15kHz |
| | Config 3 | Depending on band group NOTE 6 | | -85+TT | -105.5+TT | -116.5+ $\Delta_{BG_offset}$ +TT |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | 20 | -4.0 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | 20 | -4.0 |
| SS-RSRP Note3 | Config 1,2 | Depending on band group NOTE 6 | dBm/SCS | -89.75+TT | -88.5+TT | -123.5+ $\Delta_{BG_offset}$ +TT |
| | Config 3 | Depending on band group NOTE 6 | | -86.75+TT | -85.5+TT | -120.5+ $\Delta_{BG_offset}$ +TT |
| SS-SINR Note3 | | Depending on band group NOTE 6 | dB | -1.75+TT | 20+TT | -4.0+ $\Delta_{BG_offset}$ +TT |
| Io Note3 | Config 1,2 | Depending on band group NOTE 6 | dBm/ 9.36MHz | -57.83 | -60.5 | -90.09+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group NOTE 6 | dBm/ 38.16MHz | -51.73 | -54.41 | -84+ $\Delta_{BG_offset}$ |
| Propagation condition | | | - | AWGN | | |
| Antenna configuration | | | - | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in clause 3.5.2.
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.
Note 7: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2

**Table 11.6.3.4.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest SS-SINR reported value | FFS | FFS | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| Highest SS-SINR reported value | FFS | FFS | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |
| | | | Bands FFS | FFS |

Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1

**Table 11.6.2.4.5-4: Relative accuracy requirements for the reported values for NR SA FR1 inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA from carrier without CCA**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|

| | All bands | All bands | All bands |
|---|---|---|---|
| Normal Conditions | | | |
| Lowest reported value (Cell 3) | SINR_x – FFS | SINR_x – FFS | SINR_x – FFS |
| Highest reported value (Cell 3) | SINR_x – FFS | SINR_x + FFS | SINR_x + FFS |
| Extreme Conditions | | | |
| Lowest reported value (Cell 3) | SINR_x – FFS | SINR_x – FFS | SINR_x – FFS |
| Highest reported value (Cell 3) | SINR_x – FFS | SINR_x + FFS | SINR_x + FFS |
| SINR_x is the reported value of Cell 2 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.4 L1-RSRP measurement accuracy for beam reporting with CCA serving cell

### 11.6.4.0 Minimum conformance requirements

#### 11.6.4.0.1 Minimum conformance requitements for SSB-based L1-RSRP measurement accuracy for beam reporting under CCA

Same as in clause 10.5.4.0.1.

### 11.6.4.1 NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA

#### 11.6.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 11.6.4.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting EN-DC FR1 with a shared spectrum NR carrier, RRM measurements and UL with a shared spectrum NR carrier.

#### 11.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.4.1.

#### 11.6.4.1.4 Test description

There is one cell in the test, PCell, which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test configurations and parameters for the Cell 2 are given in Table 11.6.4.1.4.1-1. Two sub-tests (Test 1 and Test 2) are provided with different $N_{oc}$ on Cell 1. The absolute and relative accuracy of L1-RSRP measurements is tested by using the parameters in Table 11.6.4.1.5-2 and Table 11.6.4.1.5-3 respectively.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 11.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.4.1.4.1-1.

**Table 11.6.4.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 11.6.4.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.4.1.4.1-2. Test environment parameters are given in Table 11.6.4.1.4.1-2.

**Table 11.6.4.1.4.1-2: Test Environment parameters for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.4.1.5-1.
2. Message contents are defined in clause 11.6.4.1.4.3.
3. Cell 1 is the PCell with CCA and transmits SSBs in DBT windows according to DL CCA model. The power levels are set according to clauses C.1.2 and C.1.3 for this test.
4. There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

### 11.6.4.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.
2. Set the parameters according to Test 1 in Table 11.6.4.1.5-1 and enable DL and UL CCA model according to the same table. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 11.6.4.1.5-1.
3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.
4. The SS shall check following requirements:

   R1: The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 11.6.4.1.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   R2: The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 11.6.4.1.5-3, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

6. Set the parameters according Test 2 in Table 11.6.4.1.5-1 and repeat steps 3-5.

#### 11.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.4.1.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.4-1<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 11.6.4.1.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 11.6.4.1.5 Test requirement

Table 11.6.4.1.5-1 defines the primary level settings for all tests for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA. In both Test 1 and Test 2, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 11.6.4.0.1 while meeting the corresponding absolute accuracy requirements in Table 11.6.4.1.5-2, and the corresponding relative accuracy requirements in Table 11.6.4.1.5-3 for all test configurations.

**Table 11.6.4.1.5-1: Test parameters for NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1 | | freq1 | freq1 |
| DL CCA model | 1 | | As specified in D.7.2.1 | As specified in D.7.2.1 |
| UL CCA model | 1 | | As specified in D.7.2.2 | As specified in D.7.2.2 |
| Duplex mode | 1 | | TDD | TDD |
| TDD configuration | 1 | | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| $BW_{channel}$ | 1 | MHz | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |

| | | | | | |
|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | 1 | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 CCA | CCR.1.1 CCA |
| SSB configuration Semi-static channel access | | 1 | | SSB.3 CCA | SSB.3 CCA |
| SSB configuration for Dynamic channel access | | 1 | | SSB.4 CCA | SSB.4 CCA |
| OCNG Patterns | | 1 | | OP.1 | OP.1 |
| Initial BWP Configuration | | 1 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| TRS configuration | | 1 | | TRS.1.2 TDD | TRS.1.2 TDD |
| Dedicated BWP configuration | | 1 | | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | | 1 | | DBT.1 | DBT.1 |
| *reportConfigType* | | 1 | | periodic | periodic |
| *reportQuantity* | | 1 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1 | | 2 | 2 |
| L1-RSRP reporting period | | 1 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | 1 | dB | 0 | 0 |
| $N_{oc}$ Note2 | NR_TDD_FR1_I | 1 | dBm/15kHz | -96 | -113 |
| $N_{oc}$ Note2 | NR_TDD_FR1_I | 1 | dBm/SCS | -93 | -110 |
| $\hat{E}_s / I_{ot}$ | | 1 | dB | 10 | -2.2 |
| SS-RSRP Note3 | NR_TDD_FR1_I | 1 | dBm/SCS | -82.99 | -112.19 |
| Io Note3 | NR_TDD_FR1_I | 1 | dBm/ 38.16MHz | -51.53 | -76.90 |
| $\hat{E}_s / N_{oc}$ | | 1 | dB | 10 | -2.2 |
| Propagation condition | | 1 | | AWGN | AWGN |
| Antenna configuration | | 1 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 11.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 1) | 63 | Bands NR_CCA_FR1_I | 38 |

| | | | |
|---|---|---|---|
| | | Bands NR_CCA_FR1_J | 38 |
| Highest reported value (Cell 1) | 84 | Bands NR_CCA_FR1_I | 51 |
| | | Bands NR_CCA_FR1_J | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 60 | Bands NR_CCA_FR1_I | 33 |
| | | Bands NR_CCA_FR1_J | 33 |
| Highest reported value (Cell 1) | 87 | Bands NR_CCA_FR1_I | 56 |
| | | Bands NR_CCA_FR1_J | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4.1, Table 3A.4.1-1 | | | |

**Table 11.6.4.1.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | Test 1 | Test 2 |
|---|---|---|
| | **All bands** | **All bands** |
| **Normal Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| **Extreme Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 11.6.5 RSSI

### 11.6.5.0 Minimum Conformance Requirements

#### 11.6.5.0.1 Intra-frequency absolute RSSI measurement accuracy requirements in FR1

Same as in clause 10.5.5.0.1.

#### 11.6.5.0.2 Inter-frequency absolute RSSI measurement accuracy requirements in FR1

Same as in clause 10.5.5.0.2.

### 11.6.5.1 NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA

#### 11.6.5.1.1 Test purpose

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits.

#### 11.6.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone NR-U and supporting RRM and RSSI measurements on shared channel access.

#### 11.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.5.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.5.1.

#### 11.6.5.1.4 Test description

Supported test configurations are shown in Table 11.6.5.1.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 11.6.5.1.5-1 and Table 11.6.5.1.5-2. In all test cases, Cell 1 is the PCell with CCA. RSSI is measured on channel number 1.

##### 11.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.5.1.4.1-1.

**Table 11.6.5.1.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| Configuration | Description |
|---|---|
| 11.6.5.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.5.1.4.1-2.

**Table 11.6.5.1.4.1-2: Initial conditions for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.5.1.5-1.
2. Message contents are defined in clause 11.6.5.1.4.3.
3. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. CCA and transmit SSBs in DBT windows according to DL CCA model.

##### 11.6.5.1.4.2 Test procedure

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*], according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

2. Set the parameters according to Table 11.6.5.1.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform RSSI measurements according to the RMTC specified in section 11.6.5.1.4.3.

4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.5.1.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 11.6.5.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.5.1.5-1.

### 11.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.5.1.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSITable H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition RSSI |

**Table 11.6.5.1.4.3-2: *MeasResults* for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.5.1.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy for PCC under CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

11.6.5.1.5 Test requirements

Table 11.6.5.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA. Table 11.6.5.1.5-2 defines the RSSI measurement time configuration (RMTC). Table 11.6.5.1.5-3 defines the absolute accuracy requirements.

**Table 11.6.5.1.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| **Parameter** | | | **Unit** | **Test 1** |
|---|---|---|---|---|
| | | | | **Cell 1** |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | | MHz | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | Config 1 | | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | Config 1 | | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| DL CCA model | | | | As specified in clause D.7.2.1 |
| UL CCA model | | | | As specified in clause D.7.2.2 |
| Measurement bandwidth | | | $n_{PRE}$ | Same as channel access bandwidth |
| Channel access bandwidth | | | MHz | 20 |
| DRX Cycle configuration | | | ms | Not Applicable |
| PDSCH Reference measurement channel | | | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 CCA |
| OCNG Patterns | | | | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dB | -Infinity |

| | | |
|---|---|---|
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -58.96 |
| Propagation condition | - | AWGN |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | |

**11.6.5.1.5-2: RSSI RMTC parameters**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 11.6.5.1.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA**

| **Normal Conditions** | **Test 1<br>All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 11.6.5.2 NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA

### 11.6.5.2.1 Test purpose

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits.

### 11.6.5.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting standalone 2DL CA NR-U and supporting RRM and RSSI measurements on shared channel access.

### 11.6.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.5.0.1 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.5.2.

### 11.6.5.2.4 Test description

Supported test configurations are shown in Table 11.6.5.2.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 11.6.5.2.5-1 and Table 11.6.5.2.5-2. Cell 1 which is PCell

operating on a carrier frequency under CCA, and Cell 2 which is SCell operating on a carrier frequency under CCA. RSSI is measured on channel number 2.

#### 11.6.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.5.2.4.1-1.

**Table 11.6.5.2.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Configuration | Description |
|---|---|
| 11.6.5.2-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.5.2.4.1-2.

**Table 11.6.5.2.4.1-2: Initial conditions for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.5.2.5-1.
2. Message contents are defined in clause 11.6.5.2.4.3.
3. Cell 1 is the NR PCell, Cell 2 is the SCell, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. All cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model.

#### 11.6.5.2.4.2 Test procedure

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*], according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.5.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform RSSI - measurements according to the RMTC specified in section 11.6.5.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.5.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in

Table 11.6.5.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

8. Repeat steps 1-7 for each subtest defined in Table 11.6.5.2.5-1.

### 11.6.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.5.2.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition RSSI |

**Table 11.6.5.2.4.3-2: *MeasResults* for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.5.2.4.3-3: *MeasResultForRSSI* for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

### 11.6.5.2.5 Test requirements

Table 11.6.5.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA. Table 11.6.5.2.5-2 defines the RSSI measurement time configuration (RMTC). Table 11.6.5.2.5-3 defines the absolute accuracy requirements.

**Table 11.6.5.2.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| Parameter | | | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | Config 1 | | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | Config 1 | | SSB.2 CCA | SSB.2 CCA |
| $P_{CCA_DL}$ | | | | 1 | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | | 1 | 0.87 (Note 1, 3)<br>0.75 (Note 2, 3) |
| DL CCA model | | | | N/A | As specified in A.3.20.2.1 |
| UL CCA model | | | | N/A | As specified in A.3.20.2.2 |
| Measurement bandwidth | | | $n_{PRE}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | | | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/BW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | | dBm/BW | -77.96 | -58.96 |
| Propagation condition | | - | | AWGN | |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2 For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**11.6.5.2.5-2: RSSI RMTC parameters**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 11.6.5.2.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA**

| **Normal Conditions** | **Test 1<br>All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 11.6.5.3 NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA

### 11.6.5.3.1 Test purpose

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits.

### 11.6.5.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting inter-frequency RRM and RSSI measurements on shared channel access.

### 11.6.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.5.0.2 for absolute accuracy under CCA.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.5.3.

### 11.6.5.3.4 Test description

Supported test configurations are shown in Table 11.6.5.3.4.1-1. The absolute accuracy of RSSI inter-frequency measurements is tested by using the parameters in Table 11.6.5.3.5-1 and Table 11.6.5.3.5-2 Cell 1 is the PCell with CCA and Cell 2 is the neighbour cell with CCA. RSSI is measured on channel number 2. The inter-frequency measurements are supported by a measurement gap.

#### 11.6.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.5.3.4.1-1.

**Table 11.6.5.3.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 11.6.5.3-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.5.3.4.1-2.

**Table 11.6.5.3.4.1-2: Initial conditions for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.5.3.5-1.
2. Message contents are defined in clause 11.6.5.3.4.3.
3. Cell 1 is the NR PCell with CCA, Cell 2 is the neighbour with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is on a different frequency than Cell 1, both cells with CCA and transmit SSBs in DBT windows according to DL CCA model.

### 11.6.5.3.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.5.3.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform inter-frequency measurements, according to the RMTC specified in section 11.6.5.3.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.5.3.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 11.6.5.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.6.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.5.3.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition RSSI |

**Table 11.6.5.3.4.3-2: *MeasResults* for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.5.2.4.3-3: *MeasResultForRSSI* for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

## 11.6.5.3.5 Test requirements

Table 11.6.5.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA. Table 11.6.5.3.5-2 defines the RSSI measurement time configuration (RMTC). Table 11.6.5.3.5-3 defines the absolute accuracy requirements.

**Table 11.6.5.3.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| **Parameter** | | **Unit** | **Test 1** | |
|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** |
| RF Channel Number | | | 1 | 2 |
| $BW_{channel}$ | | MHz | 40 | 40 |
| SSB configuration | Config 1 | | SSB.1 CCA for semi-static channel access Note 1, 3<br>SSB.2 CCA for dynamic channel access Note 2, 3 | |
| $P_{CCA_DL}$ | | | 1 | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | 1 | 0.87 (Note 1, 3)<br>0.75 (Note 2, 3) |
| DL CCA model | | | N/A | As specified in clause D.7.2.1 |

| | | | |
|---|---|---|---|
| UL CCA model | | N/A | As specified in clause D.7.2.2 |
| Measurement bandwidth | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | MHz | 20 | |
| DRX Cycle configuration | ms | Not Applicable | |
| PDSCH Reference measurement channel | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -77.96 | -58.96 |
| Propagation condition | - | AWGN | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

**11.6.5.3.5-2: RSSI RMTC parameters**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 11.6.5.3.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA**

| Normal Conditions | Test 1<br>All bands |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| Extreme Conditions | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 11.6.6 Channel occupancy

### 11.6.6.0 Minimum Conformance Requirements

#### 11.6.6.0.1 Intra-frequency channel occupancy measurement accuracy requirements in FR1

Same as in clause 10.5.6.0.1.

#### 11.6.6.0.2 Inter-frequency channel occupancy measurement accuracy requirements in FR1

Same as in clause 10.5.6.0.2.

### 11.6.6.1 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA

#### 11.6.6.1.1 Test purpose

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits.

#### 11.6.6.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting RRM and Channel occupancy measurements on shared channel access.

#### 11.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 11.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.6.1.

#### 11.6.6.1.4 Test description

Supported test configurations are shown in Table 11.6.6.1.4.1-1. The absolute accuracy of intra-frequency channel occupancy measurement is tested by using the parameters in Table 11.6.6.1.5-1 and Table 11.6.6.1.5-2. Cell 1 is the PCell with CCA.

#### 11.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.6.1.4.1-1.

**Table 11.6.6.1.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| Configuration | Description |
|---|---|
| 11.6.6.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.6.1.4.1-2.

**Table 11.6.6.1.4.1-2: Initial conditions for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.6.1.5-1.
2. Message contents are defined in clause 11.6.6.1.4.3.
3. Cell 1 is the PCell with CCA and transmits SSBs in DBT windows according to DL CCA model. The power levels are set according to clauses C.1.2 and C.1.3 for this test.

#### 11.6.6.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.6.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform Channel occupancy measurements according to the RMTC specified in section 11.6.6.1.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.6.1.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 1 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.6.1.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition Channel_Occupancy |

**Table 11.6.6.1.4.3-2: *MeasResults* for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.6.1.4.3-3: *MeasResultForRSSI* for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

#### 11.6.6.1.5 Test requirements

Table 11.6.6.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA.

**Table 11.6.6.1.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| **Parameter** | **Unit** | **Test 1** |
|---|---|---|
| | | **Cell 1** |
| RF Channel Number | | 1 |
| $BW_{channel}$ | MHz | 40 |

| | | | |
|---|---|---|---|
| SSB configuration | Config 1 | | SSB.1 CCA for semi-static channel access Note 1, 3<br>SSB.2 CCA for dynamic channel access Note 2, 3 |
| $P_{CCA_DL}$ | | | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | 0.87 (Note 1, 3)<br>0.75 (Note 2, 3) |
| DL CCA model | | | As specified in clause D.7.2.1 |
| UL CCA model | | | As specified in clause D.7.2.2 |
| Measurement bandwidth | | $n_{PRB}$ | Same as channel access bandwidth |
| Channel access bandwidth | | MHz | 20 |
| DRX Cycle configuration | | ms | Not Applicable |
| PDSCH Reference measurement channel | | | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | CCR.1.1 CCA |
| OCNG Patterns | | | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 |
| $\hat{E}_s / I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/BW | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/BW | -58.96 |
| Propagation condition | | - | AWGN |
| channelOccupancyThreshold | | dBm | -83 |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 11.6.6.1.5-2: EN-DC FR1 Channel occupancy RMTC parameters for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |

| | |
|---|---|
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

## 11.6.6.2 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA

### 11.6.6.2.1 Test purpose

The purpose of this test is to verify that the channel occupancy measurement accuracy for SCC is within the specified limits.

### 11.6.6.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone 2DL CA NR-U and supporting RRM and Channel occupancy measurements on shared channel access.

### 11.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.6.2.

### 11.6.6.2.4 Test description

Supported test configurations are shown in Table 11.6.6.2.4.1-1. The absolute accuracy of intra-frequency channel occupancy measurement is tested by using the parameters in Table 11.6.6.2.5-1 and Table 11.6.6.2.5-2. Cell 1 is the PCell with CCA, and Cell 2 is SCell with CCA.

#### 11.6.6.2.4.1 Initial conditions

**Table 11.6.6.2.4.1-1: Supported test configurations for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| Configuration | Description |
|---|---|
| 11.6.6.1-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.6.2.4.1-2.

**Table 11.6.6.2.4.1-2: Initial conditions for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.6.2.5-1.
2. Message contents are defined in clause 11.6.6.2.4.3.
3. Cell 1 is the PCell with CCA, Cell 2 is the SCell with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. All cells are on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model.

### 11.6.6.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
2. Set the parameters according to Table 11.6.6.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform Channel occupancy measurements in the target SCC frequency, according to the RMTCspecified in section 11.6.6.2.4.3.
4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.6.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 3, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 2 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

### 11.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.6.2.4.3-1: Common Exception messages for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition Channel_Occupancy |

**Table 11.6.6.2.4.3-2: *MeasResults* for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.6.2.4.3-3 *MeasResultForRSSI* for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

## 11.6.6.2.5 Test requirements

Table 11.6.6.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA.

**Table 11.6.6.2.5-1: Cell specific test parameters for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| **Parameter** | | **Unit** | **Test 1** | |
|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** |
| RF Channel Number | | | 1 | 2 |
| $BW_{channel}$ | | MHz | 40 | 40 |
| SSB configuration | Config 1 | | SSB.1 CCA for semi-static channel access Note 1, 3<br>SSB.2 CCA for dynamic channel access Note 2, 3 | |
| $P_{CCA_DL}$ | | | 1 | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | 1 | 0.87 (Note 1, 3)<br>0.75 (Note 2, 3) |
| DL CCA model | | | N/A | As specified in clause D.7.2.1 |
| UL CCA model | | | N/A | As specified in clause D.7.2.2 |
| Measurement bandwidth | | $n_{PRE}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | MHz | 20 | |
| DRX Cycle configuration | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | | OP.1 | OP.1 |

| | | | |
|---|---|---|---|
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/BW | -77.96 | -58.96 |
| Propagation condition | - | AWGN | |
| channelOccupancyThreshold | dBm | -83 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

**Table 11.6.6.2.5-2: EN-DC FR1 Channel occupancy RMTC parameters for NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

### 11.6.6.3 NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA

#### 11.6.6.3.1 Test purpose

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits.

#### 11.6.6.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone standalone NR-U and supporting inter-frequency RRM and Channel occupancy measurements on shared channel access.

#### 11.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 11.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.11.6.6.3.

#### 11.6.6.3.4 Test description

Supported test configurations are shown in Table 11.6.6.3.4.1-1. The absolute accuracy of inter-frequency channel occupancy measurement is tested by using the parameters in Table 11.6.6.3.5-1 and Table 11.6.6.3.5-2. Cell 1 is the PCell with CCA and Cell 2 is the neighbour cell with CCA. The inter-frequency measurements are supported by a measurement gap.

##### 11.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.6.6.3.4.1-1.

**Table 11.6.6.3.4.1-1: Supported test configurations for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 11.6.6.3-1 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 11.6.6.3.4.1-2.

**Table 11.6.6.3.4.1-2: Initial conditions for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.9-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 11.6.6.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | LTE link is not used in this test | | |

1. The general test parameter settings are set up according to Table 11.6.6.3.5-1.
2. Message contents are defined in clause 11.6.6.3.4.3.
3. Cell 1 is the NR PCell with CCA, Cell 2 is the neighbour with CCA, all of which have power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 2 is on a different frequency than Cell 1.

#### 11.6.6.3.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).

2. Set the parameters according to Table 11.6.6.3.5-1 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 configuring the UE to perform channel occupancy measurements in the target neighbouring frequency, according to the RMTCspecified in section 11.6.6.3.4.3.

4. The UE shall transmit an *RRCReconfiguration* message to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 11.6.6.3.5-1.

5. The UE shall transmit periodical *MeasurementReport* messages.

6. After 10s wait from Step 3, the SS shall check the Channel occupancy reported values in the periodic *MeasurementReport*. If the Channel occupancy value of Cell 2 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

#### 11.6.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 11.6.6.3.4.3-1: Common Exception messages for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-3 with condition Channel_Occupancy |

**Table 11.6.6.3.4.3-2: *MeasResults* for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 11.6.6.3.4.3-3: *MeasResultForRSSI* for EN-DC FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

11.6.6.3.5 Test requirements

Table 11.6.6.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA

**Table 11.6.6.3.5-1: Cell specific test parameters for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| **Parameter** | | **Unit** | **Test 1** | |
|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** |
| RF Channel Number | | | 1 | 2 |
| $BW_{channel}$ | | MHz | 40 | 40 |
| SSB configuration | Config 1 | | SSB.1 CCA for semi-static channel access Note 1, 3<br>SSB.2 CCA for dynamic channel access Note 2, 3 | |
| $P_{CCA_DL}$ | | | 1 | 0.9375 (Note 1, 3)<br>0.75 / 0.75 (Note 2, 3) |
| $P_{CCA_UL}$ | | | 1 | 0.87 (Note 1, 3)<br>0.75 (Note 2, 3) |
| DL CCA model | | | N/A | As specified in clause D.7.2.1 |
| UL CCA model | | | N/A | As specified in clause D.7.2.2 |
| Measurement bandwidth | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | MHz | 20 | |
| DRX Cycle configuration | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | | SR.1.1 CCA | SR.1.1 CCA |
| RMSI CORESET Reference Channel | | | CR.1.1 CCA | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | | | CCR.1.1 CCA | CCR.1.1 CCA |
| OCNG Patterns | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/ SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/ SCS | -106 | -87 |
| $\hat{E}_s / I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |

| | | | |
|---|---|---|---|
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/ SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | dBm/ BW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | dBm/ BW | -77.96 | -58.96 |
| Propagation condition | - | AWGN | |
| channelOccupancyThreshold | dBm | -83 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | |

**Table 11.6.6.3.5-2: EN-DC FR1 Channel occupancy RMTC parameters for NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

# 12 E-UTRA Standalone Tests with at Least One NR Cell under CCA

## 12.1 RRC_IDLE State Mobility

### 12.1.1 Inter-RAT cell re-selection to NR on a carrier frequency with CCA

#### 12.1.1.0 Minimum Conformance Requirements

##### 12.1.1.0.1 Minimum conformance requitements for Inter-RAT cell re-selection to NR on a carrier frequency with CCA

The UE shall be able to identify new inter-RAT cells subject to CCA and perform SS-RSRP or SS-RSRQ measurements of identified inter-RAT cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT layers of higher priority at least every $T_{higher_priority_search}$.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this subclause.

The UE shall be able to evaluate whether a newly detectable inter-RAT cell meets the reselection criteria defined in TS 38.304 [30] within $K_{carrier} * T_{detect,NR_Inter} + K_{carrier_CCA} * T_{detect,NR_Inter_CCA}$ if at least carrier frequency information is provided for inter-RAT neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least 6dB in FR1 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 for SS-RSRQ reselections based on absolute priorities.

The parameter $K_{carrier}$ is the number of NR inter-RAT carriers on licensed band and $K_{carrier_CCA}$ is the number of NR inter-RAT carriers on unlicensed band indicated by the serving cell. An inter-RAT cell is considered to be detectable according to the conditions defined in Annex B.x.y for a corresponding band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter_CCA}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_CCA} * T_{measure,NR_Inter_CCA}$ (see table 12.1.1.0.1-1) for identified lower priority inter-RAT cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

In the requirements of clause 12.1.1.0.1, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the *N* candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding detection, measurement, or evaluation period, where:

- For the cell detection procedure: *N* is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and

- For other procedures in clause 12.1.1.0.1: *N* are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise N is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher and lower priority inter-RAT cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter_CCA}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-RAT cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-RAT cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier} * T_{evaluate,NR_Inter} + K_{carrier_CCA} * T_{evaluate,NR_Inter_CCA}$ when $T_{reselection} = 0$ as specified in table 12.1.1.0.1-1 if eDRX_IDLE cycle is not configured, provided that the reselection criteria is met by

- 6dB in FR1 for SS-RSRP reselections based on absolute priorities or

- 4dB in FR1 for SS-RSRQ reselections based on absolute priorities.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT cell is satisfied with the reselection criteria, the UE shall evaluate this inter-RAT cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 12.1.1.0.1-1: $T_{detect,NR_Inter_CCA}$, $T_{measure,NR_Inter_CCA}$ and $T_{evaluate,NR_Inter_CCA}$**

| DRX cycle length [s] | $T_{detect,NR_Inter_CCA}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_CCA}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_CCA}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 0.32x([36]+$M_d$)<br>{([36]+ $M_d$) } | 0.32x([4]+$M_m$)<br>{([4]+ $M_m$) } | 0.32x([16]+$M_e$)<br>{([16]+ $M_e$) } |
| 0.64 | 0.64x([28]+ $M_d$)<br>{[28]+ $M_d$ } | 0.64x([2]+ $M_m$)<br>{[2]+ $M_m$ } | 0.64x([8]+ $M_e$)<br>{[8]+ $M_e$ } |
| 1.28 | 1.28x([25]+ $M_d$)<br>{[25]+ $M_d$ } | 1.28x([1]+ $M_m$)<br>{[1]+ $M_m$ } | 1.28x([5]+ $M_e$)<br>{[5]+ $M_e$ } |
| 2.56 | 2.56x([23]+ $M_d$)<br>{[23]+ $M_d$ } | 2.56x([1]+ $M_m$)<br>{[1]+ $M_m$ } | 2.56x([3]+ $M_e$)<br>{[3]+ $M_e$ } |
| Note 1: | Md, Mm, Me are the number of DRX cycles each with at least one SMTC occasion not available at the UE during the $T_{detect,NR_Inter_CCA,}$, $T_{measure,NR_Inter_CCA}$ and $T_{evaluate,NR_Inter_CCA}$, respectively. $M_{m,max}$, $M_{d,max}$ and $M_{e,max}$ are the maximum values of $M_m$, $M_d$ and $M_e$, respectively. | | |
| Note 2: | $M_m \leq M_{m,max}$, where: $M_{m,max}$ = [16] for DRX cycle = 0.32 seconds, $M_{m,max}$ = [8] for DRX cycle = 0.64 seconds, $M_{m,max}$ = [4] for DRX cycle = 1.28 seconds, $M_{m,max}$ = [4] for DRX cycle = 2.56 seconds, | | |
| Note 3: | $M_d \leq M_{d,max}$, where: $M_{d,max}$ = [4] * $M_{m,max}$, | | |
| Note 4: | Me ≤ $M_{e,max}$, where: $M_{e,max}$ = [2] * $M_{m,max}$, | | |

The UE shall restart the measurements upon exceeding $M_{m,max}$, $M_{d.max}$, or $M_{e,max}$.

The normative reference for this requirement is TS 36.133 [23] clause 4.2.2.5.7.

## 12.1.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA

### 12.1.1.1.1 Test purpose

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell subject to CCA reselection requirements specified in clause 12.1.1.0.1.

#### 12.1.1.1.2 Test applicability

This test applies to all E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier.

#### 12.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.1.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.1.1.1.

#### 12.1.1.1.4 Test description

##### 12.1.1.1.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 12.1.1.1.4.1-1.

**Table 12.1.1.1.4.1-1: Supported test configurations for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Configuration | Description of a cell without CCA | Description of a cell with CCA |
|---|---|---|
| 12.1.1.1-1 | LTE FDD | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 12.1.1.1-2 | LTE TDD | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Configure the test requirement and the DUT according to the parameters in Table 12.1.1.1.4.1-2.

**Table 12.1.1.1.4.1-2: Initial conditions for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 12.1.1.1.4.1-3.
2. Message contents are defined in clause 12.1.1.1.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. NR Cell 2 is the PCell subject to CCA and E-UTRA Cell 1 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 12.1.1.1.4.1-3: General test parameters for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| T1 end condition | Active cell | | | Cell 1 | During T1 period the UE reselects to Cell 1 |
| | Neighbour cell | | | Cell 2 | |

| | | | | | |
|---|---|---|---|---|---|
| T3 end condition | Active cell | | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 during T3 |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| DBT Window Configuration | | | 1, 2 | DBT.1 | As specified in clause A.12.1. |
| DL CCA model | | | 1, 2 | As specified in clause D.7.2.1 | DL CCA model |
| UL CCA model | | | 1, 2 | As specified in clause D.7.2.2 | UL CCA model |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| T1 | | s | 1, 2 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | >7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 12.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one NR PCell (NR Cell 2) subject to CCA and a E-UTRA neighbour cell (E-UTRA Cell 1). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA Cell 1 is already identified by the UE prior to the start of the test. NR Cell 2 is of higher priority than E-UTRA Cell 1. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure.

1. The SS shall send a *RRCRelease* message on NR Cell 2 to ensure the UE is in State RRC_IDLE with generic procedure parameters connectivity = *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. The SS shall set the parameters according to T1 in Table 12.1.1.1.5-1 and 12.1.1.1.5-2 at the same time instance *RRCRelease* message is sent on NR Cell 2, The SS shall enable DL and UL CCA model according to Table 12.1.1.1.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, E-UTRA Cell 1.

4. If the UE responds on lower priority cell, E-UTRA Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1".

5. If the UE has re-selected E-UTRA Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE, disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) and skip to step 1.

5a. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 12.1.1.1.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE. T2 starts.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 12.1.1.1.5-1, T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, NR Cell 2.

9. If the UE responds on higher priority cell, NR Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 11. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE, disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) and continue with step 1.

11. The SS shall send an *RRCRelease* message on NR Cell 2 to ensure that the UE is in state RRC_IDLE with generic procedure parameters connectivity = NR with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G clause G.2.7 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 12.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 12.1.1.1.4.3-1: Common Exception messages for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br>Table H.2.3-2 with condition lower priority<br>Table H.2.3-3 with condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 12.1.1.1.4.3-2: *SystemInformationBlockType3***

| Derivation Path: TS 36.508 Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearch | 25 | Actual value = 50 dB | |
| threshServingLow | 22 | Actual value = 44 dB | |
| } | | | |
| } | | | |

**Table 12.1.1.1.4.3-3: SystemInformationBlockType24**

| Derivation Path: TS 36.508, Table 4.4.3.3-20 with Condition FR1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| measTimingConfig-r15[1] SEQUENCE { | | | |
| periodicityAndOffset-r15 CHOICE { | | | |
| sf20-r15 | 0 | | |

| | | | |
|---|---|---|---|
| } | | | |
| ssb-Duration-r15 | sf2 | Synchronous cells | Configuration 1,2 |
| } | | | |
| subcarrierSpacingSSB-r15[1] | kHz30 | | Configuration 1,2 |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| q-RxLevMin-r15[1] | -69 | Actual value = -137 dBm, Round down | Configuration 1,2 |
| } | | | |
| } | | | |

12.1.1.1.5 Test requirement

Tables 12.1.1.1.4.1-3, 12.1.1.1.5-1 and 12.1.1.1.5-2 define the primary level settings including test tolerances for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA.

**Table 12.1.1.1.5-1: NR Cell specific test parameters for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.1.1.CCA | | |
| DL CCA probability for semi-static channel access ($P_{CCA_DL}$) | | 1, 2 | 0.9 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_1}$) | | 1, 2 | 0.75 | | |
| DL CCA probability for dynamic static channel access ($P_{CCA_DL_2}$) | | 1, 2 | 0.5 | | |
| UL CCA probability $P_{CCA_UL}$ | | 1, 2 | 1 | | |
| $M_{d,max}$ | | 1, 2 | 16 | | |
| $M_{m,max}$ | | 1, 2 | 4 | | |
| $M_{e,max}$ | | 1, 2 | 8 | | |
| PDSCH Reference measurement channel | | 1, 2 | SR.1.1 CCA | | |
| RMSI CORESET Reference Channel | | 1, 2 | CR.1.1 CCA | | |
| RMC CORESET Reference Channel | | 1, 2 | CCR.1.1 CCA | | |
| OCNG Patterns | | 1, 2 | OP.1 | | |
| SSB configuration | | 1, 2 | SSB.1 CCA Note4<br>SSB.2 CCA Note5,6 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -137 | | |
| Pcompensation | dB | 1, 2 | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | -3.65 | -infinity | 13.55 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -96.9 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -99.9 | -98 | -98 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | -3.65 | -infinity | 13.55 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -100.54 | -infinity | -81.44 |
| Io | dBm/38.16 MHz | 1, 2 | -64.29 | -63.94 | -50.21 |
| Treselection | s | 1, 2 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2 | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2 | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2 | 50 | | |
| Propagation Condition | | 1, 2 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 6: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 12.1.1.1.5-2: E-UTRA Cell specific test parameters for E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA**

| Parameter | Unit | Cell 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 kHz | -84 | -84 | -82.45 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 | 15.55 |
| $\hat{E}_s/N_{oc}$ | dB | 14 | 14 | 15.55 |

| | | |
|---|---|---|
| $Treselection_{EUTRAN}$ | s | 0 |
| SnonintrasearchP | dB | 50 |
| $Thresh_{x, highP}$ | dB | 48 |
| $Thresh_{serving, lowP}$ | dB | 44 |
| $Thresh_{x, lowP}$ | dB | 50 |
| Propagation Condition | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority NR cell subject to CCA is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration updateon Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 60 + 1.28 x (5 + $M_e$) + $T_{SI_CCA}$ s. $M_e$ is the number of DRX cycles with at least one SMTC where there are no SSBs available during the $T_{evaluate,NR_Intra_CCA}$. If $M_e > M_{e,max}$ the UE is required to restart the evaluation of Cell 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate, NR_inter_CCA}$ + $T_{SI_CCA,}$ and to a lower priority cell can be expressed as: $T_{evaluate, NR}$ + $T_{SI\text{-}NR,}$

Where:

$T_{higher_priority_search}$ See clause 4.2.2 in TS 36.133 [23]

$T_{evaluate, NR_inter_CCA}$ See Table 12.1.1.0.1-1 in clause 12.1.1.0.1.

$T_{SI_CCA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

$T_{evaluate, NR}$ See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [23]

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

# 12.2 RRC_CONNECTED State Mobility

## 12.2.1 Handover

### 12.2.1.0 Minimum Conformance Requirements

#### 12.2.1.0.1 Minimum conformance requitements for E-UTRA - NR FR1 with CCA handover

The purpose of inter-RAT handover from E-UTRAN to NR in FR1 in carrier frequencies with CCA is to transfer a connection between the UE and E-UTRAN to NR in FR1 carrier frequencies with CCA. The handover procedure is initiated from E-UTRAN with an RRC message (MOBILITY FROM E-UTRA). The procedure is described in TS 36.331 [29].

In the requirements of clause 12.2.1.0.1, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due

to DL CCA failures at gNB during the corresponding detection or time tracking period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 12.2.1.0.1, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB at the UE but not transmitted by the UE during the corresponding period due to UL CCA failures at the UE; otherwise the PRACH occasion is considered as available for transmission.

When the UE receives an RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within $D_{handover}$ seconds from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay which is 50 ms.

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding $T_{RRC_procedure_delay}$. $T_{interrupt}$ is defined below.

When inter-RAT handover to NR is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{rs} + T_{processing} + T_{margin} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown cell and target cell Es/Iot $\geq$ [-2] dB, then $T_{search} = (3+L_1') * T_{rs}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$L_1'$ is the number of SMTC occasions not available at the UE during the inter-RAT detection period. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20 ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2 ms.

$T_{IU}$ is the interruption uncertainty due to the random access procedure when sending PRACH to the new cell. $T_{IU}$ can be up to: $(1+ L_3)*T_{SSB,RO}$ + 10 ms; where $T_{SSB,RO}$ is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [8] and $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures. $L_3$ = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [37]. When the UE is configured with both the UL BWP with PRACH occasion on the target cell and UL LBT failure detection/recovery, the interruption can be longer.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

NOTE 2: The interruption time extended by $L_1'$ and $L_3$ parameters, and by the UL LBT failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is specified in TS 38.331 [13].

$T_{rs}$ is the SMTC period of the taget NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise $T_{rs}$ is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 36.133 [23] clause 8.1.2.4.21A, and 8.1.2.4.22A.

The normative reference for this requirement is TS 36.133 [23] clause 5.3.4A.

## 12.2.1.1 E-UTRAN - NR with CCA handover with known target cell

### 12.2.1.1.1 Test purpose

The purpose of this test is to verify the E-UTRAN to NR FR1 handover requirements specified in clause 12.2.1.0.1.

### 12.2.1.1.2 Test applicability

This test applies to all E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier, supporting standalone NR-U, RRM measurements and UL with a shared spectrum NR carrier.

### 12.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.2.1.1.

### 12.2.1.1.4 Test description

#### 12.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.2.1.1.4.1-1.

**Table 12.2.1.1.4.1-1: Supported test configurations for E-UTRAN - NR with CCA handover with known target cell**

| Configuration | Description |
|---|---|
| 12.2.1.1-1 | LTE FDD, NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 12.2.1.1-2 | LTE TDD, NR with CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 12.2.1.1.4.1-2.

**Table 12.2.1.1.4.1-2: Initial conditions for E-UTRAN - NR with CCA handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 12.2.1.1.4.1-3.
2. Message contents are defined in clause 12.2.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier subject to CCA. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.

**Table 12.2.1.1.4.1-3: General test parameters for E-UTRAN - NR with CCA handover with known target cell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency with CCA is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | E-UTRAN cell |
| | Neighbouring cell | | Cell 2 | NR cell with CCA |
| Final condition | Active cell | | Cell 2 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| b2-Threshold1 | | dBm | -84 | Absolute E-UTRAN RSRP threshold for event B2 |
| b2-Threshold2NR | | dBm | As specified in Table 12.2.1.1.5-2 | Absolute NR SS-RSRP threshold for event B2 |
| Hysteresis | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in Table 8.1.2.1-1 started before T2 starts [23] |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

#### 12.2.1.1.4.2 Test procedure

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN cell and Cell 2 is an inter-RAT NR neighbour cell under CCA. The general and cell specific test parameters for PCell and neighbour cell are given in Table 12.2.1.1.4.1-3, 12.2.1.1.5-1 and 12.2.1.1.5-2, respectively.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable, and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [23] is configured before T2 begins to enable inter-RAT frequency monitoring. A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 12.2.1.1.5-1 and Table 12.2.1.1.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 12.2.1.1.5-1 and Table 12.2.1.1.5-2 respectively. The SS shall enable DL and UL CCA model according to Table 12.1.1.1.5-2. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2.
7. SS shall transmit a *MobilityFromEUTRACommand* message implying handover to Cell 2.
8. The start of T3 is the instant when the last TTI containing the *MobilityFromEUTRACommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 12.2.1.1.5-1 and Table 12.2.1.1.5-2.

9. If the UE transmits the uplink PRACH channel to Cell 2 less than 312 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. The UE shall transmit an *RRCReconfigurationComplete* message on Cell 2.

11. After T3 expires, the SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1) and,

    - could switch the parameters setting from T3 to T1 as specified in Table 12.2.1.1.5-1 and Table 12.2.1.1.5-2 respectively.

    - If the UE handover back to E-UTRA Cell 1, then T1 starts, skip to step 3. Otherwise, switch off and on the UE. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.

    - Or, switch off and on the UE. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.

12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

13. Repeat step 2-12 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 12.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 12.2.1.1.4.3-1: Common Exception messages for E-UTRAN - NR with CCA handover with known target cell**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.3-2<br>Table H.3.4-1a<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 and gapUE<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-6 with Condition Asynchronous cells<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 12.2.1.1.5 Test requirement

Table 12.2.1.1.4.1-3, 12.2.1.1.5-1 and 12.2.1.1.5-2 define the primary level settings including test tolerances for E-UTRAN - NR with CCA handover with known target cell.

**Table 12.2.1.1.5-1: E-UTRAN PCell specific test parameters for E-UTRAN - NR with CCA handover with known target cell**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2 | 2 | | |
| Duplex mode | | 1 | FDD | | |
| | | 2 | TDD | | |
| TDD special subframe configuration[Note1] | | 1, 2 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 1, 2 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |

| | | | | | |
|---|---|---|---|---|---|
| PRACH Configuration[Note2] | | 1 | 4 | | |
| | | 2 | 53 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | |
| PBCH_RA<br>PBCH_RB<br>PSS_RA<br>SSS_RA<br>PCFICH_RB<br>PHICH_RA<br>PHICH_RB<br>PDCCH_RA<br>PDCCH_RB<br>PDSCH_RA<br>PDSCH_RB<br>OCNG_RA[Note4]<br>OCNG_RB[Note4] | dB | 1, 2 | 0 | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1, 2 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 7 | 4.45 | 4.45 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2 | 7 | 4.45 | 4.45 |
| RSRP[Note6] | dBm/15kHz | 1, 2 | -91 | -93.55 | -93.55 |
| SCH_RP[Note6] | dBm/15kHz | 1, 2 | -91 | -93.55 | -93.55 |
| Io[Note6] | dBm/9MHz | 1, 2 | -59.42 | -61.43 | -61.43 |
| Propagation Condition | | 1, 2 | AWGN | | |
| Antenna Configuration and Correlation Matrix [Note7] | | 1, 2 | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 12.2.1.1.5-2: NR neighbour cell specific test parameters for E-UTRAN - NR with CCA handover with known target cell**

| Parameter | | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1, 2 | 1 | | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 4, 6 | | 1, 2 | $P_{CCA_DL}$=0.9375 | | |
| | Dynamic channel access Note 5, 6 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 4, 6 | | 1, 2 | $P_{CCA_UL}$=0.87 | | |
| | Dynamic channel access Note 5, 6 | | 1, 2 | $P_{CCA_UL}$=0.75 | | |
| $L_{CCA_DL}$ | | - | 1, 2 | 5 | | |
| $W_{CCA_DL}$ | | ms | 1, 2 | T304 | | |
| $L_{CCA_UL}$ | | - | 1, 2 | 5 | | |
| $W_{CCA_UL}$ | | ms | 1, 2 | T304 | | |
| T304 | | ms | 1, 2 | 500 | | |
| Duplex mode | | | 1, 2 | TDD | | |
| TDD Configuration | | | 1, 2 | TDDConf.1.1 CCA | | |
| $BW_{channel}$ | | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 2 | SR.1.1 CCA | | |
| CORESET reference channel | | | 1, 2 | CR.1.1 CCA | | |
| PRACH configuration | | | 1, 2 | FR1 PRACH configuration 1 under CCA | | |
| OCNG pattern Note1 | | | 1, 2 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2 | SMTC.1 | | |
| SSB configuration | Semi-static channel access Note 4, 6 | | 1, 2 | SSB.1 CCA | | |
| | Dynamic channel access Note 5, 6 | | 1, 2 | SSB.2 CCA | | |
| DBT window configuration | | | | DBT.1 | | |
| b2-Threshold2NR | | dBm | 1 | -105 | | |
| | | | 2 | -103 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | 1, 2 | -98 | | |
| $N_{oc}$ Note2 | | dBm/SCS | 1, 2 | -95 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2 | -inifinity | 0.55 | 0.55 |
| $\hat{E}_s/I_{ot}$ Note3 | | dB | 1, 2 | -inifinity | 0.55 | 0.55 |
| SS-RSRP Note3 | | dBm/SCS | 1, 2 | -inifinity | -94.44 | -94.44 |
| Io Note3 | | dBm/38.16 MHz | 1, 2 | -63.94 | -60.65 | -60.65 |
| Propagation condition | | | 1, 2 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2 | 1x2 Low | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted | | | | | | |

| | |
|---|---|
| | only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 5: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 6: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

The UE shall start to transmit the PRACH to Cell 2 less than 112 + ($L_1$´ + $L_3$)*20 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in TS 36.331 [29].

$T_{interrupt}$ = 62 + ( $L_1$´ + $L_3$) * $T_{SMTC}$; $T_{interrupt}$ is defined in clause 12.2.1.0.1 where

- $L_1$´ is the number of SMTC occasions not available at the UE during the inter-RAT detection period.
- $L_3$ is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failure. $L_3$ = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [37].

$T_{SMTC}$ = 20 ms is the SMTC periodicity ms in the test.

This gives a total of 112 +( $L_1$´ + $L_3$ )*20 ms.

# 12.3 Void

# 12.4 Measurement Procedure

## 12.4.1 E-UTRAN-NR inter-RAT SFTD measurements

### 12.4.1.0 Minimum Conformance Requirements

#### 12.4.1.0.1 Minimum conformance requitements for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA

Same Minimum Conformance Requirements as in clause 8.4.1.0.1 apply with addition below.

##### 12.4.1.0.1.1 SFTD Measurement delay with CCA on target frequency

The requirements on SFTD measurement delay defined in this section are applicable to a UE configured with a target NR carrier for which CCA is used and under the side condition SCH $\hat{E}s/Iot \geq$ -3 dB for the NR cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest NR cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more NR cells. The UE may be configured with *cellsForWhichToReportSFTD*. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the NR cell regardless of its SSB position in the SMTC period. The SFTD measurement shall be conducted with sustained connection to the E-UTRA PCell and activated SCell(s), however, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in TS 36.133 [23] clause 7.35.

When measurement gaps are provided, the UE shall be capable of finding the NR cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no MCG DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of $T_{measure_SFTD_LBT_max} = 4 \times T_{measure_SFTD1}$, where $T_{measure_SFTD1}$ is defined in clause 8.4.1.0.1. If the UE is unable to meet the requirement, it shall terminate the inter-RAT SFTD measurement.

When MCG DRX is used, the same $T_{measure_SFTD_LBT_max}$ as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case an NR PSCell is added, the UE shall terminate the inter-RAT SFTD measurement.

In case PCell is changed due to handover, the UE shall terminate the inter-RAT SFTD measurement.

#### 12.4.1.0.1.2 SFTD Measurement reporting delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report and all delays due to UL CCA failures until the successful transmission of the report. When the UE is configured to perform SRS carrier-based switching, an additional delay can be expected.

The SFTD measurement reporting delay shall be less than $T_{measure_SFTD1}$ defined in clause 8.4.1.0.1 and $T_{measure_SFTD_LBT_max}$ defined in clause 12.4.1.0.1.1 for target carrier without and with CCA, respectively.

#### 12.4.1.0.1.3 E-UTRAN TDD – NR SFTD Measurements

This clause contains requirements for a UE supporting E-UTRAN TDD – NR dual connectivity and is applicable in RRC_CONNECTED state and conditioned on that no NR PSCell is configured.

When no measurement gap is provided, the UE is not required to perform SFTD measurement during the UL subframes of an E-UTRAN serving cell which is on the same TDD band with the NR target cell.

When no measurement gap is provided, the UE is not required to perform SFTD measurement during the UL subframes of a TDD E-UTRAN serving cell which is on the different band with the NR target cell when UE doesn't support *simultaneousRxTxInterBandENDC* in this band combination.

The requirements in clauses 12.4.1.0.1.1 and 12.4.1.0.1.2 also apply for this section.

The normative reference for this requirement is TS 36.133 [23] clauses 8.1.2.4.25 and 8.1.2.4.26.

### 12.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX

#### 12.4.1.1.1 Test purpose

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell under CCA is within the requirements stated in clause 12.4.1.0.1 for E-UTRA FDD and TDD, when no measurement gaps are provided and no DRX is configured.

#### 12.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting FR1 with a shared spectrum NR carrier and supporting inter-RAT SFTD measurements on a TDD NR cell.

#### 12.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.4.1.1.

#### 12.4.1.1.4 Test description

Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier under CCA with the NR neighbour cell (Cell 2).

This test consists of a single time period of duration T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report. No measurement gaps are provided and no DRX is configured in this test.

##### 12.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.4.1.1.4.1-1.

**Table 12.4.1.1.4.1-1: Supported test configurations for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Config | Description |
|---|---|
| 12.4.1.1-1 | LTE FDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 12.4.1.1-2 | LTE TDD; NR: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test requirement and the DUT according to the parameters in Table 12.4.1.1.4.1-2.

**Table 12.4.1.1.4.1-2: Initial conditions for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 12.4.1.1.4.1-3.
2. Message contents are defined in clause 12.4.1.1.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier under CCA. Cell 1 is the cell used for connection setup for this test. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1.

**Table 12.4.1.1.4.1-3: General test parameters for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN carrier frequencies is used. |

| | | | | | |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2 | 1 | | One NR carrier frequencies is used. |
| Active cell | | Config 1,2 | Cell 1 | | Cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | Config 1,2 | Cell 2 | | Cell 2 is on NR RF channel number 1. |
| CP length | | Config 1,2 | Normal | | Applicable to both cells. |
| DRX | | Config 1,2 | OFF | | DRX is not used |
| Frame time offset between serving and neighbour cells | ms | Config 1 | 3 | 7 | Asynchronous cells.<br>The timing of Cell 2 relative to the timing of Cell 1. |
| | µs | Config 2 | 3 | | Synchronous cells. |
| SFN offset between serving and neighbour cells | | Config 1,2 | 0 | 1 | SFN of Cell 2 relative to SFN of Cell 1. |
| SS-RSRP reporting | | Config 1,2 | No | | Only SFTD is reported. |
| T1 | s | Config 1,2 | 2 | | T1 shall exceed $T_{measure_SFTD_LBT_max}$ = 56 × SMTC |

#### 12.4.1.1.4.2 Test procedure

The test has two subtests with different frame time offset and SFN offset. Cell specific test parameters for the E-UTRA PCell and neighbour cell are given in Table 12.4.1.1.5-1 and 12.4.1.1.5-2, respectively.

In the measurement control information, it is indicated to the UE that inter-RAT SFTD measurement on Cell 2 is used. This test consists of single time period with time duration of T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The DL CCA model is disabled (i.e. $P_{CCA_DL_i}$= 1) at the start of the test.

Configure the frame time offset and SFN offset according to Test 1 in Table 12.4.1.1.4.1-3.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. The SS shall set the parameters of Cell 2 according to T1 in Table 12.4.1.1.5-2 and enable DL CCA model according to Table 12.4.1.1.5-2. T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. UE shall transmit a *MeasurementReport* message triggered by SFTD measurement reporting. If the overall delays measured from the beginning of time period T1 is less than 1132 ms then the number of successful tests is increased by one. If the UE fails to report within the overall delays measured requirement then the number of failure tests is increased by one.
6. After the SS receive the *MeasurementReport* message in step 6) or when T1 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. The SS shall disable the DL CCA model (i.e. PCCA_DL_i= 1).
7. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
9. Repeat step 2-8 until the confidence level according to Annex G clause G.2.7 is achieved.
10. Set the frame time offset and SFN offset for Test 2 according to Table 12.4.1.1.4.1-3 and repeat steps 1 to 9.

#### 12.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 12.4.1.1.4.3-1: Common Exception messages for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and SFTD;<br>Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.2 |

#### 12.4.1.1.5 Test requirement

Table 12.4.1.1.4.1-3, 12.4.1.1.5-1 and 12.4.1.1.5-2 define the primary level settings including test tolerances E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX.

**Table 12.4.1.1.5-1: E-UTRA Cell specific test parameters for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Parameter | Unit | E-UTRAN Cell1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |

| | | |
|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | -59.13+10log($N_{RB,c}$ /50) |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 12.4.1.1.5-2: NR Cell specific test parameters for E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| NR RF Channel Number | | | 1 |
| Duplex mode | | | TDD |
| $BW_{channel}$ | | MHz | 40: $N_{RB,c}$ = 106 |
| TDD configuration | | | TDDConf.1.1 CCA |
| DL CCA model | | | As specified in clause D.7.2.1 |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | 0.9375 |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | 0.75 |
| | $P_{CCA_DL_2}$ | | 0.75 |
| OCNG Pattern defined in A.2.1 Note 1 | | | OP.1 |
| SMTC configuration | | | SMTC.2 |
| SSB configuration for semi-static channel access Note5,7 | | | SSB.1 CCA |
| SSB configuration for dynamic channel access Note6,7 | | | SSB.2 CCA |
| DBT window configuration | | | DBT.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 30 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | dB | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | dB | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | dB | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 |
| $N_{oc}$ Note2 | | dBm/SCS | -95 |
| SS-RSRP Note 3, 4 | | dBm/SCS | -91 |
| $\hat{E}_s/I_{ot}$ | | dB | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 |
| Io Note 3 | | dBm/38.16 MHz | -58.50 |

| Propagation Condition | | AWGN |
|---|---|---|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. | |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | |
| Note 7: | For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel access only.. | |

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at $T_{RRC_procedure_delay} + T_{measure_SFTD_LBT_max}$ after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2\times TTI_{DCCH}$ longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

## 12.4.2 E-UTRAN-NR inter-RAT measurements on NR carrier frequency under CCA

### 12.4.2.0 Minimum Conformance Requirements

Requirements in this clause shall apply for NR capable UE, when NR is in carrier frequencies with CCA and not configured with EN-DC.

The UE shall be able to identify new NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

In the requirements on this clause, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the *N* candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period, where:

- For the cell detection procedure: *N* is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and

- For other procedures in this clause: *N* are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise N is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

The normative reference for this requirement is TS 36.133 [23] clauses 8.1.2.4.21A and 8.1.2.4.22A.

### 12.4.2.0.1 E-UTRAN – NR measurements

#### 12.4.2.0.1.1 Identification of a new NR cell

When measurement gaps are scheduled, the UE shall be able to identify a new detectable cell within $T_{identify_irat_cca_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT frequency cell within $T_{identify_irat_cca_with_index}$. The UE shall be able to identify a new detectable inter-RAT frequency SSB of an already detected cell within $T_{identify_irat_cca_without_index}$.

$$T_{identify_irat_cca_without_index} = (T_{PSS/SSS_sync_irat_cca} + T_{SSB_measurement_period_irat_cca})\ ms$$

$$T_{identify_irat_cca_with_index} = (T_{PSS/SSS_sync_irat_cca} + T_{SSB_measurement_period_irat_cca} + T_{SSB_time_index_irat_cca})\ ms$$

Where:

$T_{PSS/SSS_sync_irat_cca}$: it is the time period used in PSS/SSS detection given in table 12.4.2.0.1.1-1.

$T_{SSB_time_index_irat_cca}$: it is the time period used to acquire the index of the SSB being measured given in table 12.4.2.0.1.1-2.

$T_{SSB_measurement_period_irat_cca}$: equal to a measurement period of SSB based measurement given in table 12.4.2.0.1.1-3.

$N_{freq}$ is defined in TS 36.133 [23] clause 8.1.2.1.1.

**Table 12.4.2.0.1.1-1: Time period for PSS/SSS detection, in NR carrier frequencies with CCA**

| Condition NOTE1,2,3,4 | $T_{PSS/SSS_sync_irat_cca}$ |
|---|---|
| No DRX | Max(600ms, (8 +$L_{PSS/SSS,gaps}$) × Max(MGRP, SMTC period)) × $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(600ms, Ceil((8+$L_{PSS/SSS,gaps}$) ×1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq}$ |
| DRX cycle > 320ms | (8+$L_{PSS/SSS,gaps}$) × DRX cycle × $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5. | |
| NOTE 3: $L_{PSS/SSS,gaps}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_irat_cca}$, where $L_{PSS/SSS,gaps} \leq L_{PSS/SSS,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. | |
| NOTE 4: $L_{PSS/SSS,gaps}$ = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms $L_{PSS/SSS,gaps}$ = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{PSS/SSS,gaps}$ = 5 for DRX cycle > 320 ms. | |

Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

**Table 12.4.2.0.1.1-2: Time period for time index detection, in NR carrier frequencies with CCA**

| Condition NOTE1,2,3,4 | $T_{SSB_time_index_irat_cca}$ |
|---|---|
| No DRX | Max(120ms, (3 + $L_{ind,gaps}$) × Max(MGRP, SMTC period)) × $N_{freq}$ |
| DRX cycle ≤ 320ms | Max(120ms, ceil((3+ $L_{ind,gaps}$) x 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq}$ |
| DRX cycle > 320ms | (3+ $L_{ind,gaps}$) × DRX cycle × $N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5 | |
| NOTE 3: $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_irat_cca}$, where $L_{ind,gaps} \leq L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. | |
| NOTE 4: $L_{ind,gaps,max}$ = 5 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{ind,gaps,max}$ = 3 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{ind,gaps,max}$ = 2 for DRX cycle > 320 ms. | |

The UE shall restart the time index detection upon exceeding $L_{ind,gaps,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

In the requirements, an NR cell is considered to be detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in TS 36.133 [23] Clause 9.11.4 are fulfilled for a corresponding band, together with the corresponding side conditions in subclause 10.1.37.1 of TS 38.133 [6],
- NR SS-RSRQ related conditions in the accuracy requirements in TS 36.133 [23] Clause 9.11.5 are fulfilled for a corresponding band, together with the corresponding side conditions in subclause 10.1.30.1 of TS 38.133 [6],
- NR SS-SINR related conditions in the accuracy requirements in TS 36.133 [23] Clause 9.11.6 are fulfilled for a corresponding band, together with the corresponding side conditions in subclause 10.1.32.1 of TS 38.133 [6].

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ, and SS-SINR measurements to higher layers with measurement accuracy, with measurement period as shown in table 12.4.2.0.1.1-3:

**Table 12.4.2.0.1.1-3: Measurement period for inter-RAT measurements**

| Condition NOTE1,2,3,4 | $T_{SSB_measurement_period_irat_cca}$ |
|---|---|
| No DRX | $Max(200ms, (8+ L_{meas}) \times Max(MGRP, SMTC\ period)) \times N_{freq}$ |
| DRX cycle ≤ 320ms | $Max(200ms, ceil((8+ L_{meas}) \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$ |
| DRX cycle > 320ms | $(8+ L_{meas}) \times DRX\ cycle \times N_{freq}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 5<br>NOTE 3: $L_{meas}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_irat_cca}$, where $L_{meas} \le L_{meas,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP.<br>NOTE 4: $L_{meas,max}$ = 12 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, $L_{meas,max}$ = 8 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and $L_{meas,max}$ = 5 for DRX cycle > 320 ms. | |

The UE shall restart the measurement upon exceeding $L_{meas,max}$. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

When the time period of unsuccessful measurement attemps due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in TS 36.133 [23] clause 9.3A.6.3, the UE shall stop the measurement attempts on this SSB and perform the detection procedure again, like for any other SSB.

The UE shall be capable of performing SSB based SS-RSRP, SS-RSRQ, and SS-SINR for up to [7] NR carrier frequencies.

For each RAT E-UTRAN-NR layer on, in carrier frequencies with CCA, the UE shall be capable of monitoring at least 4 cells.

For each RAT E-UTRAN-NR layer in carrier frequencies with CCA, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB indexes and/or PCI on the RAT E-UTRAN-NR layer.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.1.1.

### 12.4.2.0.1.2 Event Triggered Reporting

Reported measurements in event triggered measurement reports shall meet the requirements in TS 36.133 [23] clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement

report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_cca_without_index}$ or $T_{identify_irat_cca_with_index}$ defined in clause 12.4.2.0.1.1 for the minimum requirements. When L3 filtering is used or IDC autonomous denial or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_irat_cca_without_index}$ or $T_{identify_irat_cca_with_index}$ defined in clause 12.4.2.0.1.1 for the minimum requirements and then triggers the measurement report as per TS 36.331 [29], the event triggered measurement reporting delay shall be less than $T_{measurement_NR_cca}$ defined in clause 12.4.2.0.1.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 8.1.2.4.21A.1.3.

### 12.4.2.0.1.3 NR inter-RAT RSSI measurements

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [10], on one or more inter-RAT carriers operating with CCA, TS 37.213 [37], if the carrier(s) are indicated by higher layers, and reporting the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration occurring with a configured RSSI measurement timing configuration periodicity, *rmtc-Periodicity*.

**Table 12.4.2.0.1.3-1: Measurement period for inter-RAT RSSI measurements with gaps**

| Condition NOTE1,2,3,4 | $T_{RSSI_measurement_period_NR_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{NR,EN-DC}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{NR,EN-DC}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [6]. | |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency RSSI measurements. The RSSI measurement duration and the measurement gap shall be aligned, and the following additional condition shall be fulfilled:

- Entire RSSI measurement duration shall be contained in the measurement gap.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.1.5.

### 12.4.2.0.1.4 NR inter-RAT channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers, based on RSSI samples provided by the physical layer.

**Table 12.4.2.0.1.4-1: Measurement period for inter-RAT Channel Occupancy measurements with gaps**

| Condition NOTE1,2,3,4 | $T_{CO_measurement_period_NR_cca}$ |
|---|---|
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{NR,EN-DC}$) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{NR,EN-DC}$) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [6]. | |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency channel occupancy measurements.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21A.1.6.

## 12.4.2.1 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA

### 12.4.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 12.4.2.0 for E-UTRAN-NR measurements under CCA.

### 12.4.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier.

### 12.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.4.2.1.

### 12.4.2.1.4 Test description

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables 12.4.2.1.4.1-3, 12.4.2.1.5-1 and 12.4.2.1.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In this test measurement gap pattern configuration # 0 as defined in Table 12.4.2.1.4.1-3 is provided.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

#### 12.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.4.2.1.4.1-1.

**Table 12.4.2.1.4.1-1: Supported test configurations for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Configuration | Description |
|---|---|
| 12.4.2.1-1 | LTE FDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 12.4.2.1-2 | LTE TDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note1: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 12.4.2.1.4.1-2.

**Table 12.4.2.1.4.1-2: Initial conditions for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | |

1. The test parameter settings are set up according to Tables 12.4.2.1.5-1 and 12.4.2.1.5-2.
2. Message contents are defined in clause 12.4.2.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is an NR cell (neighbour cell) in an unlicensed carrier subject to CCA and its power level is set according to clauses C.1.2 and C.1.3 for this test.

**Table 12.4.2.1.4.1-3: General test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1, 2 | 1 | One FR1 NR carrier frequency under CCA is used. |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| $L_{CCA_DL}$ | | 1, 2 | 12 | |
| $W_{CCA_DL}$ | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | |
| Active cell | | 1, 2 | E-UTRA cell 1 (PCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2 | NR cell 2 | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2 | Note 1 | E-UTRA RSRP threshold for measurement on cell 1 for event B2 |
| b2-Threshold2NR | dBm | 1, 2 | Note 2 | SS-RSRP threshold for measurement on cell 2 for event B2 |
| Hysteresis | dB | 1, 2 | 0 | |
| CP length | | 1, 2 | Normal | |
| TimeToTrigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1, 2 | 3µs | Synchronous cells. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | $T_{identify_irat_cca_without_index}$ is defined in clause 12.4.2.0 |
| Note 1: The value of b2-Threshold1 is defined in Table 12.4.2.1.5-1<br>Note 2: The value of b2-Threshold2NR is defined in Table 12.4.2.1.5-2 | | | | |

### 12.4.2.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to T1 in Tables 12.4.2.1.5-1 and 12.4.2.1.5-2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message configuring inter-RAT RSRP measurements on a target NR unlicensed carrier according to section 12.4.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 12.4.2.1.5-1. T1 starts.

5. UE shall transmit a *MeasurementReport* message containing Cell 2 RSRP measurements obtained in the target unlicensed NR carrier. If the overall measurement reporting delay measured from the beginning of time period T1 is less than 1602 ms, then the number of successful tests is increased by one. If the UE fails to report the measurements within the overall delays measured requirement, then the number of failure tests is increased by one.

6. After the SS receives the *MeasurementReport* message in step 5, the SS shall transmit *RRCConnectionRelease* according to TS 36.508 [25] to release the LTE cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

7. Set Cell 2 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 1-7 until the confidence level according to Annex G clause G.2.7 is achieved.

### 12.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 12.4.2.1.4.3-1: Common Exception messages for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 12.4.2.1.5 Test requirements

Tables 12.4.2.1.5-1 and 12.4.2.1.5-2 define the primary level settings including test tolerances for all tests for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA.

**Table 12.4.2.1.5-1: E-UTRAN cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD | |

| | | | | |
|---|---|---|---|---|
| | | | 10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2 | -59.13+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition [Note6] | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 12.4.2.1.5-2: NR neighbour cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access [Note 6,8] | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access [Note 7,8] | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Pattern | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |

| | | | | |
|---|---|---|---|---|
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index. $T_{identify_irat_cca_without_index}$ is defined in defined in clause 12.4.2.0.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 12.4.2.2 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA

### 12.4.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 12.4.2.0 for E-UTRAN-NR measurements under CCA.

#### 12.4.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier and long DRX cycle.

#### 12.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.4.2.2.

#### 12.4.2.2.4 Test description

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables 12.4.2.2.4.1-3, 12.4.2.2.5-1 and 12.4.2.2.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In this test measurement gap pattern configuration # 0 as defined in Table 12.4.2.2.4.1-3 is provided.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

##### 12.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.4.2.2.4.1-1.

**Table 12.4.2.2.4.1-1: Supported test configurations for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA**

| Configuration | Description |
|---|---|
| 12.4.2.2-1 | LTE FDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 12.4.2.2-2 | LTE TDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note1: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 12.4.2.2.4.1-2.

**Table 12.4.2.2.4.1-2: Initial conditions for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 12.4.2.2.5-1 and 12.4.2.2.5-2.
2. Message contents are defined in clause 12.4.2.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is an NR cell (neighbour cell) in an unlicensed carrier subject to CCA and its power level is set according to clauses C.1.2 and C.1.3 for this test.

**Table 12.4.2.2.4.1-3: General test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | 1, 2 | 1 | | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | 1, 2 | 1 | | One FR1 NR carrier frequency under CCA is used. |
| Active cell | | 1, 2 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| DL CCA model | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | |
| $L_{CCA_DL}$ | | 1, 2 | 12 | 5 | |
| $W_{CCA_DL}$ | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | | |
| Neighbour cell | | 1, 2 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2 | Note 1 | | E-UTRA RSRP threshold for measurement on cell 1 for event B2 |
| b2-Threshold2NR | dBm | 1, 2 | Note 2 | | SS-RSRP threshold for measurement on cell 2 for event B2 |
| Hysteresis | dB | 1, 2 | 0 | | |
| CP length | | 1, 2 | Normal | | |
| TimeToTrigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | 1, 2 | 3µs | | Synchronous cells. |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | | $T_{identify_irat_cca_without_index}$ is defined in clause 12.4.2.0 |
| Note 1: The value of b2-Threshold1 is defined in Table 12.4.2.2.5-1<br>Note 2: The value of b2-Threshold2NR is defined in Table 12.4.2.2.5-2 | | | | | |

### 12.4.2.2.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to T1 in Tables 12.4.2.2.5-1 and 12.4.2.2.5-2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message configuring inter-RAT RSRP measurements on a target NR unlicensed carrier according to section 12.4.2.2.4.3.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 12.4.2.2.5-1. T1 starts.
5. UE shall transmit a *MeasurementReport* message containing Cell 2 RSRP measurements obtained in the target unlicensed NR carrier. If the overall measurement reporting delay measured from the beginning of time period T1 is less than 2402 ms for Test 1 and 16642 ms for Test 2, then the number of successful tests is increased by

one. If the UE fails to report the measurements within the overall delays measured requirement, then the number of failure tests is increased by one.

6. After the SS receives the *MeasurementReport* message in step 5, the SS shall transmit *RRCConnectionRelease* according to TS 36.508 [25] to release the LTE cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

7. Set Cell 2 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 1-7 until the confidence level according to Annex G clause G.2.7 is achieved.

9. Repeat step 1-8 for each subtest in Table 12.4.2.2.4.3-1.

#### 12.4.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 12.4.2.2.4.3-1: Common Exception messages for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.7-2 with Condition DRX.9 for Test 1, or Condition DRX.12 for Test 2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 12.4.2.2.5 Test requirements

Tables 12.4.2.2.5-1 and 12.4.2.2.5-2 define the primary level settings including test tolerances for all tests for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA.

**Table 12.4.2.2.5-1: E-UTRAN cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters: | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |

| | | | | |
|---|---|---|---|---|
| DL Reference Measurement Channel[Note2] | | | | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2 | 17 | 17 |
| RSRP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP[Note5] | dBm/15kHz | 1, 2 | -87 | -87 |
| Io[Note5] | dBm/9MHz | 1, 2 | -59.13+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition [Note6] | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 12.4.2.2.5-2: NR neighbour cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 1 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access [Note 6,8] | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access [Note 7,8] | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Pattern | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |

| | | | | |
|---|---|---|---|---|
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

In test 1, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_without_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 12.4.2.3 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA

#### 12.4.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 12.4.2.0 for E-UTRAN-NR measurements under CCA.

#### 12.4.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier.

#### 12.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.4.2.3.

#### 12.4.2.3.4 Test description

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables 12.4.2.3.4.1-3, 12.4.2.3.5-1 and 12.4.2.3.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In this test measurement gap pattern configuration # 0 as defined in Table 12.4.2.3.4.1-3 is provided.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

##### 12.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.4.2.3.4.1-1.

**Table 12.4.2.3.4.1-1: Supported test configurations for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA**

| Configuration | Description |
|---|---|
| 12.4.2.3-1 | LTE FDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 12.4.2.3-2 | LTE TDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note1: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 12.4.2.3.4.1-2.

**Table 12.4.2.3.4.1-2: Initial conditions for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.4.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 12.4.2.3.5-1 and 12.4.2.3.5-2.
2. Message contents are defined in clause 12.4.2.3.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is an NR cell (neighbour cell) in an unlicensed carrier subject to CCA and its power level is set according to clauses C.1.2 and C.1.3 for this test.

**Table 12.4.2.3.4.1-3: General test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | 1, 2 | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1, 2 | 1 | One FR1 NR carrier frequency under CCA is used. |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| $L_{CCA_DL}$ | | 1, 2 | 12 | |
| $W_{CCA_DL}$ | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | |
| Active cell | | 1, 2 | E-UTRA cell 1 (PCell) | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | 1, 2 | NR cell 2 | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2 | 39 | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2 | Note 1 | E-UTRA RSRP threshold for measurement on cell 1 for event B2 |
| b2-Threshold2NR | dBm | 1, 2 | Note 2 | SS-RSRP threshold for measurement on cell 2 for event B2 |
| Hysteresis | dB | 1, 2 | 0 | |
| CP length | | 1, 2 | Normal | |
| TimeToTrigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 1, 2 | 3µs | Synchronous cells. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | $T_{identify_irat_cca_without_index}$ is defined in clause 12.4.2.0 |
| Note 1: The value of b2-Threshold1 is defined in Table 12.4.2.3.5-1<br>Note 2: The value of b2-Threshold2NR is defined in Table 12.4.2.3.5-2 | | | | |

### 12.4.2.3.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}= P_{CCA_UL}=1$) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to T1 in Tables 12.4.2.3.5-1 and 12.4.2.3.5-2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message configuring inter-RAT RSRP measurements on a target NR unlicensed carrier according to section 12.4.2.3.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 12.4.2.3.5-1. T1 starts.

5. UE shall transmit a *MeasurementReport* message containing Cell 2 RSRP measurements obtained in the target unlicensed NR carrier. If the overall measurement reporting delay measured from the beginning of time period T1 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the measurements within the overall delays measured requirement, then the number of failure tests is increased by one.

6. After the SS receives the *MeasurementReport* message in step 5, the SS shall transmit *RRCConnectionRelease* according to TS 36.508 [25] to release the LTE cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

7. Set Cell 2 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 1-7 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 12.4.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 12.4.2.3.4.3-1: Common Exception messages for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-8 with Condition SSB-Index<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 12.4.2.3.5 Test requirements

Tables 12.4.2.3.5-1 and 12.4.2.3.5-2 define the primary level settings including test tolerances for all tests for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA.

**Table 12.4.2.3.5-1: E-UTRAN cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |

| | | | | |
|---|---|---|---|---|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns Note2 | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2 | -59.13+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition Note6 | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 12.4.2.3.5-2: NR neighbour cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 2 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Pattern | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |

| | | | | |
|---|---|---|---|---|
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2 | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 12.4.2.4 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA

#### 12.4.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 12.4.2.0 for E-UTRAN-NR measurements under CCA.

#### 12.4.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting RRM measurements on a shared spectrum NR carrier and long DRX cycle.

#### 12.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.4.2.4.

#### 12.4.2.4.4 Test description

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1 on a carrier frequency with CCA. The test parameters are given in Tables 12.4.2.4.4.1-3, 12.4.2.4.5-1 and 12.4.2.4.5-2. Cell transmits SSBs in DBT windows according to DL CCA model.

In this test measurement gap pattern configuration # 0 as defined in Table 12.4.2.4.4.1-3 is provided.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than threshold2) is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

##### 12.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.4.2.4.4.1-1.

**Table 12.4.2.4.4.1-1: Supported test configurations for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA**

| Configuration | Description |
|---|---|
| 12.4.2.4-1 | LTE FDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| 12.4.2.4-2 | LTE TDD;<br>NR with CCA: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note1: The UE is only required to pass in one of the supported test configurations above. | |

Configure the test equipment and the DUT according to the parameters in Table 12.4.2.4.4.1-2.

**Table 12.4.2.4.4.1-2: Initial conditions for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.4.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 12.4.2.4.5-1 and 12.4.2.4.5-2.
2. Message contents are defined in clause 12.4.2.4.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6B. Cell 2 is an NR cell (neighbour cell) in an unlicensed carrier subject to CCA and its power level is set according to clauses C.1.2 and C.1.3 for this test.

**Table 12.4.2.4.4.1-3: General test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | 1, 2 | 1 | | One E-UTRAcarrier frequency is used. |
| NR RF Chanel Number | | 1, 2 | 1 | | One FR1 NR carrier frequency under CCA is used. |
| Active cell | | 1, 2 | E-UTRA cell 1 (PCell) | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| DL CCA model | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | |
| $L_{CCA_DL}$ | | 1, 2 | 12 | 5 | |
| $W_{CCA_DL}$ | ms | 1, 2 | $T_{PSS/SSS_sync_irat_cca}$ | | |
| Neighbour cell | | 1, 2 | NR cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 1, 2 | 0 | | As specified in clause Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 1, 2 | 39 | | As specified in TS 36.331 [29]. |
| b2-Threshold1 | dBm | 1, 2 | Note 1 | | E-UTRA RSRP threshold for measurement on cell 1 for event B2 |
| b2-Threshold2NR | dBm | 1, 2 | Note 2 | | SS-RSRP threshold for measurement on cell 2 for event B2 |
| Hysteresis | dB | 1, 2 | 0 | | |
| CP length | | 1, 2 | Normal | | |
| TimeToTrigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | 1, 2 | 3µs | | Synchronous cells. |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | $\geq T_{identify_irat_cca_without_index}$ | | $T_{identify_irat_cca_without_index}$ is defined in clause 12.4.2.0 |
| Note 1: The value of b2-Threshold1 is defined in Table 12.4.2.4.5-1<br>Note 2: The value of b2-Threshold2NR is defined in Table 12.4.2.4.5-2 | | | | | |

### 12.4.2.4.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to T1 in Tables 12.4.2.4.5-1 and 12.4.2.4.5-2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message configuring inter-RAT RSRP measurements on a target NR unlicensed carrier according to section 12.4.2.4.4.3.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 12.4.2.4.5-1. T1 starts.

5. UE shall transmit a *MeasurementReport* message containing Cell 2 RSRP measurements obtained in the target unlicensed NR carrier. If the overall measurement reporting delay measured from the beginning of time period T1 is less than 2882 ms for Test 1 or 19842 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the measurements within the overall delays measured requirement, then the number of failure tests is increased by one.

6. After the SS receives the *MeasurementReport* message in step 5, the SS shall transmit *RRCConnectionRelease* according to TS 36.508 [25] to release the LTE cell. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

7. Set Cell 2 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 1-7 until the confidence level according to Annex G clause G.2.7 is achieved.

9. Repeat step 1-8 for each subtest in Table 12.4.2.4.4.3-1.

#### 12.4.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 12.4.2.4.4.3-1: Common Exception messages for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and EVENT B2;<br>Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2<br>Table H.3.4-5 with Condition Pattern #0<br>Table H.3.4-8 with Condition SSB-Index<br>Table H.3.7-2 with Condition DRX.9 for Test 1, or Condition DRX.12 for Test 2<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 12.4.2.4.5 Test requirements

Tables 12.4.2.4.5-1 and 12.4.2.4.5-2 define the primary level settings including test tolerances for all tests for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA.

**Table 12.4.2.4.5-1: E-UTRAN cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2 | 1 | |
| Duplex mode | | 1 | FDD | |
| | | 2 | TDD | |
| TDD special subframe configuration[Note1] | | 2 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 2 | 1 | |
| $BW_{channel}$ | MHz | 1, 2 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 2 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |

| | | | | |
|---|---|---|---|---|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | | 1 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 2 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns Note2 | | 1 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 2 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | dBm | 1, 2 | -77 | |
| PBCH_RA | dB | 1, 2 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15kHz | 1, 2 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2 | 17 | 17 |
| RSRP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| SCH_RP Note5 | dBm/15kHz | 1, 2 | -87 | -87 |
| Io Note5 | dBm/9MHz | 1, 2 | -59.13+10log ($N_{RB,c}$ /50) | -59.13+10log ($N_{RB,c}$ /50) |
| Propagation Condition Note6 | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | 1, 2 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 12.4.2.4.5-2: NR neighbour cell specific test parameters for E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | 1, 2 | 1 | |
| TDD configuration | | 1, 2 | TDDConf.1.1 CCA | |
| $BW_{channel}$ | MHz | 1, 2 | 40: $N_{RB,c}$ = 106 | |
| $P_{CCA_DL}$ for dynamic channel access Note 6,8 | | 1, 2 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| $P_{CCA_DL}$ for semi-static channel access Note 7,8 | | 1, 2 | $P_{CCA_DL}$=0.9375 | |
| OCNG Pattern | | 1, 2 | OP.1 | |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| DBT window configuration | | 1, 2 | DBT.1 | |
| SSB configuration for semi-static channel access | | 1, 2 | SSB.1 CCA | |

| | | | | |
|---|---|---|---|---|
| SSB configuration for dynamic channel access | | 1, 2 | SSB.2 CCA | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 30 | |
| b2-Threshold2NR | dBm | 1, 2 | -98 | |
| EPRE ratio of PSS to SSS | | 1, 2 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | 1, 2 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -95 | |
| SS-RSRP Note 3,5 | dBm/SCS | 1, 2 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 1, 2 | -Infinity | 7 |
| Io Note3 | dBm/38.16MHz | 1, 2 | -63.95 | -56.16 |
| Propagation Condition | | 1, 2 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, | 1x2 Low | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

In test 1 the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than $T_{identify_irat_cca_with_index}$ ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1 and 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 12.4.2.5 Void

### 12.4.2.6 Void

# 12.5 Measurement Performance

## 12.5.1 E-UTRAN-NR SFTD

### 12.5.1.0 Minimum conformance requirements

#### 12.5.1.0.1 Minimum conformance requitements for E-UTRAN-NR SFTD Accuracy Requirement under CCA

The SFN and frame timing difference (SFTD) is measured between PCell and NR PSCell under CCA in EN-DC, or between PCell and NR cell under CCA for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 12.5.1.0.1-2 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to TS 36.133 [23] Annex B.3.5 for a corresponding band.
- Io range defined in TS 36.133 [23] Table 9.1.27.1-1.

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 [2] clause 7.3F for reference sensitivity are fulfilled.
- Io range defined in Table 12.5.1.0.1-1.

**Table 12.5.1.0.1-1: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy with NR cell under CCA**

| Parameter | Io [Note 1] range | | | |
|---|---|---|---|---|
| | NR operating band groups [Note 4, 5] | Minimum Io [Note 2, 3] | | Maximum Io |
| | | dBm/$SCS_{SSB}$ | | dBm/$BW_{Channel}$ |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_CCA_FR1_I | -117 | -114 | -50 |
| | NR_CCA_FR1_J | -116.5 | -113.5 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA – NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA – NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3.5 in TS 38.133 [6].
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

**Table 12.5.1.0.1-2: SFTD measurement accuracy with NR cell under CCA**

| Accuracy | Conditions | |
|---|---|---|
| | Ês/Iot | Frequency range |
| Ts [Note 1] | dB | |
| 40 | ≥ -3 dB | FR1 |

NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.28.

## 12.5.1.1 E-UTRA - NR FR1 SFTD measurement accuracy under CCA

Editor's Note:

- Test requirements need to be updated

### 12.5.1.1.1 Test purpose

The purpose of this test is to verify that the SFTD measurement accuracy is within the specified limits and to verify the requirements as specified in clause 12.5.1.0.1 for inter-RAT SFTD measurements between E-UTRA PCell and NR target cell under CCA.

### 12.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting FR1 with a shared spectrum NR carrier and supporting inter-RAT SFTD measurements on a TDD NR cell.

### 12.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 12.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.12.5.1.1.

### 12.5.1.1.4 Test description

Two cells on different carriers are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell under CCA.

#### 12.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 12.5.1.1.4.1-1.

**Table 12.5.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Config | Description |
|---|---|
| 12.5.1.1-1 | LTE FDD<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 12.5.1.1-2 | LTE TDD<br>NR with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 12.5.1.1.4.1-2.

**Table 12.5.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.10-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 12.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 12.5.1.1.4.3.

2. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier under CCA. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The SFTD between PCell and NR neighbour cell shall be set to one of the conditions in Table 12.5.1.1.5-3. For negative Frame boundary offset, it can be achieved delaying NR neighbour cell in regards to PCell OR advancing PCell in regards to NR neighbour cell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to NR neighbour cell OR advancing NR neighbour cell in regards to PCell. The DL CCA model is disabled (i.e. $P_{CCA_DL_i}$= 1) at the start of the test.

#### 12.5.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 12.5.1.1.5-1 and Table 12.5.1.1.5-3 as appropriate. (Condition = 3). The SS shall set the parameters of Cell 2 and enable DL CCA model according to Table 12.5.1.1.5-2.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit a *MeasurementReport* message triggered by SFTD measurement.

6. The SS shall check the reported values of SFN offset and frame boundary offset in the *MeasurementReport*. The SFN offset value and frame boundary offset value between E-UTRA Cell 1 and Cell 2 reported by the UE is compared to the expected SFN offset value and frame boundary offset, respectively. The number of failed iterations is increased by one, if

   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or

   - The value of *frameBoundaryOffsetResult* is outside the range given in Table 12.5.1.1.5-4, or

   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.

7. After the RRC connection release, the SS shall disable the DL CCA model (i.e. PCCA_DL_i= 1) and:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

8. Repeat steps 1-7 until the confidence level according to Annex G.2.7 is achieved.

#### 12.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

**Table 12.5.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.4-7 with Condition Inter-RAT and SFTD<br>Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

12.5.1.1.5 Test requirement

Table 12.5.1.1.5-1 and 12.5.1.1.5-2 defines the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement accuracy under CCA.

The SFN offset and frame boundary offset between E-UTRA PCell and the inter-RAT neighbour cell shall be set to one of the configurations in Table 12.5.1.1.5-3. The reported SFTD accuracy shall fulfil the accuracy requirements in Table 12.5.1.0.1-2. The SFN offset in reported SFTD shall match the values in Table 12.5.1.1.5-3 and the frame boundary offset in reported SFTD shall be within the range given in Table 12.5.1.1.5-4.

**Table 12.5.1.1.5-1: E-UTRA cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Parameter | Unit | Test 1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | -2.7 |
| $\hat{E}_s/I_{ot}$ | dB | -2.7 |
| RSRP [Note5] | dBm/15 kHz | -106.7 |
| SCH_RP [Note5] | dBm/15 kHz | -106.7 |
| Io [Note5] | dBm/Ch BW | -74.35<br>+10log<br>($N_{RB,c}$ /50) |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 12.5.1.1.5-2: NR cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Duplex mode | | | TDD |
| TDD Configuration | | | TDDConf.1.1 CCA |
| $BW_{channel}$ | | MHz | 40: $N_{RB,c}$ = 106 |
| DL CCA model | | | As specified in clause D.7.2.1 |
| DL CCA probability for semi-static channel access Note6,8 | $P_{CCA}$ | | 0.75 |
| DL CCA probability for dynamic channel access Note7,8 | $P_{CCA_DL_1}$ | | 0.75 |
| | $P_{CCA_DL_2}$ | | 0.75 |
| SSB configuration for semi-static channel access Note6,8 | | | SSB.1 CCA |
| SSB configuration for dynamic channel access Note7,8 | | | SSB.2 CCA |
| SMTC configuration | | | SMTC.1 |
| DBT window configuration | | | DBT.1 |
| OCNG Patterns | | | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 |
| $N_{oc}$ Note2 | | dBm/SSB SCS | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | -2.7 |
| $\hat{E}_s/N_{oc}$ | | dB | -2.7 |
| SS-RSRP Note3 | | dBm/SCS | -103.7 |
| Io Note3 | | dBm/38.16 MHz | -68.08 |
| Propagation condition | | | AWGN |
| Antenna configuration | | | 1x2 |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols in slots with downlink transmission bursts. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

| | |
|---|---|
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification |
| Note 6: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 7: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 8: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |

**Table 12.5.1.1.5-3: Timing offsets for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Configuration | SFN offset between PCell and NR neighbour cell | Frame boundary offset between PCell and NR neighbour cell (Ts) |
|---|---|---|
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

**Table 12.5.1.1.5-4: E-UTRA - NR FR1 SFTD measurement accuracy requirements for E-UTRA - NR FR1 SFTD measurement accuracy under CCA**

| Normal and Extreme Conditions | frameBoundaryOffsetResult | | | | |
|---|---|---|---|---|---|
| | Condition 1 | Condition 2 | Condition 3 | Condition 4 | Condition 5 |
| Lowest reported value | FFS | FFS | FFS | FFS | FFS |
| Highest reported value | FFS | FFS | FFS | FFS | FFS |

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 12.5.1.0.

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 13 NR Standalone Tests with NR SCell under CCA and All Other NR Cells in FR1

## 13.1 Void

## 13.2 Signalling Characteristics

### 13.2.2 SCell activation and deactivation delay

#### 13.2.2.0 Minimum conformance requirements

##### 13.2.2.0.1 Minimum conformance requirements for SCell activation and deactivation delay

Same as in clauses 10.3.3.0.1 for activation delay requirement and 10.3.3.0.2 for deactivation delay requirement.

## 13.2.2.1 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle

### 13.2.2.1.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell both under CCA, are within the requirements stated in clause 13.2.2.0.1, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 160 ms.

### 13.2.2.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier.

### 13.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.2.2.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.13.2.2.1.

### 13.2.2.1.4 Test description

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two carriers, each with one cell: Cell 1 (PCell) on radio channel 1 (PCC) in NR, and Cell2 (SCell) on radio channel 2 (SCC) in NR with CCA. Before the test starts the UE is connected to Cell 1, but is not aware of Cell 2, as the UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. At the end of T1, the test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted *m*, defines the start of time period T2. The UE shall be able to report a valid CSI in PCell for the activated SCell at latest in slot $m + \frac{T_{\text{HARQ}}+T_{\text{activation_time_withCCA}}+T_{\text{CSI_Reporting_withCCA}}}{\text{NR slot length}}$, as defined in TS 38.133 [6] clause 8.3A.2. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $m+\frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.2. At the end of T2 the test equipment sends a MAC message for deactivation of the SCell.

The point in time at which the MAC message is received by at the UE antenna connector, in a slot # denoted *n*, defines the start of time period T3. The UE shall complete the activation at latest in slot $n + \frac{T_{\text{HARQ}}+3\text{ms}}{\text{NR slot length}}$. Any PCell interruption shall fall within the time window specified in TS 38.133 [6] clause 8.3A.3.

#### 13.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations are shown in Table 13.2.2.1.4.1-1.

This test shall be tested using any of the test configurations in Table 13.2.2.1.4.1-1.

**Table 13.2.2.1.4.1-1: Supported test configurations for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Configuration | Description |
|---|---|
| 13.2.2.1-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.2.2.1-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.2.2.1-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode;<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

| Note: | The UE is only required to be tested in one of the supported test configurations |
|---|---|

Configure the test equipment and the DUT according to the parameters in Table 13.2.2.1.4.1-2.

**Table 13.2.2.1.4.1-2: Initial conditions for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.2.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link<br>- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. | | |

**Table 13.2.2.1.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2 | Two radio channels (1, 2) are used for this test |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Configured deactivated SCell | | Cell 2 | Configured deactivated secondary cell on NR RF channel number 2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every second subframe |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | µs | 0 | |
| Time alignment error between cell2 and cell1 | µs | ≤ TAE as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability |
| $T_{CSI_Reporting}$ | ms | $10 + 5 \cdot 2^{\mu_{DL}}$ | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]<br>$\mu_{DL}$ is the subcarrier spacing configuration for DL |

1. Message contents are defined in clause 13.2.2.1.4.3.

2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is the PCell and Cell 2 is the deactivated SCell. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

#### 13.2.2.1.4.2 Test procedure

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received, while taking into account CCA failures on SCC.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 13.2.2.1.4.1-3 and 13.2.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2. The SS shall enable DL and UL CCA model according to Table 13.2.2.1.5-1.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations with the message content exceptions defined in clause 13.2.2.1.4.3.

3a. The UE sends a *MeasurementReport* message. If the TE doesn't receive the *MeasurementReport* during T1, go to step 9.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $s_{first_CSI}$ = m + 1 + $\frac{\mathrm{T_{HARQ}+3ms+}T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$,

     - or slot $s^{int}_{first_CSI} = m + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting_withCCA}+T_X}{NR\ slot\ length}$ if the slot $s_{first_CSI}$ was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots $s_{first_CSI}$ or $s^{int}_{first_CSI}$,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $s_{nonzero_CQI}$ = m + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time_withCCA}}+T_{\mathrm{CSI_Reporting_withCCA}}}{\mathrm{NR\ slot\ length}}$,

     - or slot $s^{int}_{nonzero_CQI} = max\left(s^{int}_{first_CSI}, s_{nonzero_CQI}\right)$ if slot $s_{nonzero_CQI}$ was subject to interruption,

     - or the next available CSI report occasion if there is no CSI report occasion for reporting the valid CSI in slot $s_{nonzero_CQI}$, or slot $s^{int}_{nonzero_CQI}$ if $s_{nonzero_CQI}$ was subject to interruption,

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. The SS shall disable the CCA model (both DL and UL, i.e. PCCA_DL_i= PCCA_UL=1).

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
    or
    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Annex G.2.7 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 13.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 13.2.2.1.4.3-1: Common Exception messages for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 CCA |

**Table 13.2.2.1.4.3-2: *RRCReconfiguration*: SCell addition for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | Table 13.2.2.1.4.3-2A | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell | Table 13.2.2.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.1.4.3-2A: *MeasConfig* (Table 13.2.2.1.4.3-2) for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation path: Table H.3.1-2 with condition Deactivated SCell | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR for SCell | entry 2 Table 13.2.2.1.4.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 1 entry | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | ReportConfigId | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR | Table 13.2.2.1.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.1.4.3-3: *MeasObjectNR* for SCell for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf160 | | |
| } | | | |

**Table 13.2.2.1.4.3-4: *ReportConfigNR* for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: Table H.3.1-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |

| | | | |
|---|---|---|---|
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -30 | To ensure reporting can always be triggered | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.1.4.3-5: *CellGroupConfig-SCell* (Table 13.2.2.1.4.3-2) for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | PCell always uses servCellIndex=0 | |
| reconfigurationWithSync | Not present | | |
| rlf-TimersAndConstants | Not present | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| SpCellConfigDedicated | ServingCellConfig-SpCell | Table 13.2.2.1.4.3-6 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 13.2.2.1.4.3-7 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.1.4.3-6: *ServingCellConfig-SpCell* (Table 13.2.2.1.4.3-5) for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 1 | | |
| } | | | |

**Table 13.2.2.1.4.3-7: *ServingCellConfig-SCell* (Table 13.2.2.1.4.3-5) for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| servingCellMO | 2 | | |
| } | | | |

13.2.2.1.5 Test requirements

Table 13.2.2.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle.

**Table 13.2.2.1.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Duplex mode | Config 1 | | FDD | | | TDD | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | --- | | | TDDConf.1.1 CCA | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | 40: $N_{RB,c}$ = 106 | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DL CCA model | | | --- | | | As specified in clause D.7.2.1 | | |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | --- | | | 0.9357 | | |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | --- | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | --- | | | 0.75 | | |
| $P_{CCA_UL}$ | | | | | | 1 | | |
| $L_{CCA_DL}$ Note 8 | | | | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | ms | | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | | | TRS.1.2 TDD | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | SR.1.1 CCA | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | | | CCR.1.3 CCA | | |
| | Config 2 | | CCR.1.1 TDD | | | | | |
| | Config 3 | | CCR.2.1 TDD | | | | | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | | | CR.1.1 CCA | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | |
| OCNG Patterns Note1 | | | OP.1 | | | OP.1 | | |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 FR1 | | | SSB.1 CCA | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.1 FR1 | | | SSB.2 CCA | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| SMTC configuration | | | SMTC.1 | | | SMTC.1 | | |
| DBT window configuration | | | --- | | | DBT.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | -104 |
| | Config 3 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | -101 |
| | Config 3 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 | -84 |
| | Config 3 | | -84 | -84 |
| Io Note3 | Config 1,2 | | -58.96 | -52.87 |
| | Config 3 | | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For Cell 2 with CCA model, OCNG is transmitted only in slots with downlink transmission bursts and is not transmitted during muted slots or during DBT windows.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 7: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.
Note 8: As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$

During T2, the UE shall send the first CSI report for SCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $m+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ and no later than slot $m+1+\frac{T_{HARQ}+3ms+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$.

During T2, conditioned on that downlink CCA failures $L_1$ and $L_{2,2}$ experienced in the SCell fulfill $L_1 \leq L_{1,max}$ and $L_{2,2} \leq L_{2,2,max}$ with $L_{1,max} = 2$ and $L_{2,2,max} = 2$, respectively, the UE shall send the first valid CSI report (non-zero CQI) for the SCell no later than slot $m+\frac{T_{HARQ}+T_{activation_time_withCCA}+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$, where $T_{activation_time_withCCA} = T_{FirstSSB} + L_1*T_{rs}$ + 5ms and $T_{CSI_reporting_withCCA} = T_{CSI_reporting} + L_{2,2}*T_{CSI\text{-}RS} + T_{CSI_ReportingDelay}$, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m+1+\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m+1+\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X = T_{FirstSSB}$.

During T3, interruption on PCell shall not occur outside slot $n+1+T_{HARQ}$/NR_slot_length to slot $n+1+(T_{HARQ}+3ms)$/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 13.2.2.2 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle

### 13.2.2.2.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 13.2.2.0.1, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

#### 13.2.2.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier.

#### 13.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.2.2.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.13.2.2.2.

#### 13.2.2.2.4 Test description

Same test description as in section 13.2.2.1.4.

##### 13.2.2.2.4.1 Initial conditions

Same initial conditions as described in section 13.2.2.1.4.1 with following exception:

- The listed parameter values in Tables 13.2.2.2.4.1-3 will replace the values of corresponding parameters in Tables 13.2.2.1.4.1-3.

**Table 13.2.2.2.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 640 | |

##### 13.2.2.2.4.2 Test procedure

Same test procedure as described in section 13.2.2.1.4.2.

##### 13.2.2.2.4.3 Message contents

Same message contents as described in section 13.2.2.1.4.3 with following exception:

- Table 13.2.2.1.4.3-3 is replaced by Table 13.2.2.2.4.3-1.

**Table 13.2.2.2.4.3-1: *MeasObjectNR* for SCell for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle**

| Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| measCycleSCell-v1530 | sf640 | | |
| } | | | |

#### 13.2.2.2.5 Test requirements

Table 13.2.2.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle.

**Table 13.2.2.2.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|

| | | | T1 | T2 | T3 | T1 | T2 | T3 |
|---|---|---|---|---|---|---|---|---|
| Duplex mode | Config 1 | | FDD | | | TDD | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | --- | | | TDDConf.1.1 CCA | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | 40: $N_{RB,c}$ = 106 | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DL CCA model | | | --- | | | As specified in clause D.7.2.1 | | |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | --- | | | 0.9357 | | |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | --- | | | 0.75 | | |
| | $P_{CCA_DL_2}$ | | --- | | | 0.75 | | |
| $P_{CCA_UL}$ | | | | | | 1 | | |
| $L_{CCA_DL}$ Note 8 | | | | | | 2 | | |
| $W_{CCA_DL}$ Note 8 | | ms | | | | $T_{activation_time_withCCA}$ | | |
| Initial downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Initial uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | | | DLBWP.0.2 | | |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| TCI state | | | TCI.State.0 | | | TCI.State.0 | | |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | | | TRS.1.2 TDD | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | SR.1.1 CCA | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | | | CCR.1.3 CCA | | |
| | Config 2 | | CCR.1.1 TDD | | | | | |
| | Config 3 | | CCR.2.1 TDD | | | | | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | | | CR.1.1 CCA | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | |
| OCNG Patterns Note1 | | | OP.1 | | | OP.1 | | |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 FR1 | | | SSB.1 CCA | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.1 FR1 | | | SSB.2 CCA | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| SMTC configuration | | | SMTC.1 | | | SMTC.1 | | |
| DBT window configuration | | | --- | | | DBT.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | | | -104 | | |
| | Config 3 | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | | | -101 | | |
| | Config 3 | | -101 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | | 17 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | | | 17 | | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 | | | -84 | | |
| | Config 3 | | -84 | | | -84 | | |
| Io Note3 | Config 1,2 | | -58.96 | | | -52.87 | | |
| | Config 3 | | -52.87 | | | -52.87 | | |
| Propagation condition | | - | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For Cell 2 with CCA model, OCNG is transmitted only in slots with downlink transmission bursts and is not transmitted during muted slots or during DBT windows. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |
| Note 8: | As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$ |

During T2, starting after at least one CSI-RS transmission occasion for channel measurement and reporting from the slot specified in clause 4.3 of TS 38.213 [8] and until the UE has completed the SCell activation, the UE shall report out-of-range if the UE has available uplink resources to report CQI for the SCell.

During T2, the UE shall send the first valid CSI report (non-zero CQI) for the SCell in first available uplink resource for CSI reporting no later than slot $m$ + ($T_{HARQ}$+$T_{activation_time_withCCA}$ + $T_{CSI_Reporting_withCCA}$)/NR_slot_length, where $T_{activation_time_withCCA}$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$*$T_{SMTC_MAX}$ + (1 +$L_{2,2}$)*$T_{rs}$ + 5ms, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m$ +1+$\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m$ +1+$\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X$ = $T_{FirstSSB_MAX}$ + $L_{2,1}$* $T_{SMTC_MAX}$.

During T3, interruption on PCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

## 13.2.2.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA

### 13.2.2.3.1 Test purpose

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 13.2.2.0.1, when the SCell is unknown to the UE at the time of activation.

### 13.2.2.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier.

### 13.2.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.2.2.0.1 for SCell Activation Delay Requirement for Deactivated SCell under CCA and SCell Deactivation Delay Requirement for Activated SCell under CCA correspondingly.

The normative reference for this requirement is TS 38.133 [6] clause A.13.2.2.3.

### 13.2.2.3.4 Test description

Same test description as described in section 13.2.2.1.4.

#### 13.2.2.3.4.1 Initial conditions

Same initial conditions as described in section 13.2.2.1.4.1 with following exception:

- The listed parameter values in Tables 13.2.2.3.4.1-3 will replace the values of corresponding parameters in Tables 13.2.2.1.4.1-3.

**Table 13.2.2.3.4.1-3: General test parameters for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| T1 | s | 0.1 | During this time period the PCell shall be known and the SCell configured, but not detected. |

#### 13.2.2.3.4.2 Test procedure

Same test procedure as described in section 13.2.2.1.4.2, except step 3 and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. The SCell (Cell 2) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell2), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

- Step 3a is removed.

#### 13.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

**Table 13.2.2.3.4.3-1: Common Exception messages for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-7 with Condition Deactivated SCell<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 CCA |

**Table 13.2.2.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 13.2.2.3.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.3.4.3-3: *CellGroupConfig* (Table 13.2.2.3.4.3-2) for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| SpCellConfig SEQUENCE { | | | |
| SpCellConfigDedicated | ServingCellConfig-SpCell | Table 13.2.2.3.4.3-4 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellConfigDedicated | ServingCellConfig-SCell | Table 13.2.2.3.4.3-5 | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.2.2.3.4.3-4: *ServingCellConfig-SpCell* (Table 13.2.2.3.4.3-3) for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

**Table 13.2.2.3.4.3-5: *ServingCellConfig-SCell* (Table 13.2.2.3.4.3-3) NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| csi-MeasConfig | CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6 | | |
| } | | | |

### 13.2.2.3.5 Test requirements

Table 13.2.2.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA.

**Table 13.2.2.3.5-1: Cell specific test parameters for NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA**

| **Parameter** | | **Unit** | **Cell 1** | | | **Cell 2** | | |
|---|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Duplex mode | Config 1 | | FDD | | | TDD | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | --- | | | TDDConf.1.1 CCA | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | 40: $N_{RB,c}$ = 106 | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |

| | | | | |
|---|---|---|---|---|
| DL CCA model | | | --- | As specified in clause D.7.2.1 |
| DL CCA probability for semi-static channel access Note5,7 | $P_{CCA_DL}$ | | --- | 0.9357 |
| DL CCA probability for dynamic channel access Note6,7 | $P_{CCA_DL_1}$ | | --- | 0.75 |
| | $P_{CCA_DL_2}$ | | --- | 0.75 |
| $P_{CCA_UL}$ | | | | 1 |
| $L_{CCA_DL}$ Note 8 | | | | 2 |
| $W_{CCA_DL}$ Note 8 | | ms | | $T_{activation_time_withCCA}$ |
| Initial downlink BWP configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Initial uplink BWP configuration | | | ULBWP.0.1 | ULBWP.0.1 |
| Dedicated downlink BWP configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Dedicated uplink BWP configuration | | | ULBWP.0.1 | ULBWP.0.1 |
| TCI state | | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | Config 1 | | TRS.1.1 FDD | TRS.1.2 TDD |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| Dedicated CORESET parameters | Config 1 | | CCR.1.1 FDD | CCR.1.3 CCA |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| RMSI CORESET parameters | Config 1 | | CR.1.1 FDD | CR.1.1 CCA |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| OCNG Patterns Note1 | | | OP.1 | OP.1 |
| SSB Configuration for semi-static channel access Note5,7 | Config 1,2 | | SSB.1 FR1 | SSB.1 CCA |
| | Config 3 | | SSB.2 FR1 | |
| SSB Configuration for dynamic channel access Note6,7 | Config 1,2 | | SSB.1 FR1 | SSB.2 CCA |
| | Config 3 | | SSB.2 FR1 | |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| DBT window configuration | | | --- | DBT.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note1 | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/15kHz | -104 | -104 |
| | Config 3 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -104 | -101 |
| | Config 3 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -87 | -84 |
| | Config 3 | | -84 | -84 |
| Io Note3 | Config 1,2 | | -58.96 | -52.87 |
| | Config 3 | | -52.87 | -52.87 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For Cell 2 with CCA model, OCNG is transmitted only in slots with downlink transmission bursts and is not transmitted during muted slots or during DBT windows.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

| | |
|---|---|
| Note 4: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. |
| Note 5: | For UE supporting semi-static channel access and network configuring semi-static channel occupancy. |
| Note 6: | For UE supporting dynamic channel access and network configuring dynamic channel occupancy. |
| Note 7: | For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations. |
| Note 8: | As specified in TS 38.133 [6] clause 8.3A for $L_{1,max}$, $L_{2,1,max}$, $L_{2,2,max}$, $L_{3,1,max}$, and $L_{3,2,max}$ |

During T2, the UE shall send the first CSI report for SCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $m+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ and no later than slot $m+1+\frac{T_{HARQ}+3ms+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$.

During T2, conditioned on that downlink CCA failures $L_{3,1}$ and $L_{3,2}$ experienced in the SCell fulfill $L_{3,1} \leq L_{3,1,max}$ and $L_{3,2} \leq L_{3,2,max}$ with $L_{3,1,max} = 2$ and $L_{3,2,max} = 2$, respectively, the UE shall send the first valid CSI report (non-zero CQI) for the SCell no later than slot $m+\frac{T_{HARQ}+T_{activation_time_withCCA}+T_{CSI_Reporting_withCCA}}{NR\ slot\ length}$, where $T_{activation_time_withCCA} = T_{FirstSSB_MAX} + (1 + L_{3,1})*T_{SMTC_MAX} + (2 + L_{3,2})*T_{rs}$ + 5ms and $T_{CSI_reporting_withCCA} = T_{CSI_reporting} + T_{CSI_ReportingDelay}$, as specified in TS 38.133 [6] clause 8.3A.2.

During T3, the UE shall stop sending CSI reports for SCell at latest in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3A.3.

During T2, interruption on PCell shall not occur outside slot $m +1+\frac{T_{HARQ}}{NR\ slot\ length}$ to slot $m +1+\frac{T_{HARQ}+3+T_X}{NR\ slot\ length}$ with $T_X = T_{FirstSSB}$.

During T3, interruption on PCell shall not occur outside slot $n$ +1+$T_{HARQ}$/NR_slot_length to slot $n$+1+($T_{HARQ}$ +3ms)/NR_slot_length.

The interruption on PCell shall not be more than specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

The rate of correctly observed SCell activation delays and SCell deactivation delays shall for repeated tests be at least 90%.

# 13.3 Measurement Procedure

## 13.3.1 Intra-frequency measurements

### 13.3.1.0 Minimum Conformance Requirements

#### 13.3.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

##### 13.3.1.0.1.1 Intra-frequency cell identification

Same as in clause 10.4.1.0.1.1.

##### 13.3.1.0.1.2 Measurement period

Same as in clause 10.4.1.0.1.2.

#### 13.3.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

##### 13.3.1.0.2.1 Intra-frequency cell identification

Same as in clause 10.4.1.0.2.1

##### 13.3.1.0.2.2 Intra-frequency measurement period

Same as in clause 10.4.1.0.2.2

## 13.3.1.1 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX

### 13.3.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 13.3.1.0.1.1 and 13.3.1.0.1.2.

### 13.3.1.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier and RRM measurements on shared channel access.

### 13.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.1.1.

### 13.3.1.1.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 13.3.1.1.4.1-1 and 13.3.1.1.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

#### 13.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.1.1.4.1-1.

**Table 13.3.1.1.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX**

| Configuration | Description |
|---|---|
| 13.3.1.1-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.1-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.1-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.1.1.4.1-2.

**Table 13.3.1.1.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.1.1.4.1-3.

2. Message contents are defined in clause 13.3.1.1.4.3.

3. There are two NR carriers and three cells specified in the test. Cell 1 is the serving cell (PCell) on one NR carrier and Cell2, Cell 3 belong to another NR carrier subject to CCA. Cell 2 is the SCell and Cell 3 is its intra-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.1.1.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX**

| Parameter | Unit | Test Configuration | Value | Comment |
|---|---|---|---|---|
| Active PCell | | 1, 2, 3 | Cell 1 | |
| Active SCell | | 1, 2, 3 | Cell 2 | |
| Neighbour cell | | 1, 2, 3 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| DBT window configuration | | 1, 2, 3 | Cell 1: N/A<br>Cell 2,3: DBT.1 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| Event A3 measurement quantity | | | SS-RSRP | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| *deriveSSB-IndexFromCell* | | 1 | *False* | |
| | | 2 | *True* | |
| | | 3 | *True* | |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

### 13.3.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.1.1.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.1.1.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 842 ms, then the number of successful tests is increased by one. If the

UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 13.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.1.1.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.1.1-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.1.1-2 and 13.3.1.1-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.1.1.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 13.3.1.1.5 Test requirements

Tables 13.3.1.1.4.1-3 and 13.3.1.1.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX.

**Table 13.3.1.1.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | | 2 | |
| Duplex mode | | Config 1 | FDD | | TDD | | TDD | |
| | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Config 2 | TDDConf.1.1 | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| | | | Config 3 | TDDConf.2.1 | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | 12 | 12 |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | $T_{PSS/SSS_sync_inter_cca}$ | $T_{PSS/SSS_sync_inter_cca}$ |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | ULBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.1 |
| | | kHz | Config 1 | 15 | 30 | 30 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | Config 2 | 15 | | 30 | | 30 | |
| | | Config 3 | 30 | | 30 | | 30 | |
| EPRE ratio of PSS to SSS | | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3 | 4 | 4 | 4 | -3.79 | -Infinity | 1.54 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -54.64 | -58.49 | -54.64 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -54.64 | -58.49 | -54.64 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.1.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.1.2 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX

### 13.3.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 13.3.1.0.1.1 and 13.3.1.0.1.2.

### 13.3.1.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier, RRM measurements on shared channel access and long DRX cycle.

### 13.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.1.2.

### 13.3.1.2.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 13.3.1.2.4.1-1 and 13.3.1.2.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

#### 13.3.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.1.2.4.1-1.

**Table 13.3.1.2.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX**

| Configuration | Description |
|---|---|
| 13.3.1.2-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.2-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.2-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.1.2.4.1-2.

**Table 13.3.1.2.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.1.2.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.1.2.4.1-3.
2. Message contents are defined in clause 13.3.1.2.4.3.
3. There are two NR carriers and three cells specified in the test. Cell 1 is the serving cell (PCell) on one NR carrier and Cell2, Cell 3 belong to another NR carrier subject to CCA. Cell 2 is the SCell and Cell 3 is its intra-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.1.2.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX**

| Parameter | Unit | Test Configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active PCell | | 1, 2, 3 | Cell 1 | | |
| Active SCell | | 1, 2, 3 | Cell 2 | | |
| Neighbour cell | | 1, 2, 3 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | |
| DBT window configuration | | 1, 2, 3 | Cell 1: N/A<br>Cell 2,3: DBT.1 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| Event A3 measurement quantity | | | SS-RSRP | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.1 | DRX.2 | |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | | Synchronous cells |
| | | 3 | 3 μs | | Synchronous cells |
| *deriveSSB-IndexFromCell* | | 1 | *False* | | |
| | | 2 | *True* | | |
| | | 3 | *True* | | |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 5 | 20 | |

### 13.3.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource

at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.1.2.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.1.2.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.1.2.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1442 ms for Test 1 or less than 10242 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

11. Repeat step 1-10 for each sub-test in Tables 13.3.1.2.4.1-3 and 13.3.1.2.5-1 as appropriate.

### 13.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.1.2.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.1.2-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.1.2-2 and 13.3.1.2-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.1.2.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.7-1 with Condition DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 13.3.1.2.5 Test requirements

Tables 13.3.1.2.4.1-3 and 13.3.1.2.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX.

**Table 13.3.1.2.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | DLBWP.0.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | ULBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | 30 | 30 |
| | | | Config 2 | 15 | 30 | 30 |
| | | | Config 3 | 30 | 30 | 30 |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3 | -98 | -98 | -98 |
| | | | Config 1,2 | -98 | -95 | -95 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/ SCS | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | 4 | -3.79 | -Infinity | 1.54 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -54.64 | -58.49 | -54.64 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -54.64 | -58.49 | -54.64 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in 10.4.1.0.1.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.1.3 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX

### 13.3.1.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 13.3.1.0.2.1 and 13.3.1.0.2.2.

### 13.3.1.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier, RRM measurements on shared channel access and BWP operation without bandwidth restriction.

### 13.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.1.3.

#### 13.3.1.3.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 13.3.1.3.4.1-1 and 13.3.1.3.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

##### 13.3.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.1.3.4.1-1.

**Table 13.3.1.3.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Configuration | Description |
|---|---|
| 13.3.1.3-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.3-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.3-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.1.3.4.1-2.

**Table 13.3.1.3.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.1.3.4.1-3.
2. Message contents are defined in clause 13.3.1.3.4.3.
3. There are two NR carriers and three cells specified in the test. Cell 1 is the serving cell (PCell) on one NR carrier and Cell2, Cell 3 belong to another NR carrier subject to CCA. Cell 2 is the SCell and Cell 3 is its intra-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.1.3.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Parameter | Unit | Test Configuration | Value | Comment |
|---|---|---|---|---|
| Active PCell | | 1, 2, 3 | Cell 1 | |
| Active SCell | | 1, 2, 3 | Cell 2 | |
| Neighbour cell | | 1, 2, 3 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | |

| | | | | |
|---|---|---|---|---|
| Measurement gap repetition periodicity | ms | 1, 2, 3 | 40 | |
| Measurement gap length | ms | 1, 2, 3 | 6 | |
| Measurement gap offset | ms | 1, 2, 3 | 39 | |
| DL CCA model | | | As specified in clause D.7.2.1 | |
| UL CCA model | | | As specified in clause D.7.2.2 | |
| DBT window configuration | | 1, 2, 3 | Cell 1: N/A<br>Cell 2,3: DBT.1 | |
| CSI-RS parameters in Cell 1 | | 1 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | |
| Event A3 measurement quantity | | | SS-RSRP | |
| CP length | | 1, 2, 3 | Normal | |
| Hysteresis | dB | 1, 2, 3 | 0 | |
| Time To Trigger | s | 1, 2, 3 | 0 | |
| Filter coefficient | | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3 | | OFF |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| *deriveSSB-IndexFromCell* | | 1 | *False* | |
| | | 2 | *True* | |
| | | 3 | *True* | |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | s | 1, 2, 3 | 5 | |

#### 13.3.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

There are two BWPs configured in Cell 1, BWP0 which contains the cell defining SSB, and BWP1 which does not contain any SSB of Cell 1. During the whole test, BWP1 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.1.3.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.1.3.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.1.3.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1082 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

   OR

- switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 13.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.1.3.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.1.3-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.1.3-2 and 13.3.1.3-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.1.3.4.1-3 and SSB Index<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 with gap offset 39<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 13.3.1.3.4.3-2: *ServingCellConfig* for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.1 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP1) | BWP1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP0) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.1 configuration | |
| } | | | |

| | | | |
|---|---|---|---|
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP1) | BWP1 |
| } | | | |
| } | | | |

13.3.1.3.5 Test requirements

Tables 13.3.1.3.4.1-3 and 13.3.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX.

**Table 13.3.1.3.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | DLBWP.0.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | ULBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | DLBWP.1.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | ULBWP.1.1 | | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | TRS.1.2 TDD | | | |
| | | | Config 2 | TRS.1.1 TDD | | TRS.1.2 TDD | | | |
| | | | Config 3 | TRS.1.2 TDD | | TRS.1.2 TDD | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OCNG Pattern | | | Config 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | SR.1.1 CCA | | | |
| | | | Config 2 | SR.1.1 TDD | | SR.1.1 CCA | | | |
| | | | Config 3 | SR2.1 TDD | | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | CR.1.1 CCA | | | |
| | | | Config 2 | CR.1.1 TDD | | CR.1.1 CCA | | | |
| | | | Config 3 | CR2.1 TDD | | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | | | Config 2 | SSB.1 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | | | Config 3 | SSB.2 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| | | | Config 2 | SSB.1 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| | | | Config 3 | SSB.2 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | | DBT.1 | | DBT.1 | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | | 30 | | 30 | |
| | | | Config 2 | 15 | | 30 | | 30 | |
| | | | Config 3 | 30 | | 30 | | 30 | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | 4 | -3.79 | -Infinity | 1.54 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -54.64 | -58.49 | -54.64 |
| | | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -54.64 | -58.49 | -54.64 |

| | | | | | |
|---|---|---|---|---|---|
| Propagation Condition | | Config 1,2,3 | AWGN | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.2.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.2.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.1.4 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX

### 13.3.1.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 13.3.1.0.2.1 and 13.3.1.0.2.2.

### 13.3.1.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier, RRM measurements on shared channel access, BWP operation without bandwidth restriction and long DRX cycle.

### 13.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.1.4.

### 13.3.1.4.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 13.3.1.4.4.1-1 and 13.3.1.4.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

#### 13.3.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.1.4.4.1-1.

**Table 13.3.1.4.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Configuration | Description |
|---|---|
| 13.3.1.4-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.4-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.1.4-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.1.4.4.1-2.

**Table 13.3.1.4.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.1.4.4.1-3.
2. Message contents are defined in clause 13.3.1.4.4.3.
3. There are two NR carriers and three cells specified in the test. Cell 1 is the serving cell (PCell) on one NR carrier and Cell2, Cell 3 belong to another NR carrier subject to CCA. Cell 2 is the SCell and Cell 3 is its intra-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.1.4.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Parameter | Unit | Test Configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active PCell | | 1, 2, 3 | Cell 1 | | |
| Active SCell | | 1, 2, 3 | Cell 2 | | |
| Neighbour cell | | 1, 2, 3 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3 | 1: Cell 1<br>2: Cell 2 and Cell 3 | | |
| Measurement gap type | | 1, 2, 3 | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1, 2, 3 | 40 | | |
| Measurement gap length | ms | 1, 2, 3 | 6 | | |
| Measurement gap offset | ms | 1, 2, 3 | 39 | | |
| DL CCA model | | | As specified in clause D.7.2.1 | | |
| UL CCA model | | | As specified in clause D.7.2.2 | | |
| DBT window configuration | | 1, 2, 3 | Cell 1: N/A<br>Cell 2,3: DBT.1 | | |
| CSI-RS parameters in Cell 1 | | 1 | CSI-RS.1.2 FDD resource #0 | | |

| | | | | | |
|---|---|---|---|---|---|
| | | 2 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | | |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |
| Event A3 measurement quantity | | | SS-RSRP | | |
| CP length | | 1, 2, 3 | Normal | | |
| Hysteresis | dB | 1, 2, 3 | 0 | | |
| Time To Trigger | s | 1, 2, 3 | 0 | | |
| Filter coefficient | | 1, 2, 3 | 0 | | L3 filtering is not used |
| DRX | | 1, 2, 3 | DRX.1 | DRX.2 | |
| Time offset between Cell 1 and Cell 2 | | 1 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | | 2 | 3 µs | | Synchronous cells |
| | | 3 | 3 µs | | Synchronous cells |
| *deriveSSB-IndexFromCell* | | 1 | *False* | | |
| | | 2 | *True* | | |
| | | 3 | *True* | | |
| T1 | s | 1, 2, 3 | 5 | | |
| T2 | s | 1, 2, 3 | 5 | 20 | |

### 13.3.1.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

There are two BWPs configured in Cell 1, BWP0 which contains the cell defining SSB, and BWP1 which does not contain any SSB of Cell 1. During the whole test, BWP1 is always scheduled as the active BWP for the UE.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.1.4.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.1.4.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.1.4.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1442 ms for Test 1 or less than 10242 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

11. Repeat step 1-10 for each sub-test in Tables 13.3.1.4.4.1-3 and 13.3.1.4.5-1 as appropriate.

#### 13.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.1.4.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.1.4-1<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.1.4-2 and 13.3.1.4-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.1.4.4.1-3 and SSB Index<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 with gap offset 39<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.7-1 with Condition DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 13.3.1.4.4.3-2: *ServingCellConfig* for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.1 configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP1) | BWP1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP0) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.1 configuration | |
| } | | | |

| | | | |
|---|---|---|---|
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP1) | BWP1 |
| } | | | |
| } | | | |

13.3.1.4.5 Test requirements

Tables 13.3.1.4.4.1-3 and 13.3.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX.

**Table 13.3.1.4.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | | 12 | | 12 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | DLBWP.0.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | ULBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | DLBWP.1.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | ULBWP.1.1 | | | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | | TRS.1.2 TDD | | | |
| | | | Config 2 | TRS.1.1 TDD | | TRS.1.2 TDD | | | |
| | | | Config 3 | TRS.1.2 TDD | | TRS.1.2 TDD | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OCNG Pattern | | | Config 1,2,3 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | | SR.1.1 CCA | | | |
| | | | Config 2 | SR.1.1 TDD | | SR.1.1 CCA | | | |
| | | | Config 3 | SR2.1 TDD | | SR.1.1 CCA | | | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | | CR.1.1 CCA | | | |
| | | | Config 2 | CR.1.1 TDD | | CR.1.1 CCA | | | |
| | | | Config 3 | CR2.1 TDD | | CR.1.1 CCA | | | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | | | Config 2 | SSB.1 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | | | Config 3 | SSB.2 FR1 | | SSB.1 CCA | | SSB.1 CCA | |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| | | | Config 2 | SSB.1 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| | | | Config 3 | SSB.2 FR1 | | SSB.2 CCA | | SSB.2 CCA | |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | | DBT.1 | | DBT.1 | |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | | 30 | | 30 | |
| | | | Config 2 | 15 | | 30 | | 30 | |
| | | | Config 3 | 30 | | 30 | | 30 | |
| EPRE ratio of PSS to SSS | | | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | 4 | -3.79 | -Infinity | 1.54 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -54.64 | -58.49 | -54.64 |
| | | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -54.64 | -58.49 | -54.64 |

| | | | | | |
|---|---|---|---|---|---|
| Propagation Condition | | Config 1,2,3 | AWGN | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |
| Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. | | | | | |
| Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. | | | | | |
| Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration. | | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index_CCA}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

$T_{identify_intra_cca_without_index} = (T_{PSS/SSS_sync_intra_cca} + T_{SSB_measurement_period_intra_cca})$ ms, where

$T_{PSS/SSS_sync_intra_cca}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.2.1-1.

$T_{SSB_measurement_period_intra_cca}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.2.2-1.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.2 Inter-frequency measurements

### 13.3.2.0 Minimum Conformance Requirements

#### 13.3.2.0.1 Minimum conformance requirements for inter-frequency measurements

##### 13.3.2.0.1.1 Inter-frequency cell identification

Same as in clause 10.4.2.0.1.1.

##### 13.3.2.0.1.2 Inter-frequency measurements

Same as in clause 10.4.2.0.1.2.

### 13.3.2.1 Void

### 13.3.2.2 Void

### 13.3.2.3 NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used

#### 13.3.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements for NR cell with CCA in clauses 13.3.2.0.1.1 and 13.3.2.0.1.2.

#### 13.3.2.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier and RRM measurements on shared channel access.

#### 13.3.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.2.3.

#### 13.3.2.3.4 Test description

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR Cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables 13.3.2.3.4.1-1, 13.3.2.3.4.1-3 and 13.3.2.3.5-1.

In this test, measurement gap pattern configuration # 0 as defined in Table 13.3.2.3.4.1-3 is provided

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 3.

##### 13.3.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.2.3.4.1-1.

**Table 13.3.2.3.4.1-1: Supported test configurations for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used**

| Configuration | Description |
|---|---|
| 13.3.2.3-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.3-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.3-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.2.3.4.1-2.

**Table 13.3.2.3.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.2.3.4.1-3.
2. Message contents are defined in clause 13.3.2.3.4.3.
3. There are three cells specified in the test, each on its carrier. Cell 1 is the serving cell (PCell), Cell2 is the SCell and Cell 3 is an inter-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.2.3.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA. |
| Active cells | | Config 1,2,3 | NR Cell 1 (PCell), NR Cell 2 with CCA (SCell) | NR Cell 1 is on NR RF channel number 1. NR Cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR Cell 3 with CCA | NR Cell 3 is on NR RF channel number 3 with CCA. |
| DL CCA model | | Config 1,2,3 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2,3 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3μs | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 1.7 | |

### 13.3.2.3.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.2.3.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.2.3.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.2.3.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.2.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1602 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

OR

- switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 13.3.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.2.3.4.3-1: Common Exception messages for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.2.3-1<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.2.3-2 and 13.3.2.3-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.2.3.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

#### 13.3.2.3.5 Test requirements

Tables 13.3.2.3.4.1-3 and 13.3.2.3.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used.

**Table 13.3.2.3.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | 12 | 12 |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | $T_{PSS/SSS_sync_inter_cca}$ | $T_{PSS/SSS_sync_inter_cca}$ |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | ULBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | 30 | 30 |
| | | | Config 2 | 15 | 30 | 30 |
| | | | Config 3 | 30 | 30 | 30 |
| EPRE ratio of PSS to SSS | | dB | Config 1,2,3 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | dB | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | dB | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | dB | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -58.49 | -63.94 | -56.15 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

In this test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.3A.4-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in TS 38.133 [6] Table 9.3A.5-1.

For test 1, MGRP = 40 ms and for test 2 MGRP = 20 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.2.4 NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used

### 13.3.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements for NR cell with CCA in clauses 13.3.2.0.1.1 and 13.3.2.0.1.2.

### 13.3.2.4.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier and RRM measurements on shared channel access and long DRX cycle.

### 13.3.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.2.4.

### 13.3.2.4.4 Test description

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR Cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables 13.3.2.4.4.1-1, 13.3.2.4.4.1-3 and 13.3.2.4.5-1.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 13.3.2.4.4.1-3 is provided

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 3.

#### 13.3.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.2.4.4.1-1.

**Table 13.3.2.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Configuration | Description |
|---|---|
| 13.3.2.4-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.4-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.4-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.2.4.4.1-2.

**Table 13.3.2.4.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.2.4.4.1-3.
2. Message contents are defined in clause 13.3.2.4.4.3.
3. There are three cells specified in the test, each on its carrier. Cell 1 is the serving cell (PCell), Cell2 is the SCell and Cell 3 is an inter-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.2.4.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA. |
| Active cells | | Config 1,2,3 | NR Cell 1 (PCell), NR Cell 2 with CCA (SCell) | | NR Cell 1 is on NR RF channel number 1. NR Cell 2 is on NR RF channel number 2 with CCA. |
| Neighbour cell | | Config 1,2,3 | NR Cell 3 with CCA | | NR Cell 3 is on NR RF channel number 3 with CCA. |
| DL CCA model | | Config 1,2,3 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2,3 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |

| | | | | | |
|---|---|---|---|---|---|
| DRX | | Config 1,2,3 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 2.5 | 17 | |

#### 13.3.2.4.4.2 Test procedure

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.
2. Set the parameters according to T1 in Table 13.3.2.4.5-1.
3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.2.4.4.1-3.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.2.4.5-1. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.2.4.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 2402 ms for Test 1 or less than 16642 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.
7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit *RRCRelease* message to release the RRC connection.

   OR

   - switch the UE off.
8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:
   - if the device has been switched off, switches on the UE.
10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.
11. Repeat step 1-10 for each sub-test in Tables 13.3.2.4.4.1-3 and 13.3.2.4.5-1 as appropriate.

#### 13.3.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.2.4.4.3-1: Common Exception messages for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.2.4-1<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.2.4-2 and 13.3.2.4-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.2.4.4.1-3<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

13.3.2.4.5 Test requirements

Tables 13.3.2.4.5-1, 13.3.2.4.5-2 and 13.3.2.4.5-3 define the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used.

**Table 13.3.2.4.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | ULBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | 30 | 30 |
| | | | Config 2 | 15 | 30 | 30 |
| | | | Config 3 | 30 | 30 | 30 |
| EPRE ratio of PSS to SSS | | dB | Config 1,2,3 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PDSCH to PDSCH | | dB | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | dB | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -58.49 | -63.94 | -56.15 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 13.3.2.4.5-2: DRX-Configuration for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 13.3.2.4.5-3: *TimeAlignmentTimer* Configuration for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_without_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

$T_{identify_inter_cca_without_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.3A.4-1.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in TS 38.133 [6] Table 9.3A.5-1.

MGRP = 40 ms.

For test 1 DRX cycle = 40 ms and for test 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.2.5 NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used

### 13.3.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements for NR cell with CCA in clauses 13.3.2.0.1.1 and 13.3.2.0.1.2.

### 13.3.2.5.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier and RRM measurements on shared channel access.

### 13.3.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.2.5.

### 13.3.2.5.4 Test description

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR Cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables 13.3.2.5.4.1-1, 13.3.2.5.4.1-3 and 13.3.2.5.5-1.

In this test, measurement gap pattern configuration # 0 as defined in Table 13.3.2.5.4.1-3 is provided

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 3.

#### 13.3.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.2.5.4.1-1.

**Table 13.3.2.5.4.1-1: Supported test configurations for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used**

| Configuration | Description |
|---|---|
| 13.3.2.5-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.5-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.5-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

NOTE: The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 13.3.2.5.4.1-2.

**Table 13.3.2.5.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.2.5.4.1-3.
2. Message contents are defined in clause 13.3.2.5.4.3.
3. There are three cells specified in the test, each on its carrier. Cell 1 is the serving cell (PCell), Cell2 is the SCell and Cell 3 is an inter-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.2.5.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA |
| Active cells | | Config 1,2,3 | NR Cell 1 (PCell), NR Cell 2 with CCA (SCell) | NR Cell 1 is on NR RF channel number 1. NR Cell 2 is on NR RF channel number 2 with CCA |
| Neighbour cell | | Config 1,2,3 | NR Cell 3 with CCA | NR Cell 3 is on NR RF channel number 3 with CCA |
| DL CCA model | | Config 1,2,3 | As specified in clause D.7.2.1 | |
| UL CCA model | | Config 1,2,3 | As specified in clause D.7.2.2 | |
| Gap Pattern Id | | Config 1,2,3 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 9 | |
| A3-Offset | dB | Config 1,2,3 | -6 | |
| Hysteresis | dB | Config 1,2,3 | 0 | |
| CP length | | Config 1,2,3 | Normal | |
| TimeToTrigger | s | Config 1,2,3 | 0 | |
| Filter coefficient | | Config 1,2,3 | 0 | L3 filtering is not used |
| DRX | | Config 1,2,3 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3μs | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | |
| T2 | s | Config 1,2,3 | 2 | |

13.3.2.5.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.2.5.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.2.5.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.2.5.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.2.5.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection.

   OR

   - switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.

### 13.3.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.2.5.4.3-1: Common Exception messages for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.2.5-1<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.2.5-2 and 13.3.2.5-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.2.5.4.1-3 with Condition SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 13.3.2.5.5 Test requirements

Tables 13.3.2.5.4.1-3 and 13.3.2.5.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used.

**Table 13.3.2.5.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | | Config 1 | FDD | | TDD | | TDD | |
| | | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | | Config 3 | TDDConf.2.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL}$=0.9375 | | $P_{CCA_DL}$=0.9375 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | | $P_{CCA_UL}$=1 | | $P_{CCA_UL}$=1 | |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | | 5 | | 5 | |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | | $T_{PSS/SSS_sync_inter_cca}$ | | $T_{PSS/SSS_sync_inter_cca}$ | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | | DLBWP.0.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | ULBWP.0.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | 30 | 30 |
| | | | Config 2 | 15 | 30 | 30 |
| | | | Config 3 | 30 | 30 | 30 |
| EPRE ratio of PSS to SSS | | dB | Config 1,2,3 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | |
| EPRE ratio of PDSCH to PDSCH | | dB | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | dB | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | dB | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2,3 | -98 | -98 | -98 |
| | | | Config 1,2 | -98 | -95 | -95 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/ SCS | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -58.49 | -63.94 | -56.15 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In this test UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.3A.4-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.3A.4-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in TS 38.133 [6] Table 9.3A.5-1.

MGRP = 40 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.2.6 NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used

### 13.3.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements for NR cell with CCA in clauses 13.3.2.0.1.1 and 13.3.2.0.1.2.

#### 13.3.2.6.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with an unlicensed carrier and RRM measurements on shared channel access and long DRX cycle.

#### 13.3.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.2.6.

#### 13.3.2.6.4 Test description

In this test, there are three cells: NR Cell 1 as PCell in FR1 on NR RF channel 1, NR Cell 2 as SCell in FR1 with CCA on NR RF channel 2 and NR Cell 3 as neighbour cell in FR1 with CCA on NR RF channel 3. The test parameters are given in Tables 13.3.2.6.4.1-1, 13.3.2.6.4.1-3 and 13.3.2.6.5-1.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 13.3.2.6.4.1-3 is provided

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 3.

##### 13.3.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.2.6.4.1-1.

**Table 13.3.2.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Configuration | Description |
|---|---|
| 13.3.2.6-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.6-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.2.6-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.2.6.4.1-2.

**Table 13.3.2.6.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | | |

1. The general test parameter settings are set up according to Table 13.3.2.6.4.1-3.
2. Message contents are defined in clause 13.3.2.6.4.3.
3. There are three cells specified in the test, each on its carrier. Cell 1 is the serving cell (PCell), Cell2 is the SCell and Cell 3 is an inter-frequency neighbour cell. The power levels and settings for Cell 1, Cell 2 and Cell 3 are set according to Annex C.1.2 and C.1.3 for this test. Cell 3 is switched off during the initial connection setup.

**Table 13.3.2.6.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2,3 | 1, 2, 3 | | Three FR1 NR carrier frequencies are used. Channels 2 and 3 are with CCA |
| Active cells | | Config 1,2,3 | NR Cell 1 (PCell), NR Cell 2 with CCA (SCell) | | NR Cell 1 is on NR RF channel number 1. NR Cell 2 is on NR RF channel number 2 with CCA |
| Neighbour cell | | Config 1,2,3 | NR Cell 3 with CCA | | NR Cell 3 is on NR RF channel number 3 with CCA |
| DL CCA model | | Config 1,2,3 | As specified in clause D.7.2.1 | | |
| UL CCA model | | Config 1,2,3 | As specified in clause D.7.2.2 | | |
| Gap Pattern Id | | Config 1,2,3 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1 |
| Measurement gap offset | | Config 1,2,3 | 9 | | |
| A3-Offset | dB | Config 1,2,3 | -6 | | |
| Hysteresis | dB | Config 1,2,3 | 0 | | |
| CP length | | Config 1,2,3 | Normal | | |
| TimeToTrigger | s | Config 1,2,3 | 0 | | |
| Filter coefficient | | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2,3 | DRX.1 | DRX.2 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1,2,3 | 3μs | | Synchronous cells |
| T1 | s | Config 1,2,3 | 5 | | |
| T2 | s | Config 1,2,3 | 3 | 20 | |

### 13.3.2.6.4.2 Test procedure

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Both Cell 1 (PCell) and Cell 2 (SCell) are configured on the UE.

2. Set the parameters according to T1 in Table 13.3.2.6.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with the corresponding offset according to Table 13.3.2.6.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. The SS shall enable DL and UL CCA model according to Table 13.3.2.6.5-1. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 13.3.2.6.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than 2882 ms for Test 1 or less than 19842 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the required measurement delay, then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

- transmit *RRCRelease* message to release the RRC connection.

OR

- switch the UE off.

8. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1). Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE (if the paging fails, switches off and on the UE),
     OR:

   - if the device has been switched off, switches on the UE.

10. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.7 is achieved.
11. Repeat step 1-10 for each sub-test in Tables 13.3.2.6.4.1-3 and 13.3.2.6.5-1 as appropriate.

### 13.3.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.2.6.4.3-1: Common Exception messages for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 for configuration 13.3.2.6-1<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 CCA for semi-static channel access or SSB.2 CCA for dynamic channel access, SMTC.1 and synchronous cells for configurations 13.3.2.6-2 and 13.3.2.6-3<br>Table H.3.1-4 with A3-offset set as per Table 13.3.2.6.4.1-3 and SSB Index<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table H.3.7-1 with Condition DRX.1 (Test 1) and DRX.2 (Test 2)<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

### 13.3.2.6.5 Test requirements

Tables 13.3.2.6.5-1, 13.3.2.6.5-2 and 13.3.2.6.5-3 define the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used.

**Table 13.3.2.6.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2,3 | 1 | | 2 | | 3 | |
| Duplex mode | | Config 1 | FDD | | TDD | | TDD | |
| | | Config 2,3 | TDD | | TDD | | TDD | |
| TDD configuration | | Config 1 | Not Applicable | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |
| | | Config 2 | TDDConf.1.1 | | TDDConf.1.1 CCA | | TDDConf.1.1 CCA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Config 3 | TDDConf.2.1 | TDDConf.1.1 CCA | TDDConf.1.1 CCA |
| DL CCA probability $P_{CCA_DL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_DL}$=0.9375 | $P_{CCA_DL}$=0.9375 |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| UL CCA probability $P_{CCA_UL}$ | Semi-static channel access Note 5,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| | Dynamic channel access Note 6,7 | | Config 1,2,3 | Not Applicable | $P_{CCA_UL}$=1 | $P_{CCA_UL}$=1 |
| $L_{CCA_DL}$ | | | Config 1,2,3 | Not Applicable | 2 | 2 |
| $W_{CCA_DL}$ | | ms | Config 1,2,3 | Not Applicable | $T_{PSS/SSS_sync_inter_cca}$ | $T_{PSS/SSS_sync_inter_cca}$ |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| | | | Config 3 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| BWP configuration | Initial DL BWP | | Config 1,2,3 | DLBWP.0.1 | DLBWP.0.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | ULBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | DLBWP.1.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | ULBWP.1.1 | |
| TRS configuration | | | Config 1 | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | | Config 2 | TRS.1.1 TDD | TRS.1.2 TDD | |
| | | | Config 3 | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern | | | Config 1,2,3 | OP.1 | OP.1 | OP.1 |
| PDSCH Reference measurement channel | | | Config 1 | SR.1.1 FDD | SR.1.1 CCA | |
| | | | Config 2 | SR.1.1 TDD | SR.1.1 CCA | |
| | | | Config 3 | SR2.1 TDD | SR.1.1 CCA | |
| CORESET Reference Channel | | | Config 1 | CR.1.1 FDD | CR.1.1 CCA | |
| | | | Config 2 | CR.1.1 TDD | CR.1.1 CCA | |
| | | | Config 3 | CR2.1 TDD | CR.1.1 CCA | |
| SSB parameters | Semi-static channel Note 5,7 | | Config 1 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.1 CCA | SSB.1 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.1 CCA | SSB.1 CCA |
| | Dynamic channel Access Note 6,7 | | Config 1 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 2 | SSB.1 FR1 | SSB.2 CCA | SSB.2 CCA |
| | | | Config 3 | SSB.2 FR1 | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | | Config 1,2,3 | Not Applicable | DBT.1 | DBT.1 |
| SMTC configuration | | | Config 1,2,3 | SMTC.1 | SMTC.1 | SMTC.4 |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 15 | 30 | 30 |
| | | | Config 2 | 15 | 30 | 30 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Config 3 | 30 | | 30 | | 30 | |
| EPRE ratio of PSS to SSS | dB | Config 1,2,3 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | dB | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | dB | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | dB | | | | | | | |
| $N_{oc}$ Note2 | dBm/ 15kHz | Config 1,2,3 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/ SCS | Config 1,2 | -98 | | -95 | | -95 | |
| | | Config 3 | -95 | | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/ SCS | Config 1,2 | -94 | -94 | -91 | -91 | -Infinity | -88 |
| | | Config 3 | -91 | -91 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/ ChBW | Config 1,2 | -64.59 | -64.59 | -58.49 | -58.49 | -63.94 | -56.15 |
| | dBm/ ChBW | Config 3 | -58.49 | -58.49 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1,2,3 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 6: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 7: For UE supporting both semi-static and dynamic channel access, the UE must be tested under dynamic channel access configuration.

**Table 13.3.2.6.5-2: DRX-Configuration for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | |

| | | | |
|---|---|---|---|
| drx-InactivityTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 13.3.2.6.5-3: *TimeAlignmentTimer* Configuration for NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_inter_cca_with_index}$ from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

$T_{identify_inter_cca_with_index} = (T_{PSS/SSS_sync_inter_cca} + T_{SSB_measurement_period_inter_cca} + T_{SSB_time_index_inter_cca})$ ms, where

$T_{PSS/SSS_sync_inter_cca}$: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.3A.4-1.

$T_{SSB_time_index_inter_cca}$: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.3A.4-2.

$T_{SSB_measurement_period_inter_cca}$: equal to a measurement period of SSB based measurement given in TS 38.133 [6] Table 9.3A.5-1.

MGRP = 40 ms.

For test 1 DRX cycle = 40 ms and for test 2 DRX cycle = 640 ms.

SMTC period = 20 ms.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.3 L1-RSRP measurement for beam reporting for SCell under CCA

### 13.3.3.0 Minimum Conformance Requirements

Same as section 10.4.3.0.

### 13.3.3.1 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used

#### 13.3.3.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 13.3.3.0.

#### 13.3.3.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM measurements in shared spectrum.

#### 13.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.3.1.

#### 13.3.3.1.4 Test description

There are two cells in the tests, FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table 13.3.3.1.4.1-3 and Table 13.3.3.1.5-1 below.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 13.3.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.3.1.4.1-1.

**Table 13.3.3.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Config | Description |
|---|---|
| 13.3.3.1-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.3.1-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.3.1-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.3.1.4.1-2.

**Table 13.3.3.1.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.3.3.1.5-1 and 13.3.3.1.5-2.
2. Message contents are defined in clause 13.3.3.1.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

**Table 13.3.3.1.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Parameter | Config | Unit | Value | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Active PCell/SCell Configuration | | | PCell | SCell |
| RF Channel Number | | | 1 | 2 |
| DL CCA model | 1~3 | | N/A | As specified in D.7.2.1 |
| UL CCA model | 1~3 | | N/A | As specified in D.7.2.2 |
| Duplex mode | 1 | | FDD | TDD |
| | 2 | | TDD | |
| | 3 | | TDD | |
| TDD Configuration | 1 | | N/A | TDDConf.1.1 CCA |
| | 2 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 |
| | 2 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | CR.1.1 CCA |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | CCR.1.1 CCA |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1 | | SSB.3 FR1 | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| | 2 | | SSB.3 FR1 | |
| | 3 | | SSB.4 FR1 | |
| OCNG Patterns | 1~3 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 | N/A |
| DBT Window Configuration | 1~3 | | N/A | DBT.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD | TRS.1.2 TDD |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |
| DRX configuration | 1~3 | | Off | Off |
| reportConfigType | 1~3 | | periodic | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 | 80 |
| T1 | 1~3 | s | 5 | 5 |
| T2 | 1~3 | s | 1 | 1 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~3 | | AWGN | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | | |

#### 13.3.3.1.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher-layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

Prior to the start of the time duration T1, the UE shall be fully synchronized to SCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 13.3.3.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.3.3.1.4.3.
3. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
4. Set the parameters according to T1 in Table 13.3.3.1.5-1. The SS shall enable DL and UL CCA model according to Table 13.3.3.1.5-1. T1 starts.
5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.
6. When T1 expires, the SS shall set the parameters according to T2 in 13.3.3.1.5-1. T2 starts.
7. The UE shall start sending L1-RSRP reports for the SCell. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 722 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 13.3.3.1.5-2) and the relative L1-RSRP requirement for SSB#0 (Table 13.3.3.1.5-3). If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 13.3.3.1.5-2 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 13.3.3.1.5-3 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.
9. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
10. The SS shall switch off and then on the UE. Then proceed with step 11.
11. Repeat steps 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 13.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.3.1.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 13.3.3.1.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 13.3.3.1.5 Test requirements

Tables 13.3.3.1.5-1, 13.3.3.1.5-2 and 13.3.3.1.5-3 define the primary level settings including test tolerances for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used.

**Table 13.3.3.1.5-1: Cell specific test parameters for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1,2,3 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1,2,3 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |

| | | | | | | |
|---|---|---|---|---|---|---|
| UL CCA probability $P_{CCA_UL}$ | 1,2,3 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1,2,3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,3 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1,2,3 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,3 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2,3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1,2,3 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.

Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 13.3.3.1.5-2 and relative accuracy requirement in Table 13.3.3.1.5-3. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

**Table 13.3.3.1.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 13.3.3.1.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 13.3.3.2 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used

#### 13.3.3.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 13.3.3.0.

#### 13.3.3.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM measurements in shared spectrum and long DRX cycle.

#### 13.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.3.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.3.3.2.

#### 13.3.3.2.4 Test description

There are two cells in the tests, FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table 13.3.3.2.4.1-3 and Table 13.3.3.2.5-1 below.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

##### 13.3.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.3.3.2.4.1-1.

**Table 13.3.3.2.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Config | Description |
|---|---|
| 13.3.3.2-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.3.2-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.3.3.2-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.3.3.2.4.1-2.

**Table 13.3.3.2.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.3.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.3.3.2.5-1 and 13.3.3.2.5-2.
2. Message contents are defined in clause 13.3.3.2.4.3.

3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

**Table 13.3.3.2.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Parameter | Config | Unit | Value | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Active PCell/SCell Configuration | | | PCell | SCell |
| RF Channel Number | | | 1 | 2 |
| DL CCA model | 1~3 | | N/A | As specified in D.7.2.1 |
| UL CCA model | 1~3 | | N/A | As specified in D.7.2.2 |
| Duplex mode | 1 | | FDD | TDD |
| | 2 | | TDD | |
| | 3 | | TDD | |
| TDD Configuration | 1 | | N/A | TDDConf.1.1 CCA |
| | 2 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 |
| | 2 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | CR.1.1 CCA |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | CCR.1.1 CCA |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1 | | SSB.3 FR1 | SSB.3 CCA for semi-static channel access<br>SSB.4 CCA for dynamic channel access |
| | 2 | | SSB.3 FR1 | |
| | 3 | | SSB.4 FR1 | |
| OCNG Patterns | 1~3 | | OP.1 | OP.1 |
| Initial BWP Configuration | 1~3 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~3 | | SMTC.1 | N/A |
| DBT Window Configuration | 1~3 | | N/A | DBT.1 |
| TRS Configuration | 1 | | TRS.1.1 FDD | TRS.1.2 TDD |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |
| DRX configuration | 1~3 | | DRX.3 | DRX.3 |
| reportConfigType | 1~3 | | periodic | periodic |
| reportQuantity | 1~3 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~3 | | 2 | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 | 80 |
| T1 | 1~3 | s | 5 | 5 |
| T2 | 1~3 | s | 1 | 1 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~3 | | AWGN | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | | |

### 13.3.3.2.4.2 Test procedure

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher-layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test.

Prior to the start of the time duration T1, the UE shall be fully synchronized to SCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above Table 13.3.3.2.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.3.3.2.4.3.
3. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
4. Set the parameters according to T1 in Table 13.3.3.2.5-1. The SS shall enable DL and UL CCA model according to Table 13.3.3.2.5-1. T1 starts.
5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.
6. When T1 expires, the SS shall set the parameters according to T2 in 13.3.3.2.5-1. T2 starts.
7. The UE shall start sending L1-RSRP reports for the SCell. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 722 ms from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 13.3.3.2.5-2) and the relative L1-RSRP requirement for SSB#0 (Table 13.3.3.2.5-3). If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 13.3.3.2.5-2 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in

Table 13.3.3.2.5-3 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.
9. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. The SS shall disable the CCA model (both DL and UL, i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1).
10. The SS shall switch off and then on the UE. Then proceed with step 11.
11. Repeat steps 1-10 until the confidence level according to Annex G clause G.2.7 is achieved.

#### 13.3.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.3.3.2.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.7-1 with condition DRX.3<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 13.3.3.2.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 13.3.3.2.5 Test requirements

Tables 13.3.3.2.5-1, 13.3.3.2.5-2 and 13.3.3.2.5-3 define the primary level settings including test tolerances for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used.

**Table 13.3.3.2.5-1: Cell specific test parameters for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DL CCA Probability $P_{CCA_DL}$ Note 4,6 | 1,2,3 | | 0.9375 | 0.9375 | 0.9375 | 0.9375 |
| DL CCA Probability $P_{CCA_DL}$ Note 4.7 | 1,2,3 | | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 | 0.75/0.75 |
| UL CCA probability $P_{CCA_UL}$ | 1,2,3 | | 1.0 | 1.0 | 1.0 | 1.0 |
| $N_{oc}$ Note2 | 1,2,3 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,3 | dBm/SSB SCS | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1,2,3 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1,2,3 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1,2,3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.49 |
| $\hat{E}_s / N_{oc}$ | 1,2,3 | dB | 0 | 0 | -Infinity | 3.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.
Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows.
Note 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds $P_{CCA_DL1}$ and the second value corresponds to the $P_{CCA_DL2}$.

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in Table 13.3.3.2.5-2 and relative accuracy requirement in Table 13.3.3.2.5-3. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

**Table 13.3.3.2.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | - | 58 |
| Highest reported value (SSB#1) | - | 78 |

**Table 13.3.3.2.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | - | 0 |
| Highest DIFF RSRP reported (SSB#0) | - | 3 |

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 13.4 Measurement Performance

## 13.4.1 SS-RSRP

### 13.4.1.0 Minimum Conformance Requirements

#### 13.4.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements under CCA

Same as section 10.5.1.0.1.

#### 13.4.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements under CCA

Same as section 10.5.1.0.2.

#### 13.4.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements under CCA

Same as section 10.5.1.0.3.

#### 13.4.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements under CCA

Same as section 10.5.1.0.4.

### 13.4.1.1 NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA

#### 13.4.1.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will partially verify the SS-RSRP measurement accuracy requirements in section 13.4.1.0.1 and 13.4.1.0.2.

#### 13.4.1.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM.

#### 13.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.1.1.

#### 13.4.1.1.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). Supported test configurations are shown in Table 13.4.1.1.4.1-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Tables 13.4.1.1.5-1, 13.4.1.1.5-2 and 13.4.1.1.5-3.

#### 13.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.1.1.4.1-1.

**Table 13.4.1.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| Config | Description |
|---|---|
| 13.4.1.1-1 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 13.4.1.1-2 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 13.4.1.1-3 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.1.1.4.1-2.

**Table 13.4.1.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.1.1.5-1 and 13.4.1.1.5-2.
2. Message contents are defined in clause 13.4.1.1.4.3.
3. Cell 1, Cell 2 and Cell 3 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 and Cell 3 are on an unlicensed carrier subject to CCA.

#### 13.4.1.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.1.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform intra-frequency SS-RSRP measurements on the SCC as specified in section 13.4.1.1.4.3.
6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.1.1.5-1.
7. The UE shall transmit periodical *MeasurementReport* messages.

8. After 10s wait from Step 5, the SS shall check the SS-RSRP reported values in the periodic *MeasurementReport*. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Tables 13.4.1.1.5-2 and 13.4.1.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

10. Repeat steps 1-9 for each Test in Table 13.4.1.1.5-1 as appropriate.

#### 13.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.1.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 CCA |

**Table 13.4.1.1.4.3-2: *ReportConfigNR* for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 13.4.1.1.5 Test requirements

Tables 13.4.1.1.5-1, 13.4.1.1.5-2 and 13.4.1.1.5-3 define the primary level settings including test tolerances for all tests for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA.

**Table 13.4.1.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Cell ID | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | freq1 | | freq1 | | freq1 | |
| DL CCA model | | As specified in clause D.7.2.1 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UL CCA model | | | | As specified in clause D.7.2.2 | | | | | |
| $P_{CCA_DL}$ for dynamic channel access Note 7,9 | | | | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 | | | | | |
| $P_{CCA_DL}$ for semi-static channel access Note 8,9 | | | | $P_{CCA_DL}$=0.9375 | | | | | |
| $P_{CCA_UL}$ | | | | 1 | | | | | |
| TDD configuration | | Config 1,2,3 | | TDDConf.1.1 CCA | | | | | |
| $BW_{channel}$ | | Config 1,2,3 | MHz | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | | Config 1,2,3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| TRS configuration | | Config 1,2,3 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1,2,3 | | SR.1.1 CCA | - | SR.1.1 CCA | - | SR.1.1 CCA | - |
| RMSI CORESET Reference Channel | | Config 1,2,3 | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| Control channel RMC | | Config 1,2,3 | | CR.1.1 CCA | - | CR.1.1 CCA | - | CR.1.1 CCA | - |
| SSB configuration for semi-static channel access | | Config 1,2,3 | | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA | SSB.1 CCA |
| SSB configuration for dynamic channel access | | Config 1,2,3 | | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA | SSB.2 CCA |
| DBT window configuration | | Config 1,2,3 | | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 | DBT.1 |
| Time offset with Cell 1 | | Config 1,2,3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | | Config 1,2,3 | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,3 | kHz | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,3 | NR_CCA_FR1_I | | Not applicable Note 5 | | -94 | | -111 | |
| | | NR_CCA_FR1_J | | | | | | -111 | |
| $N_{oc}$ Note2 | Config 1,2,3 | NR_CCA_FR1_I | dBm/SCS | Not applicable Note 5 | | -91 | | -108 | |
| | | NR_CCA_FR1_J | | | | | | -108 | |
| $\hat{E}_s/I_{ot}$ Note6 | | | dB | Not applicable Note 5 | Not applicable Note 5 | 2.23 | -5.57 | -2.11 | -3.34 |
| $\hat{E}_s/N_{oc}$ Note6 | | | dB | Not applicable Note 5 | Not applicable Note 5 | 6 | 1.4 | 1 | 0.2 |
| SS-RSRP Note3,6 | Config 1,2,3 | NR_TDD_FR1_I | dBm/SCS | Not applicable Note 5 | Not applicable Note 5 | -85 | -89.6 | -107 | -107.8 |
| | | | | | | | | -107 | -107.8 |
| Io Note3 | Config 1,2,3 | NR_CCA_FR1_I | dBm/38.16MHz | Not applicable Note 5 | | -51.91 | | -71.75 | |
| | | NR_CCA_FR1_J | | | | | | -71.75 | |
| Propagation condition | | | - | AWGN | | | | | |

| | | |
|---|---|---|
| Antenna configuration | | 1x2 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>NOTE 5: Subtest 1 is not used when testing with 30kHz SSB SCS.<br>NOTE 6: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows.<br>NOTE 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>NOTE 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>NOTE 9: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | |

**Table 13.4.1.1.5-2: Absolute accuracy requirements for the reported values for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| **Normal Conditions** | **Test 2 All bands** | **Test 3** | |
|---|---|---|---|
| Lowest SS-RSRP reported value (cell 3) | 57 | Bands NR_CCA_FR1_I | 43 |
| | | Bands NR_CCA_FR1_J | 43 |
| Highest SS-RSRP reported value (cell 3) | 76 | Bands NR_CCA_FR1_I | 55 |
| | | Bands NR_CCA_FR1_J | 55 |
| **Extreme Conditions** | **Test 2 All bands** | **Test 3** | |
| Lowest SS-RSRP reported value (cell 3) | 54 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |
| Highest SS-RSRP reported value (cell 3) | 79 | Bands NR_CCA_FR1_I | 59 |
| | | Bands NR_CCA_FR1_J | 59 |

**Table 13.4.1.1.5-3: Relative accuracy requirements for the reported values for NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA**

| | **Test 2** | **Test 3** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x – 1 | RSRP_x + 1 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 3) | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 2 | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 13.4.2 SS-RSRQ

### 13.4.2.0 Minimum Conformance Requirements

#### 13.4.2.0.1 Intra-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

Same as section 10.5.2.0.1.

#### 13.4.2.0.2 Void

#### 13.4.2.0.3 Inter-frequency absolute SS-RSRQ measurement accuracy requirements under CCA

Same as section 10.5.2.0.3.

#### 13.4.2.0.4 Inter-frequency relative SS-RSRQ measurement accuracy requirements under CCA

Same as section 10.5.2.0.4.

### 13.4.2.1 NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA

#### 13.4.2.1.1 Test purpose

The purpose of this test is to verify that the SS-RSRQ measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will partially verify the SS-RSRQ measurement accuracy requirements in section 13.4.2.0.1.

#### 13.4.2.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM in shared spectrum.

#### 13.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.2.1.

#### 13.4.2.1.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). Supported test configurations are shown in Table 13.4.2.1.4.1-1. The absolute accuracy of SS-RSRQ intra-frequency measurements is tested by using the parameters in Tables 13.4.2.1.5-1 and 13.4.2.1.5-2.

##### 13.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.2.1.4.1-1.

**Table 13.4.2.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| Config | Description |
|---|---|
| 13.4.2.1-1 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 13.4.2.1-2 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 13.4.2.1-3 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.2.1.4.1-2.

**Table 13.4.2.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.2.1.5-1 and 13.4.2.1.5-2.
2. Message contents are defined in clause 13.4.2.1.4.3.
3. Cell 1, Cell 2 and Cell 3 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 and Cell 3 are on an unlicensed carrier subject to CCA.

### 13.4.2.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.2.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform intra-frequency SS-RSRQ measurements on the SCC as specified in section 13.4.2.1.4.3.
6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.2.1.5-1.
7. The UE shall transmit periodical *MeasurementReport* messages.
8. After 10s wait from Step 5, the SS shall check the SS-RSRQ reported values in the periodic *MeasurementReport*. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 13.4.2.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
10. Repeat steps 1-9 for each Test in Table 13.4.2.1.5-1 as appropriate.

### 13.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.2.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 CCA |

**Table 13.4.2.1.4.3-2: *ReportConfigNR* for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

13.4.2.1.5 Test requirements

Tables 13.4.2.1.5-1 and 13.4.2.1.5-2 define the primary level settings including test tolerances for all tests for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA.

**Table 13.4.2.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| | | | **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| SSB ARFCN | | | freq2 | freq2 | freq2 | freq2 |
| DL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.2 | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | Config 1, 2, 3 | | TDD | | | |
| TDD configuration | Config 1, 2, 3 | | TDDConf.1.1 CCA | | | |
| $BW_{channel}$ | Config 1, 2, 3 | MHz | 40: $N_{RB,c}$ = 106 | | | |
| Gap Pattern ID | | | 0 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 2, 3 | | SR1.1 CCA | | SR1.1 CCA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | | Config 1, 2, 3 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Control Channel RMC | | Config 1, 2, 3 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| TRS Configuration | | Config 1, 2, 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | | OP. 1 | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | |
| Time offset with Cell 1 | | Config 1, 2, 3 | µs | 3 | 3 | 3 | 3 |
| DBT Window configuration | | Config 1, 2, 3 | | DBT.1 | | | |
| SSB configuration | | Config 1, 2, 3 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | | Config 1, 2, 3 | | SMTC.1 | | | |
| CSI-RS for tracking | | Config 1, 2, 3 | | TRS.1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 3 | kHz | 30 kHz | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -92.6 | | -110 | |
| | | NR_CCA_FR1_J | | | | -109.5 | |
| $N_{oc}$ Note2 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/SCS | -89.6 | | -107 | |
| | | NR_CCA_FR1_J | | | | -106.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -4 | -4 |
| SS-RSRP Note 3 | Config 1, 2, 3 | NR_CCA_FR1_I | | -86.59 | -86.59 | -110.99 | -110.99 |
| | | NR_CCA_FR1_J | | | | -110.49 | -110.49 |
| SS-RSRQ Note3 | | NR_CCA_FR1_I | dB | -14.77 | -14.77 | -17.34 | -17.34 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/ 38.16MHz | -51.56 | | -73.4 | |
| | | NR_CCA_FR1_J | | | | -72.9 | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3A.4.1.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.

Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 13.4.2.1.5-2: NR PCell specific test parameters for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| Parameter | | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 1 |
| SSB ARFCN | | | | freq1 | freq1 |
| Duplex mode | | Config 1 | | FDD | FDD |
| | | Config 2,3 | | TDD | TDD |
| TDD configuration | | Config 1 | | Not Applicable | Not Applicable |
| | | Config 2 | | TDDConf.1.1 | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | Config 2 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | Config 3 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| Gap Pattern ID | | | | 0 | 0 |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | DLBWP.0.1 |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | DLBWP.1.1 |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | ULBWP.0.1 |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | ULBWP.1.1 |
| DRX Cycle configuration | | | ms | Not Applicable | Not Applicable |
| TRS configuration | | Config 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 | OP.1 |
| SS-RSSI-Measurement | | | | Not Applicable | Not Applicable |
| SMTC configuration | | Config 1<br>Config 2,3 | | SMTC.2 | SMTC.2 |
| | | | | SMTC.1 | SMTC.1 |
| SSB configuration | | Config 1,2 | | SSB.1 FR1 | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 | 15 |
| | | Config 3 | | 30 | 30 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -85 | -114 |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_B | | | -113.5 |
| | | NR_TDD_FR1_C | | | -113 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -112.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -112 |
| | | NR_FDD_FR1_F | | | -111.5 |
| | | NR_FDD_FR1_G | | | -111 |
| | | NR_FDD_FR1_H | | | -110.5 |
| | | NR_FDD_FR1_N | | | -107.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -91 | -114 |
| | | NR_FDD_FR1_B | | | -113.5 |
| | | NR_TDD_FR1_C | | | -113 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -112.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -112 |
| | | NR_FDD_FR1_F | | | -111.5 |
| | | NR_FDD_FR1_G | | | -111 |
| | | NR_FDD_FR1_H | | | -110.5 |
| | | NR_FDD_FR1_N | | | -107.5 |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -85 | -114 |
| | | NR_FDD_FR1_B | | | -113.5 |
| | | NR_TDD_FR1_C | | | -113 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -112.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -112 |
| | | NR_FDD_FR1_F | | | -111.5 |
| | | NR_FDD_FR1_G | | | -111 |
| | | NR_FDD_FR1_H | | | -110.5 |
| | | NR_FDD_FR1_N | | | -107.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -88 | -111 |
| | | NR_FDD_FR1_B | | | -110.5 |
| | | NR_TDD_FR1_C | | | -110 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -109.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -109 |
| | | NR_FDD_FR1_F | | | -108.5 |
| | | NR_FDD_FR1_G | | | -108 |
| | | NR_FDD_FR1_H | | | -107.5 |
| | | NR_FDD_FR1_N | | | -104.5 |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.76 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 3 | -4 |
| SS-RSRP Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -82 | -118 |
| | | NR_FDD_FR1_B | | | -117.5 |
| | | NR_TDD_FR1_C | | | -117 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -116.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -116 |
| | | NR_FDD_FR1_F | | | -115.5 |
| | | NR_FDD_FR1_G | | | -115 |
| | | NR_FDD_FR1_H | | | -114.5 |
| | | NR_FDD_FR1_N | | | -111.5 |

| | | | | | |
|---|---|---|---|---|---|
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -85 | -115 |
| | | NR_FDD_FR1_B | | | -114.5 |
| | | NR_TDD_FR1_C | | | -114 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -113.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -113 |
| | | NR_FDD_FR1_F | | | -112.5 |
| | | NR_FDD_FR1_G | | | -112 |
| | | NR_FDD_FR1_H | | | -111.5 |
| | | NR_FDD_FR1_N | | | -108.5 |
| SS-RSRQ Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dB | -14.77 | -17.34 |
| | | NR_FDD_FR1_B | | | |
| | | NR_TDD_FR1_C | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | | NR_FDD_FR1_F | | | |
| | | NR_FDD_FR1_G | | | |
| | | NR_FDD_FR1_H | | | |
| | | NR_FDD_FR1_N | | | |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -50 | -83.5 |
| | | NR_FDD_FR1_B | | | -83 |
| | | NR_TDD_FR1_C | | | -82.5 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -82 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -81.5 |
| | | NR_FDD_FR1_F | | | -81 |
| | | NR_FDD_FR1_G | | | -80.5 |
| | | NR_FDD_FR1_H | | | -80 |
| | | NR_FDD_FR1_N | | | -77 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16MHz | -50 | -77.4 |
| | | NR_FDD_FR1_B | | | -76.9 |
| | | NR_TDD_FR1_C | | | -76.4 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -75.9 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -75.4 |
| | | NR_FDD_FR1_F | | | -74.9 |
| | | NR_FDD_FR1_G | | | -74.4 |
| | | NR_FDD_FR1_H | | | -73.9 |
| | | NR_FDD_FR1_N | | | -70.9 |
| Propagation condition | | | - | AWGN | AWGN |
| Antenna configuration | | | - | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3A.4.1.

| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |
|---|---|

**Table 13.4.2.1.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRQ_52 | SS-RSRQ_44 |
| Highest reported value (Cell 3) | SS-RSRQ_62 | SS-RSRQ_59 |
| Extreme Conditions | | |
| Lowest reported value (Cell 3) | SS-RSRQ_49 | SS-RSRQ_43 |
| Highest reported value (Cell 3) | SS-RSRQ_65 | SS-RSRQ_60 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 13.4.3 SS-SINR

### 13.4.3.0 Minimum Conformance Requirements

#### 13.4.3.0.1 Intra-frequency absolute SS-SINR measurement accuracy requirements under CCA

Same as section 10.5.3.0.1.

#### 13.4.3.0.2 Intra-frequency relative SS-SINR measurement accuracy requirements under CCA

Same as section 10.5.3.0.2.

#### 13.4.3.0.3 Inter-frequency absolute SS-SINR measurement accuracy requirements under CCA

Same as section 10.5.3.0.3.

#### 13.4.3.0.4 Inter-frequency relative SS-SINR measurement accuracy requirements under CCA

Same as section 10.5.3.0.4.

### 13.4.3.1 NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA

#### 13.4.3.1.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will partially verify the SS-SINR measurement accuracy requirements in section 13.4.3.0.1.

#### 13.4.3.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and SS-SINR measurements on shared spectrum.

#### 13.4.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.3.1.

#### 13.4.3.1.4 Test description

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). Supported test configurations are shown in Table 13.4.3.1.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurements is tested by using the parameters in Tables 13.4.3.1.5-1, 13.4.3.1.5-2 and 13.4.3.1.5-3. Two sub-tests (Test 1 and Test 2) are provided different $N_{oc}$ on Cells 1, 2, and 3.

##### 13.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.3.1.4.1-1.

**Table 13.4.3.1.4.1-1: Supported test configurations for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Config | Description |
|---|---|
| 13.4.3.1-1 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 13.4.3.1-2 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 13.4.3.1-3 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.3.1.4.1-2.

**Table 13.4.3.1.4.1-2: Initial conditions for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.3.1.5-1 and 13.4.3.1.5-2.
2. Message contents are defined in clause 13.4.3.1.4.3.
3. Cell 1, Cell 2 and Cell 3 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 and Cell 3 are on an unlicensed carrier subject to CCA.

##### 13.4.3.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 13.4.3.1.5-1 and 13.4.3.1.5-2 as appropriate.

3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.3.1.4.3.

4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.

5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform intra-frequency SS-SINR measurements on the SCC as specified in section 13.4.3.1.4.3.

6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.3.1.5-1.

7. The UE shall transmit periodical *MeasurementReport* messages.

8. After 10s wait from Step 5, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 13.4.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

10. Repeat steps 1-9 for each Test in Table 13.4.3.1.5-1 as appropriate.

#### 13.4.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.3.1.4.3-1: Common Exception messages for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel accessH.3.10-2 with Condition SMTC.1 CCA |

**Table 13.4.3.1.4.3-2: *RRCReconfiguration* (step 2, SCell addition) for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Measurements configuration | NR_MEAS |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-SCell(n) | n is number of SCC to be added | SCell_add |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 13.4.3.1.4.3-3: *ReportConfigNR* for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

13.4.3.1.5 Test requirements

Tables 13.4.3.1.5-1, 13.4.3.1.5-2 and 13.4.3.1.5-3 define the primary level settings including test tolerances for all tests for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA.

**Table 13.4.3.1.5-1: Cell specific test parameters for CCA cells for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| | | | **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| SSB ARFCN | | | freq2 | freq2 | freq2 | freq2 |
| DL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.1 | | | |
| UL CCA model | Config 1, 2, 3 | | As specified in clause D.7.2.2 | | | |
| UL CCA probability | $P_{CCA_UL}$ | | 1.0 | - | 1.0 | - |
| DL CCA probability for semi-static channel access Note 7, 8 | $P_{CCA_DL}$ | | 0.9375 | - | 0.9375 | - |
| DL CCA probability for dynamic channel access Note 8, 9 | $P_{CCA_DL_1}$ | | 0.75 | - | 0.75 | - |
| | $P_{CCA_DL_2}$ | | 0.75 | - | 0.75 | - |
| Duplex mode | Config 1, 2, 3 | | TDD | | | |
| TDD configuration | Config 1, 2, 3 | | TDDConf.1.1 CCA | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1, 2, 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | Config 1, 2, 3 | | SR.1.1 CCA | | SR.1.1 CCA | |
| RMSI CORESET Reference Channel | Config 1, 2, 3 | | CR.1.1 CCA | | CR.1.1 CCA | |
| Dedicated CORESET Reference Channel | Config 1, 2, 3 | | CCR.1.1 CCA | | CCR.1.1 CCA | |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| DBT Window configuration | Config 1, 2, 3 | | DBT.1 | | | |
| Time offset with Cell 1 | Config 1, 2, 3 | µs | 3 (for Cell 2) | 3 | 3 (for Cell 2) | 3 |
| SSB configuration | Config 1, 2, 3 | | SSB.1 CCA for semi-static channel access<br>SSB.2 CCA for dynamic channel access | | | |
| SMTC configuration | Config 1, 2, 3 | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 3 | kHz | 30 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_CCA_FR1_I | dBm/15kHz | -93.2 | | -112 | |
| | | NR_CCA_FR1_J | | | | -111.5 | |
| $N_{oc}$ Note2 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/SCS | -90.2 | | -109 | |
| | | NR_CCA_FR1_J | | | | -108.5 | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -3.5 | -3.5 |
| SS-RSRP Note 3 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/SCS | -85.65 | -87.53 | -112.49 | -112.49 |
| | | NR_CCA_FR1_J | | | | -111.99 | -111.99 |
| SS-SINR Note3 | | NR_CCA_FR1_I | dB | 0 | -3.19 | -5.10 | -5.10 |
| | | NR_CCA_FR1_J | | | | | |
| Io Note3 | Config 1, 2, 3 | NR_CCA_FR1_I | dBm/38.16MHz | -51.59 | | -75.17 | |
| | | NR_CCA_FR1_J | | | | -74.67 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

Note 6: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configuration.

Note 7: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 8: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

Note 9: For UE supporting both semi-static and dynamic cannel access, the UE must be tested under both dynamic and semi-static channel occupancy configurations.

**Table 13.4.3.1.5-2: Cell specific test parameters for PCell for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| | | | Cell 1 | Cell 1 |
| SSB ARFCN | | | freq1 | freq1 |
| Duplex mode | Config 1 | | FDD | FDD |
| | Config 2,3 | | TDD | TDD |
| TDD configuration | Config 1 | | Not Applicable | Not Applicable |
| | Config 2 | | TDDConf.1.1 | TDDConf.1.1 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | Config 3 | | TDDConf.2.1 | TDDConf.2.1 |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | DLBWP.0.1 |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | DLBWP.1.1 |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | ULBWP.0.1 |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | ULBWP.1.1 |
| DRX Cycle configuration | | | ms | Not Applicable | Not Applicable |
| TRS configuration | | Config 1 | | TRS.1.1 FDD | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD | TRS.1.2 TDD |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.1.1 FDD | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 | OP.1 |
| SS-RSSI-Measurement | | | | Not Applicable | Not Applicable |
| SMTC configuration | | Config 1<br>Config 2,3 | | SMTC.2 | SMTC.2 |
| | | | | SMTC.1 | SMTC.1 |
| SSB configuration | | Config 1,2 | | SSB.1 FR1 | SSB.1 FR1 |
| | | Config 3 | | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 | 15 |
| | | Config 3 | | 30 | 30 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ Note2 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/15kHz | -93 | -116 |
| | | NR_FDD_FR1_B | | | -115.5 |
| | | NR_TDD_FR1_C | | | -115 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -114.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -114 |
| | | NR_FDD_FR1_F | | | -113.5 |
| | | NR_FDD_FR1_G | | | -113 |
| | | NR_FDD_FR1_H | | | -112.5 |
| | | NR_FDD_FR1_N | | | -109.5 |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -93 | Same as Noc for 15 kHz |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -90 | -113 |
| | | NR_FDD_FR1_B | | | -112.5 |
| | | NR_TDD_FR1_C | | | -112 |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -111.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -111 |
| | | NR_FDD_FR1_F | | | -110.5 |
| | | NR_FDD_FR1_G | | | -110 |
| | | NR_FDD_FR1_H | | | -109.5 |
| | | NR_FDD_FR1_N | | | -106.5 |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -5.46 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | -4 |
| SS-RSRP Note 3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/SCS | -88.46 | -120 |
| | | NR_FDD_FR1_B | | | -119.5 |
| | | NR_TDD_FR1_C | | | -119 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -118.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -118 |
| | | NR_FDD_FR1_F | | | -117.5 |
| | | NR_FDD_FR1_G | | | -117 |
| | | NR_FDD_FR1_H | | | -116.5 |
| | | NR_FDD_FR1_N | | | -113.5 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | | -85.46 | -117 |
| | | NR_FDD_FR1_B | | | -116.5 |
| | | NR_TDD_FR1_C | | | -116 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -115.5 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -115 |
| | | NR_FDD_FR1_F | | | -114.5 |
| | | NR_FDD_FR1_G | | | -114 |
| | | NR_FDD_FR1_H | | | -113.5 |
| | | NR_FDD_FR1_N | | | -110.5 |
| SS-SINR Note3 | | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dB | 0 | -5.46 |
| | | NR_FDD_FR1_B | | | |
| | | NR_TDD_FR1_C | | | |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | |
| | | NR_FDD_FR1_F | | | |
| | | NR_FDD_FR1_G | | | |
| | | NR_FDD_FR1_H | | | |
| | | NR_FDD_FR1_N | | | |
| Io Note3 | Config 1,2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 9.36MHz | -57.5 | -85.51 |
| | | NR_FDD_FR1_B | | | -85.01 |
| | | NR_TDD_FR1_C | | | -84.51 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -84.01 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -83.51 |
| | | NR_FDD_FR1_F | | | -83.01 |
| | | NR_FDD_FR1_G | | | -82.51 |
| | | NR_FDD_FR1_H | | | -82.01 |
| | | NR_FDD_FR1_N | | | -79.01 |
| | Config 3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 | dBm/ 38.16MHz | -51.41 | -79.41 |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_B | | | -78.91 |
| | | NR_TDD_FR1_C | | | -78.41 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -77.91 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | | | -77.41 |
| | | NR_FDD_FR1_F | | | -76.91 |
| | | NR_FDD_FR1_G | | | -76.41 |
| | | NR_FDD_FR1_H | | | -75.91 |
| | | NR_FDD_FR1_N | | | -72.91 |
| Propagation condition | | | - | AWGN | AWGN |
| Antenna configuration | | | - | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 13.4.3.1.5-3: Absolute accuracy requirements for the reported values for NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest reported value (Cell 3) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 3) | SS-SINR_49 | SS-SINR_45 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 3) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 3) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 13.4.4 L1-RSRP measurement for beam reporting with CCA serving cell

### 13.4.4.0 Minimum Conformance Requirements

#### 13.4.4.0.1 SSB-based L1-RSRP measurement absolute accuracy under CCA

Same as section 10.5.4.0.1.1.

#### 13.4.4.0.2 SSB-based L1-RSRP measurement relative accuracy under CCA

Same as section 10.5.4.0.1.2.

### 13.4.4.1 NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA

#### 13.4.4.1.1 Test purpose

The purpose of this test is to verify that the L1-RSRP measurement accuracy on the carrier frequency with CCA is within the specified limits. This test will partially verify the L1-RSRP measurement accuracy requirements in section 13.4.4.0.1 and 13.4.4.0.2.

#### 13.4.4.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and UL with a shared spectrum NR carrier.

#### 13.4.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.4.1.

#### 13.4.4.1.4 Test description

In this set of test cases there are two cells in the test, PCell (Cell 1) and a SCell under CCA (Cell2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model.

Two sub-tests (Test 1 and Test 2) are provided with different $N_{oc}$ on Cell 2. The test parameters for the Cell 1 and Cell 2 as well as the absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Tables 13.4.4.1.5-1, 13.4.4.1.5-2 and 13.4.4.1.5-3.

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. On Cell 2, UE is configured to perform L1-RSRP measurement based on the SSB resources 0 and 1.

##### 13.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.4.1.4.1-1.

**Table 13.4.4.1.4.1-1: Supported test configurations for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| Config | Description |
|---|---|
| 13.4.4.1-1 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 13.4.4.1-2 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 13.4.4.1-3 | NR carrier with CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>NR carrier without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations for each supported band | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.4.1.4.1-2.

**Table 13.4.4.1.4.1-2: Initial conditions for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | |

1. The test parameter settings are set up according to Tables 13.4.4.1.5-1 and 13.4.4.1.5-2.
2. Message contents are defined in clause 13.4.4.1.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

### 13.4.4.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.4.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.4.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform L1-RSRP measurements on the SCell as specified in section 13.4.4.1.4.3.
6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.4.1.5-1.
7. The UE shall transmit periodical PUCCH format 2 CSI reports containing L1-RSRP measurements for the SCell every 80 slots.
8. After 10s wait from Step 6, the SS shall check the L1-RSRP reported values in the periodic CSI reports:

   R1: The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 13.4.4.1.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   R2: The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 13.4.4.1.5-3, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
9. The SS shall continue checking the L1-RSRP reports transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
10. Repeat steps 1-9 for each Test in Table 13.4.4.1.5-1 as appropriate.

### 13.4.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.4.1.4.3-1: Common Exception messages for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10<br>Table H.3.10-1 with Condition SSB.3 CCA and SemiStatic, for semi-static channel access; or Condition SSB.4 CCA and Dynamic, for dynamic channel access |

**Table 13.4.4.1.4.3-2: RadioLinkMonitoringConfig for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

13.4.4.1.5 Test requirements

Tables 13.4.4.1.5-1, 13.4.4.1.5-2 and 13.4.4.1.5-3 define the primary level settings including test tolerances for all tests for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA.

**Table 13.4.4.1.5-1: Cell specific test parameters for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Active PCell/SCell Configuration | 1~3 | | PCell | SCell | PCell | SCell |
| SSB GSCN | 1~3 | | freq1 | freq2 | freq1 | freq2 |
| DL CCA model | 1~3 | | N/A | As specified in D.7.2.1 | N/A | As specified in D.7.2.1 |
| UL CCA model | 1~3 | | N/A | As specified in D.7.2.2 | N/A | As specified in D.7.2.2 |
| Duplex mode | 1 | | FDD | TDD | FDD | TDD |
| | 2,3 | | TDD | | TDD | |
| TDD configuration | 1 | | N/A | TDDConf.1.1 CCA | N/A | TDDConf.1.1 CCA |
| | 2 | | TDDConf. 1.1 | | TDDConf.1 .1 | |
| | 3 | | TDDConf. 2.1 | | TDDConf.2 .1 | |
| $BW_{channel}$ | 1 | MHz | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 | 10: $N_{RB,c}$ = 52 | 40: $N_{RB,c}$ = 106 |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 106 | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | SR.1.1 CCA | SR.1.1 FDD | SR.1.1 CCA |
| | 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | | SR.2.1 TDD | |
| | 1 | | CR.1.1 FDD | CR.1.1 CCA | CR.1.1 FDD | CR.1.1 CCA |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | | 2 | | CR.1.1 TDD | | CR.1.1 TDD | | |
| | | 3 | | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 CCA | CCR.1.1 FDD | CCR.1.1 CCA | |
| | | 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| | | 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| SSB configuration for Semi-static channel access | | 1 | | SSB.3 FR1 | SSB.3 CCA | SSB.3 FR1 | SSB.3 CCA | |
| | | 2 | | SSB.3 FR1 | | SSB.3 FR1 | | |
| | | 3 | | SSB.4 FR1 | | SSB.4 FR1 | | |
| SSB configuration for Dynamic channel access | | 1 | | SSB.3 FR1 | SSB.4 CCA | SSB.3 FR1 | SSB.4 CCA | |
| | | 2 | | SSB.3 FR1 | | SSB.3 FR1 | | |
| | | 3 | | SSB.4 FR1 | | SSB.4 FR1 | | |
| TRS configuration | | 1 | | TRS.1.1 FDD | TRS.1.2 TDD | TRS.1.1 FDD | TRS.1.2 TDD | |
| | | 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | |
| | | 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| OCNG Patterns | | 1~3 | | OP.1 | | OP.1 | | |
| Initial BWP Configuration | | 1~3 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | | |
| Dedicated BWP configuration | | 1~3 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | | |
| SMTC configuration | | 1~3 | | SMTC.1 | N/A | SMTC.1 | N/A | |
| DBT Window Configuration | | 1~3 | | N/A | DBT.1 | N/A | DBT.1 | |
| reportConfigType | | 1~3 | | periodic | | periodic | | |
| reportQuantity | | 1~3 | | ssb-Index-RSRP | | ssb-Index-RSRP | | |
| Number of reported RS | | 1~3 | | 2 | | 2 | | |
| L1-RSRP reporting period | | 1~3 | | slot80 | | slot80 | | |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/15 kHz | -94.65 | -96 | -94.65 | - | |
| | NR_FDD_FR1_B | | | | | | - | |
| | NR_TDD_FR1_C | | | | | | - | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | - | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | - | |
| | NR_FDD_FR1_F | | | | | | - | |
| | NR_FDD_FR1_G | | | | | | - | |
| | NR_FDD_FR1_H | | | | | | - | |
| | NR_FDD_FR1_N | | | | | | - | |
| | NR_TDD_FR1_I | | | | | - | -113 | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/SB SCS | -91.65 for SCS 30kHz | -93 | -91.65 for SCS 30kHz | - | |
| | NR_FDD_FR1_B | | | | | | - | |
| | NR_TDD_FR1_C | | | | | | - | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | -94.65 for SCS 15kHz | | -94.65 for SCS 15kHz | - |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | - |
| | NR_FDD_FR1_F | | | | | | - |
| | NR_FDD_FR1_G | | | | | | - |
| | NR_FDD_FR1_H | | | | | | - |
| | NR_FDD_FR1_N | | | | | | - |
| | NR_TDD_FR1_I | | | | | - | -110 |
| $\hat{E}_s/I_{ot}$ | | 1~3 | dB | 10 | | 10 | -2.2 |
| SS-RSRP Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/SCS | -81.65 for SCS 30kHz<br>-84.65 for SCS 15kHz | -83 | -81.65 for SCS 30kHz<br>-84.65 for SCS 15kHz | - |
| | NR_FDD_FR1_B | | | | | | - |
| | NR_TDD_FR1_C | | | | | | - |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | - |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | - |
| | NR_FDD_FR1_F | | | | | | - |
| | NR_FDD_FR1_G | | | | | | - |
| | NR_FDD_FR1_H | | | | | | - |
| | NR_FDD_FR1_N | | | | | | - |
| | NR_TDD_FR1_I | | | | | - | -112.2 |
| Io Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~3 | dBm/38.16MHz | -50.19 | -51.53 | -50.19 | - |
| | NR_FDD_FR1_B | | | | | | - |
| | NR_TDD_FR1_C | | | | | | - |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | - |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | - |
| | NR_FDD_FR1_F | | | | | | - |
| | NR_FDD_FR1_G | | | | | | - |
| | NR_FDD_FR1_H | | | | | | - |
| | NR_FDD_FR1_N | | | | | | - |
| | NR_TDD_FR1_I | | | | | - | -76.90 |
| $\hat{E}_s/N_{oc}$ | | 1~3 | dB | 10 | | 10 | -2.2 |
| Propagation condition | | 1~3 | | AWGN | | AWGN | |
| Antenna configuration | | 1~3 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 13.4.4.1.5-2: Absolute accuracy requirements for the L1-RSRP reported values for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| Normal Conditions | Test 1 All bands | Test 2 | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 63 | Bands NR_CCA_FR1_I | 38 |
| | | Bands NR_CCA_FR1_J | 38 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | 84 | Bands NR_CCA_FR1_I | 51 |
| | | Bands NR_CCA_FR1_J | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 60 | Bands NR_CCA_FR1_I | 33 |
| | | Bands NR_CCA_FR1_J | 33 |
| Highest reported value (Cell 2) | 87 | Bands NR_CCA_FR1_I | 56 |
| | | Bands NR_CCA_FR1_J | 56 |
| NOTE: NR operating band groups are defined in clause 3A.4.1, Table 3A.4.1-1 | | | |

**Table 13.4.4.1.5-3: Relative accuracy requirements for the L1-RSRP reported values for NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 13.4.5 RSSI

### 13.4.5.0 Minimum Conformance Requirements

#### 13.4.5.0.1 Intra-frequency absolute RSSI measurement accuracy requirements in FR1

Same as section 10.5.5.0.1.

#### 13.4.5.0.2 Inter-frequency absolute RSSI measurement accuracy requirements in FR1

Same as section 10.5.5.0.2.

#### 13.4.5.0.3 RSSI measurement report mapping

The reporting range of RSSI measurement is defined from -100 dBm to -25 dBm with 1 dBm resolution.

The mapping of the measured quantity is defined in Table 13.4.5.0.3-1. The range in the signalling may be larger than the guaranteed accuracy range, provided that the following condition is met:

the RSSI measurement bandwidth is the channel bandwidth defined in Clause 4 of TS 37.213 [37], where the channel has the center frequency configured by *ARFCN-valueNR*.

**Table 13.4.5.0.3-1: RSSI measurement report mapping**

| Reported value | Measured quantity value | Unit |
|---|---|---|
| RSSI_00 | RSSI < -100 | dBm |
| RSSI_01 | -100 ≤ RSSI < -99 | dBm |
| RSSI_02 | -99 ≤ RSSI < -98 | dBm |

| … | … | … |
|---|---|---|
| RSSI_74 | -27 ≤ RSSI < -26 | dBm |
| RSSI_75 | -26 ≤ RSSI < -25 | dBm |
| RSSI_76 | -25 ≤ RSSI | dBm |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.34.3.

## 13.4.5.1 NR SA FR1 RSSI measurement accuracy on a carrier with CCA

### 13.4.5.1.1 Test purpose

The purpose of this test is to verify that the RSSI measurement accuracy is within the specified limits. This test will partially verify the RSSI measurement accuracy requirements in section 13.4.5.0.1.

### 13.4.5.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

### 13.4.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.5.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.5.1.

### 13.4.5.1.4 Test description

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the SCell with CCA. RSSI is measured on channel number 2. Supported test configurations are shown in Table 13.4.5.1.4.1-1. The accuracy of RSSI intra-frequency measurements is tested by using the parameters in Tables 13.4.5.1.5-1, 13.4.5.1.5-2 and 13.4.5.1.5-3.

#### 13.4.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.5.1.4.1-1.

**Table 13.4.5.1.4.1-1: Supported test configurations for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 13.4.5.1-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.5.1-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.5.1-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.5.1.4.1-2.

**Table 13.4.5.1.4.1-2: Initial conditions for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | |

1. The test parameter settings are set up according to Tables 13.4.5.1.5-1 and 13.4.5.1.5-2.
2. Message contents are defined in clause 13.4.5.1.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

### 13.4.5.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.5.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.5.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.
5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform intra-frequency RSSI measurements on the SCC according to the RMTC specified in section 13.4.5.1.4.3.
6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.5.1.5-1.
7. The UE shall transmit periodical *MeasurementReport* messages.
8. After 10s wait from Step 5, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 13.4.5.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
10. Repeat steps 1-9 for each Test in Table 13.4.5.1.5-1 as appropriate.

### 13.4.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.5.1.4.3-1: Common Exception messages for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 |

**Table 13.4.5.1.4.3-2: *MeasResults* for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 13.4.5.1.4.3-3: *MeasResultForRSSI* for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

13.4.5.1.5 Test requirements

Tables 13.4.5.1.5-1, 13.4.5.1.5-2 and 13.4.5.1.5-3 define the primary level settings including test tolerances for all tests for NR SA FR1 RSSI measurement accuracy on a carrier with CCA.

**Table 13.4.5.1.5-1: Cell specific test parameters for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.2 CCA |
| $P_{CCA_DL}$ for dynamic channel access Note 1,3 | | 1,2,3 | | 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |
| $P_{CCA_DL}$ for semi-static channel access Note 2,3 | | 1,2,3 | | 1 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ | | | | 1 | 1 |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | | 2,3 | | SR.1.1 TDD | |
| | | 1 | | CR.1.1 FDD | CR.1.1 CCA |

| | | | | |
|---|---|---|---|---|
| RMSI CORESET Reference Channel | 2,3 | | CR.1.1 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | CCR.1.1 CCA |
| | 2,3 | | CCR.1.1 TDD | |
| OCNG Patterns | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

**Table 13.4.5.1.5-2: RSSI RMTC parameters for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 13.4.5.1.5-3: Requirements for the reported values for NR SA FR1 RSSI measurement accuracy on a carrier with CCA**

| Normal Conditions | Test 1<br>All bands |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| **Extreme Conditions** | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

The average RSSI measurement accuracy shall fulfil the requirements in section 13.4.5.0.1. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## 13.4.5.2 NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA

### 13.4.5.2.1 Test purpose

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

### 13.4.5.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

### 13.4.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.5.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.5.2.

### 13.4.5.2.4 Test description

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the neighbour with CCA. RSSI is measured on channel number 2. Supported test configurations are shown in Table 13.4.5.2.4.1-1. The accuracy of RSSI inter-frequency measurements is tested by using the parameters in Tables 13.4.5.2.5-1, 13.4.5.2.5-2 and 13.4.5.2.5-3.

#### 13.4.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.5.2.4.1-1.

**Table 13.4.5.2.4.1-1: Supported test configurations for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 13.4.5.2-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.5.2-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.5.2-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.5.2.4.1-2.

**Table 13.4.5.2.4.1-2: Initial conditions for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.5.2.5-1 and 13.4.5.2.5-2.
2. Message contents are defined in clause 13.4.5.2.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

### 13.4.5.2.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.5.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform inter-frequency RSSI measurements according to the RMTC specified in section 13.4.5.2.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.5.2.5-1.
5. The UE shall transmit periodical *MeasurementReport* messages.
6. After 10s wait from Step 5, the SS shall check the RSSI reported values in the periodic *MeasurementReport*. The RSSI value of Cell 2 reported by the UE is compared to the expected RSSI. If the value is outside the limits in Table 13.4.5.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.
8. Repeat steps 1-7 for each Test in Table 13.4.5.2.5-1 as appropriate.

### 13.4.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.5.2.4.3-1: Common Exception messages for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTER-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>H.3.10-2 with Condition SMTC.1 |

**Table 13.4.5.2.4.3-2: *MeasResults* for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 13.4.5.2.4.3-3: *MeasResultForRSSI* for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |

## 13.4.5.2.5 Test requirements

Tables 13.4.5.2.5-1, 13.4.5.2.5-2 and 13.4.5.2.5-3 define the primary level settings including test tolerances for all tests for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA.

**Table 13.4.5.2.5-1: Cell specific test parameters for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1<br>Configuration 3: SSB.2 FR1 | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1<br>Configuration 3: SSB.2 FR1 | SSB.2 CCA |
| $P_{CCA_DL}$ for dynamic channel access Note 1,3 | | 1,2,3 | | 1 | $P_{CCA_DL_1}$=0.75<br>$P_{CCA_DL_2}$=0.75 |

| | | | | |
|---|---|---|---|---|
| $P_{CCA_DL}$ for semi-static channel access Note 2,3 | 1,2,3 | | 1 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ | | | 1 | 1 |
| DL CCA model | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | MHz | 20 | |
| DRX Cycle configuration | | ms | Not Applicable | |
| PDSCH Reference measurement channel | 1 | | SR.1.1 FDD | NA |
| | 2,3 | | SR.1.1 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.1.1 FDD | NA |
| | 2,3 | | CR.1.1 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.1.1 FDD | NA |
| | 2,3 | | CCR.1.1 TDD | |
| OCNG Patterns | | | OP.1 | NA |
| EPRE ratio of PSS to SSS | | dB | 0 | NA |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -106 |
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |

Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.

| Note 3: | For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. |
|---|---|

**Table 13.4.5.2.5-2: RSSI RMTC parameters for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

**Table 13.4.5.2.5-3: Requirements for the reported values for NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA**

| **Normal Conditions** | **Test 1<br>All bands** |
|---|---|
| Lowest RSSI reported value | 35 |
| Highest RSSI reported value | 49 |
| Extreme Conditions | **Test 1<br>All bands** |
| Lowest RSSI reported value | 32 |
| Highest RSSI reported value | 52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-1 | |

The average RSSI measurement accuracy shall fulfil the requirements in section 13.4.5.0.2. The nominal RSSI used to evaluate the requirement shall be based on Io in slots corresponding to RSSI measurement time configuration (RMTC).

## 13.4.6 Channel Occupancy

### 13.4.6.0 Minimum Conformance Requirements

#### 13.4.6.0.1 Intra-frequency channel occupancy measurement accuracy requirements in FR1

Same as section 10.5.6.0.1.

#### 13.4.6.0.2 Inter-frequency channel occupancy measurement accuracy requirements in FR1

Same as section 10.5.6.0.2.

### 13.4.6.1 NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA

#### 13.4.6.1.1 Test purpose

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in section 13.4.6.0.1.

#### 13.4.6.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

#### 13.4.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.6.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.6.1.

### 13.4.6.1.4 Test description

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the SCell with CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in Table 13.4.6.1.4.1-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in Tables 13.4.6.1.5-1, 13.4.6.1.5-2 and 13.4.6.1.5-3.

#### 13.4.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.6.1.4.1-1.

**Table 13.4.6.1.4.1-1: Supported test configurations for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 13.4.6.1-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.6.1-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.6.1-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.6.1.4.1-2.

**Table 13.4.6.1.4.1-2: Initial conditions for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.6.1.5-1 and 13.4.6.1.5-2.
2. Message contents are defined in clause 13.4.6.1.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

#### 13.4.6.1.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.6.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.6.1.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.

5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform intra-frequency channel occupancy measurements on the SCC according to the RMTC specified in section 13.4.6.1.4.3.

6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.6.1.5-1.

7. The UE shall transmit periodical *MeasurementReport* messages.

8. After 10s wait from Step 5, the SS shall check the channel occupancy reported values in the periodic *MeasurementReport*. If the channel occupancy value of Cell 2 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

10. Repeat steps 1-9 for each Test in Table 13.4.6.1.5-1 as appropriate.

### 13.4.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.6.1.4.3-1: Common Exception messages for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 13.4.6.1.4.3-2: *MeasResults* for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 13.4.6.1.4.3-3: *MeasResultForRSSI* for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

13.4.6.1.5 Test requirements

Tables 13.4.6.1.5-1 and 13.4.6.1.5-2 define the primary level settings including test tolerances for all tests for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA.

**Table 13.4.6.1.5-1: Cell specific test parameters for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.2 CCA |
| $P_{CCA_DL}$ for dynamic channel access Note 1,3 | | 1,2,3 | | 1 | $P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75 |
| $P_{CCA_DL}$ for semi-static channel access Note 2,3 | | 1,2,3 | | 1 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ | | | | 1 | 1 |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | | 2,3 | | SR.1.1 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | CR.1.1 CCA |
| | | 2,3 | | CR.1.1 TDD | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 CCA |
| | | 2,3 | | CCR.1.1 TDD | |
| OCNG Patterns | | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -106 |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |
| channelOccupancyThreshold | | dBm | -83 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

**Table 13.4.6.1.5-2: Channel Occupancy RMTC parameters for NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. At least 90% of channel occupancy reports made by the UE shall indicate this value.

## 13.4.6.2 NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA

### 13.4.6.2.1 Test purpose

The purpose of this test is to verify that the channel occupancy measurement accuracy is within the specified limits. This test will partially verify the channel occupancy measurement accuracy requirements in section 13.4.6.0.2.

### 13.4.6.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting 2DL CA with a shared spectrum NR carrier and supporting RRM and Channel occupancy measurements on shared channel access.

### 13.4.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 13.4.6.0.

The normative reference for this requirement is TS 38.133 [6] clause A.13.4.6.2.

### 13.4.6.2.4 Test description

In all test cases, Cell 1 is the PCell on a licensed FR1 band and Cell 2 is the neighbour with CCA. Channel occupancy is measured on channel number 2. Supported test configurations are shown in Table 13.4.6.2.4.1-1. The accuracy of channel occupancy intra-frequency measurements is tested by using the parameters in Tables 13.4.6.2.5-1, 13.4.6.2.5-2 and 13.4.6.2.5-3.

#### 13.4.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 13.4.6.2.4.1-1.

**Table 13.4.6.2.4.1-1: Supported test configurations for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Configuration | Description |
|---|---|
| 13.4.6.2-1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.6.2-2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 13.4.6.2-3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 13.4.6.2.4.1-2.

**Table 13.4.6.2.4.1-2: Initial conditions for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.11-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 13.4.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part | | |

1. The test parameter settings are set up according to Tables 13.4.6.2.5-1 and 13.4.6.2.5-2.
2. Message contents are defined in clause 13.4.6.2.4.3.
3. Cell 1 and Cell 2 are NR cells with power levels set according to clauses C.1.2 and C.1.3. In addition, Cell 2 is on an unlicensed carrier subject to CCA.

#### 13.4.6.2.4.2 Test procedure

The CCA model (both DL and UL) is disabled (i.e. $P_{CCA_DL_i}$= $P_{CCA_UL}$=1) at the start of the test. The SS shall provide sufficient UL grants to the UE such that no SR is required for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 13.4.6.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 adding Cell 2 as SCell as specified in section 13.4.6.2.4.3.
4. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration.

5. The SS shall transmit an *RRCReconfiguration* on Cell 1 configuring the UE to perform inter-frequency channel occupancy measurements according to the RMTC specified in section 13.4.6.2.4.3.

6. The UE shall transmit an *RRCReconfigurationComplete* to acknowledge the configuration. Afterwards, the SS shall enable DL and UL CCA model according to Table 13.4.6.2.5-1.

7. The UE shall transmit periodical *MeasurementReport* messages.

8. After 10s wait from Step 5, the SS shall check the channel occupancy reported values in the periodic *MeasurementReport*. If the channel occupancy value of Cell 2 reported by the UE is less than 100%, or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

9. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Annex G clause G.2.7 is achieved.

10. Repeat steps 1-9 for each Test in Table 13.4.6.2.5-1 as appropriate.

### 13.4.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 13.4.6.2.4.3-1: Common Exception messages for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition INTRA-FREQ MO and RSSI<br>Table H.3.1-4 with Condition RSSI and channelOccupancyThreshold set to 18 (value of -83dBm)<br>Table H.3.1-5<br>Table H.3.1-7<br>Table H.3.10-1 with Condition SSB.1 CCA and SemiStatic, for semi-static channel access; or Condition SSB.2 CCA and Dynamic, for dynamic channel access<br>Table H.3.10-2 with Condition SMTC.1 |

**Table 13.4.6.2.4.3-2: *MeasResults* for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measId | MeasId | | |
| MeasResultServMO[1] SEQUENCE { | | entry 1 | |
| servCellId | ServCellIndex | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId | | |
| } | | | |
| measResultForRSSI-r16 | MeasResultForRSSI | | SharedSpectrum |
| } | | | |
| } | | | |

**Table 13.4.6.2.4.3-3: *MeasResultForRSSI* for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| MeasResultForRSSI ::= SEQUENCE { | | | |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |

13.4.6.2.5 Test requirements

Tables 13.4.6.2.5-1 and 13.4.6.2.5-2 define the primary level settings including test tolerances for all tests for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA.

**Table 13.4.6.2.5-1: Cell specific test parameters for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| Parameter | | Configurations | Unit | Test 1 | |
|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 |
| RF Channel Number | | | | 1 | 2 |
| $BW_{channel}$ | | | MHz | 40 | 40 |
| SSB configuration | Semi-static channel access Note 1, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.1 CCA |
| | Dynamic channel access Note 2, 3 | 1,2,3 | | Configuration 1,2: SSB.1 FR1 Configuration 3: SSB.2 FR1 | SSB.2 CCA |
| $P_{CCA_DL}$ for dynamic channel access Note 1,3 | | 1,2,3 | | 1 | $P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75 |
| $P_{CCA_DL}$ for semi-static channel access Note 2,3 | | 1,2,3 | | 1 | $P_{CCA_DL}$=0.9375 |
| $P_{CCA_UL}$ | | | | 1 | 1 |
| DL CCA model | | | | N/A | As specified in D.7.2.1 |
| UL CCA model | | | | N/A | As specified in D.7.2.2 |
| Measurement bandwidth | | | $n_{PRB}$ | Same as channel access bandwidth | |
| Channel access bandwidth | | | MHz | 20 | |
| DRX Cycle configuration | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | 1 | | SR.1.1 FDD | SR.1.1 CCA |
| | | 2,3 | | SR.1.1 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.1.1 FDD | CR.1.1 CCA |
| | | 2,3 | | CR.1.1 TDD | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.1.1 FDD | CCR.1.1 CCA |
| | | 2,3 | | CCR.1.1 TDD | |
| OCNG Patterns | | | | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | |
| $N_{oc}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | | dBm/SCS | -106 | -106 |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -106 | -87 |
| $\hat{E}_s/I_{ot}$ in slots not corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | 2.5 |
| $\hat{E}_s/I_{ot}$ in slots corresponding to RSSI measurement time configuration (RMTC) | | dB | 2.5 | -Infinity |
| SS-RSRP in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -103.5 |
| SS-RSRP in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/SCS | -103.5 | -Infinity |
| Io within measurement bandwidth in slots not corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -77.96 |
| Io within measurement bandwidth in slots corresponding to RSSI measurement time configuration (RMTC) | | dBm/measBW | -77.96 | -58.96 |
| Propagation condition | | - | AWGN | |
| channelOccupancyThreshold | | dBm | -83 | |
| Note 1: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.<br>Note 2: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.<br>Note 3: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only. | | | | |

**Table 13.4.6.2.5-2: Channel Occupancy RMTC parameters for NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA**

| | |
|---|---|
| measDurationSymbols-r16 | sym14or12 |
| rmtc-Periodicity-r16 | ms40 |
| rmtc-SubframeOffset-r16 | 20 |
| ref-SCS-CP-r16 | kHz15 |
| ReportInterval | ms120 |

The nominal reported *channelOccupancy* shall be 100%. At least 90% of channel occupancy reports made by the UE shall indicate this value.

# 14 NR standalone tests for Satellite access

## 14.0 General

The Satellite Access tests defined in this clause apply provided that UE indicates *nonTerrestrialNetwork* and is accessing a cell served by a Satellite Access Node (SAN). The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO).

### 14.0.1 Principle of testing GSO and NGSO scenarios

The test cases related to satellite access are defined for both GSO and NGSO. The testing principle for these test cases is as follows:

- A UE capable of GSO only is required to pass the test cases with GSO.

- A UE capable of NGSO only is required to pass the test cases with NGSO.
- A UE capable of both GSO and NGSO is required to pass the test cases with NGSO only.

Support of GSO and NGSO scenario is indicated via *ntn-ScenarioSupport-r17*.

## 14.0.2 Principle of testing different RRM requirements

Satellite Access RRM test cases are defined for all applicable RRM requirements. The testing principle for these test cases is as follows:

- A UE capable of NTN only is required to pass all the test cases defined in clause 14.
- A UE capable of both TN and NTN is required to pass the test cases for NTN specific requirements in Table 14.0.2-1.

**Table 14.0.2-1: Test cases for NTN specific requirements**

| Clause | Test case title |
|---|---|
| 14.1.2 | NR SA FR1 Cell reselection for UE configured with the feature for enhanced requirements for NR satellite access |
| 14.1.3 | NR SA FR1 Time-based Measurement Initiation cell reselection for satellite access |
| 14.1.4 | NR SA FR1 Location-based Measurement Initiation cell reselection for satellite access |
| 14.1.7 | NR SA FR1-FR1 Time-based Measurement Initiation Cell reselection satellite access |
| 14.1.8 | NR SA FR1-FR1 Location-based Measurement Initiation Cell reselection for satellite access |
| 14.1.9 | NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for satellite access |
| 14.2.1.3 | NR SA FR1 time-based conditional Handover for satellite access |
| 14.2.1.4 | NR SA FR1-FR1 time-based conditional Handover for satellite access |
| 14.2.1.5 | NR SA FR1 distance-based conditional Handover for satellite access |
| 14.2.1.6 | NR SA FR1-FR1 distance-based conditional Handover for satellite access |
| 14.3.1.1 | NR SA FR1 UE Transmit Timing Accuracy for satellite access |
| 14.5.1.1 | NR SA FR1 event triggered reporting tests without gap under non-DRX for NR satellite access |
| 14.5.1.2 | NR SA FR1 event triggered reporting tests without gap under DRX for NR satellite access |
| 14.5.1.3 | NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access |
| 14.5.1.4 | NR SA FR1 event triggered reporting tests without SSB time index detection when DRX is not used with single gap for satellite access |
| 14.5.1.5 | NR SA FR1 event triggered reporting tests without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access |
| 14.5.1.6 | NR SA FR1 event triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access |
| 14.5.2.1 | NR SA FR1-FR1 Event triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access |
| 14.5.2.2 | NR SA FR1-FR1 Event triggered reporting without SSB time index detection when DRX is used with single gap for satellite access |
| 14.6.3.1 | NR SA FR1 SS-SINR measurement accuracy for satellite access |
| 14.6.3.2 | NR SA FR1-FR1 SS-SINR measurement accuracy for satellite access |
| 14.6.4.1 | NR SA FR1 SSB based L1-RSRP measurement accuracy for satellite access |
| 14.6.4.2 | NR SA FR1 CSI-RS based L1-RSRP measurement accuracy for satellite access |

## 14.0.3 Principle of testing different ephemeris formats

Satellite access RRM test cases are defined such that satellite ephemeris information is sent to UE in each test case, according to Tables 14.0.3-1 and 14.0.3-2.

**Table 14.0.3-1: Test cases configuring EphemerisInfo as PositionVelocity**

| Functional Area | Test Case |
|---|---|
| RRC_IDLE state mobility | 14.1.3 |
| | 14.1.4 |
| | 14.1.5 |
| | 14.1.6 |
| | 14.1.9 |
| | 14.1.10 |
| Handover | 14.2.1.3 |
| | 14.2.1.4 |
| | 14.2.1.5 |
| | 14.2.1.6 |
| Timing | 14.3.1 |
| Radio Link Monitoring | 14.4.1.1 |
| | 14.4.1.2 |
| | 14.4.1.5 |
| | 14.4.1.6 |
| BFD and LR procedures | 14.4.2.1 |
| | 14.4.2.3 |
| | 14.4.2.5 |
| Active BWP switch | 14.4.3.1 |
| UE specific CBW change | 14.4.4.1 |
| PL-RS switching delay | 14.4.5.1 |
| Intra-frequency measurements | 14.5.1.1 |
| | 14.5.1.3 |
| | 14.5.1.5 |
| Inter-frequency measurements | 14.5.2.1 |
| | 14.5.2.3 |
| | 14.5.2.7 |
| L1-RSRP measurements | 14.5.3.1 |
| | 14.5.3.3 |
| SS-RSRP accuracy | 14.6.1.1 |
| SS-RSRQ accuracy | 14.6.2.1 |
| SS-SINR accuracy | 14.6.3.1 |
| L1-RSRP accuracy | 14.6.4.1 |

**Table 14.0.3-2: Test cases configuring EphemerisInfo as Orbital**

| Functional Area | Test Case |
|---|---|
| RRC_IDLE state mobility | 14.1.1 |
| | 14.1.2 |
| | 14.1.5 |
| | 14.1.6 |
| Handover | 14.2.1.1 |
| | 14.2.1.2 |
| RRC Connection Mobility Control | 14.2.2.1 |
| | 14.2.2.2 |
| | 14.2.2.3 |
| Timing | 14.3.2 |
| Radio Link Monitoring | 14.4.1.3 |
| | 14.4.1.4 |
| | 14.4.1.7 |
| | 14.4.1.8 |
| BFD and LR procedures | 14.4.2.2 |
| | 14.4.2.4 |
| | 14.4.2.6 |
| Active BWP switch | 14.4.3.2 |
| Intra-frequency measurements | 14.5.1.2 |

| | |
|---|---|
| | 14.5.1.4 |
| | 14.5.1.6 |
| Inter-frequency measurements | 14.5.2.2 |
| | 14.5.2.4 |
| | 14.5.2.6 |
| | 14.5.2.8 |
| L1-RSRP measurements | 14.5.3.2 |
| | 14.5.3.4 |
| SS-RSRP accuracy | 14.6.1.2 |
| SS-RSRQ accuracy | 14.6.2.2 |
| SS-SINR accuracy | 14.6.3.2 |
| L1-RSRP accuracy | 14.6.4.2 |

## 14.0.4 General setup for SIB19

The general parameters for SIB19 setup is specified in Table 14.0.4-1.

**Table 14.0.4-1: SIB19 configuration for NTN test cases**

| Parameter | Unit | Test 1 |
|---|---|---|
| Interval between adjacent epoch time | s | LEO: 2.56<br>GEO: 10.24 |
| ntn-UlSyncValidityDuration | s | LEO: 5<br>GEO: 900 |
| cellSpecificKoffset | slot | LEO: 8<br>GEO: 256 |
| kmac | slot | Not configured |
| ta-Common | | 0 |
| ta-CommonDrift | | 0 |
| ta-CommonDriftVariant | | 0 |
| ntn-PolarizationDL | | linear |
| ntn-PolarizationUL | | linear |
| ephemerisInfo | | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ta-Report | | Not configured |

## 14.0.5 Initial test environment conditions for RRM NTN tests

The following initial conditions apply to all RRM satellite access specified in this section, unless otherwise specified in the test:

1. UE location according to TS 38.508-1 [14] clause 7.6.1 is provided to the UE through any preconfigured means.

2. Test equipment shall emulate the signal with doppler and delay according to ephemeris defined in TS 38.508-1 [14]:

   - GSO configurations (30º elevation angle conditions):

     - Serving cell: Tables 7.6.2.1-1a or 7.6.2.1-1b

     - Neighbor cells: Tables 7.6.2.1-1c or 7.6.2.1-1d

   - NGSO (LEO-1200) configurations (30º elevation angle conditions):

     - Serving cell: Tables 7.6.2.1-3a or 7.6.2.1-3b

     - Neighbor cells: Tables 7.6.2.1-3c or 7.6.2.1-3d

   Test system shall send same SIB19 information during the duration of the test as defined in TS 38.508-1 [14] clause 7.6.3.1.

3. Deactivate UE prediction of satellite trajectory by any preconfigured means.

High-level test procedure for SAN RRM tests is described in Annex B.5.

# 14.1 RRC_IDLE state mobility

## 14.1.0 Minimum conformance requirements

### 14.1.0.1 Measurements of intra-frequency NR cells

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if the *distanceThresh* is configured (see TS 38.304 [30]) and UE has location information, then the UE is not required to perform measurement of intra-frequency.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $K_{multi_SMTC} * T_{detect,NR_Intra}$ when that $T_{reselection}= 0$ if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within $K_{multi_SMTC} * T_{detect,NR_Intra_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled. An intra-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.6 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $K_{multi_SMTC} * T_{measure,NR_Intra}$ (see table 14.1.0.1-1) if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or every $K_{multi_SMTC} * T_{measure,NR_Intra_enh}$ (see table 14.1.0.1-2) if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

If smtcs do not overlap with each other,

- $K_{multi_SMTC} = 1$, if GEO satellites are measured on the carrier;
- $K_{multi_SMTC} = \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if LEO satellites are measured on the carrier;

- If smtcs partially overlap with each other,
  - $K_{multi_SMTC} = N_{SMTC,overlap}$, if only GEO satellites are measured on the carrier;
  - $K_{multi_SMTC} = \sum_{i=1}^{N_{SMTC,overlap}} \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if only LEO satellites are measured on the carrier;

Where

- $N_{LEO,i}$ Is the number of LEO satellites to be measured within i-th SMTC,
- $N_{LEO,simul}$ Is the number of LEO satellites that UE can measure in parallel within an SMTC,
- $N_{SMTC,overlap}$ Is the number of smtcs that partially overlap with each other.

Note: for deriving $K_{multi_SMTC}$ for $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$, two SMTCs are considered as overlapping if they overlap in one or more occasions during a single $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ or $T_{evaluate,NR_Intra}$.

The parameter $K_{multi_SMTC}$ is the scaling factor for measurements of multiple SMTCs which correspond to different satellites.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS 38.304 [30] within $K_{multi_SMTC}$ * $T_{evaluate,NR_Intra}$ if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within $K_{multi_SMTC}$ * $T_{evaluate,NR_Intra_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, when $T_{reselection}$ = 0 as specified in table 14.1.0.1-1 or table 14.1.0.1-2 provided that:

- when *rangeToBestCell* is not configured:
- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2.
- when *rangeToBestCell* is configured:
- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them.
        - the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 if the current serving cell is among them.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a nonzero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

**Table 14.1.0.1-1: $T_{detect,NR_Intra}$, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$**

| DRX cycle length [s] | Scaling Factor (N1) | $T_{detect,NR_Intra}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra}$ [s] (number of DRX cycles) |
|---|---|---|---|---|
| | FR1 | | | |
| 0.32 | 1 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 | | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |

Note 1: M2 = 2 if SMTC periodicity of measured intra-frequency cell > 20 ms and $1<N_{SMTC} \leq 4$ upon more than 1 SMTC configured at the UE; M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms and $N_{SMTC}=1$ upon 1 SMTC configured at the UE; otherwise M2=1. Where, $N_{SMTC}$ is the number of SMTCs configured by SAN If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra}$ is expected.

Note 2: The UE is not required to meet the requirements for 2.56s DRX cycle length for earth-moving LEO deployment.

**Table 14.1.0.1-2: $T_{detect,NR_Intra_enh}$, $T_{measure,NR_Intra_enh}$ and $T_{evaluate,NR_Intra_enh}$**

| DRX cycle length [s] | $T_{detect,NR_Intra_enh}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_enh}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_enh}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 2.56 x M2 (8 x M2) Note 1 | 0.32 x M3 (1 x M3) Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

| Note 1: | When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 2, M3 = M4 = 2.5 |
|---|---|

If '*t-Service*' is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location is met or the legacy Srxlev/Squal condition are met, and when to start the detection, measurement and evaluation on neighbour cells is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than $T_{trigger}$.

$$T_{trigger} = \max(T_{detect,NR_Intra}, K_{carrier} * T_{detect,NR_Inter}),$$

where

- $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell,
- $T_{detect,NR_Intra}$ refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined Table 14.1.0.1-2,
- $T_{detect,NR_Inter}$ refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined Table 14.1.0.2-2.

The requirements in this clause apply provided that the number of SMTCs for any inter-frequency carrier does not exceed the *parallelSMTC-r17*, otherwise UE may select one or subset of all the configured SMTCs sequentially for performing the measurements until all of the SMTCs can be measured. The selection of SMTCs to be used is up to UE implementation, and in this case, measurement period longer than the corresponding measurement period specified in Table 14.1.0.1-1 and Table 14.1.0.1-2 is expected.

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.3.

## 14.1.0.2 Measurements of inter-frequency NR cells

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2C.2.9.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, or the distance between UE and serving cell reference location is larger than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. The requirements apply provided that the distance exceeds the *distanceThresh* by a margin of 50 m. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{detect,NR_Inter}$ if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{detect,NR_Inter_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the reselection criteria is met by a margin of at least [5]dB in FR1 for reselections based on ranking or [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or [4]dB in FR1 for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell.

The parameter $K_{multi_SMTC,i}$ is the scaling factor for measurement of multiple SMTCs or multiple satellites

- If SMTCs do not overlap with each other,
  - $K_{multi_{SMTC,i}} = 1$, if GEO satellites are measured on the carrier;

- $K_{multi_{SMTC,i}} = \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if LEO satellites are measured on the carrier;

- If SMTCs partially overlap with each other,

  - $K_{multi_{SMTC,i}} = N_{SMTC,overlap}$, if only GEO satellites are measured on the carrier;

  - $K_{multi_{SMTC,i}} = \sum_{i=1}^{N_{SMTC,overlap}} \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if only LEO satellites are measured on the carrier;

  where:

  $N_{LEO,i}$ is the number of LEO satellites to be measured within i-th SMTC,

  $N_{LEO,simul}$ is the number of LEO satellites that UE can measure in parallel within an SMTC,$N_{SMTC,overlap}$ is the number of SMTCs that partially overlap with each other.

  Note: for deriving $K_{multi_SMTC,i}$ for $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$ of frequency layer *i*, two SMTCs are considered as overlapping if they overlap in one or more occasions during a single $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ or $T_{evaluate,NR_Inter}$.

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.7 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{measure,NR_Inter}$ (see table 14.1.0.2-1) if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or every $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{measure,NR_Inter_enh}$ (see table 14.1.0.2-2) if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17*is enabled, for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{evaluate,NR_Inter}$ if the UE does not support [capability for enhanced requirements] or if the [NW configuration for enhanced requirements] is not enabled, or within $\sum_{i=1}^{K_{carrier}} K_{multi_SMTC,i} * T_{evaluate,NR_Inter_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, when $T_{reselection} = 0$ as specified in table 14.1.0.2-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  when *rangeToBestCell* is not configured:

  - the cell is at least [5]dB better ranked in FR1 or.

  when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them
    - the cell is at least [5]dB better ranked in FR1 if the current serving cell is among them. or

- [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or
- [4]dB in FR1 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 14.1.0.2-1 under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where
    - TSMTC_intra is the periodicity of the SMTC configured for the intra-frequency carrier if no identified intra-frequency cell is in the PCI list of smtc2-LP on this intra-frequency carrier; TSMTC_intra is the periodicity of the smtc2-LP configured for the intra-frequency carrier if at least one identified intra-frequency cell is in the PCI list of smtc2-LP on this intra-frequency carrier. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed for TSMTC_intra. If the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR_intra is expected.
    - TSMTC_inter is the actual SMTC periodicity used by the inter-frequency cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the inter-frequency carrier is assumed for TSMTC_inter. If the actual SSB transmission periodicity is greater than the SMTC configured for the inter-frequency carrier, longer Tdetect, NR_inter is expected.
    - SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
    - SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion in TS 38.304 [30].

**Table 14.1.0.2-1: $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$**

| DRX cycle length [s] | Scaling Factor (N1) | $T_{detect,NR_Inter}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter}$ [s] (number of DRX cycles) |
|---|---|---|---|---|
| | FR1 | | | |
| 0.32 | 1 | 11.52 x N1 x 1.5 (36 x N1 x 1.5) | 1.28 x N1 x 1.5 (4 x N1 x 1.5) | 5.12 x N1 x 1.5 (16 x N1 x 1.5) |
| 0.64 | | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: UE is not required to fulfil the requirements for 2.56s DRX cycle length for earth-moving LEO deployment. | | | | |

**Table 14.1.0.2-2: $T_{detect,NR_Inter_enh}$, $T_{measure,NR_Inter_enh}$ and $T_{evaluate,NR_Inter_enh}$**

| DRX cycle length [s] | $T_{detect,NR_Inter_enh}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_enh}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_enh}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | [3.2 x M2 (10 x M2)] Note 1 | [0.32 x M3 ([1] x M3)] Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | [6.4 (10)] | [0.64 (1)] | 1.92 (3) |
| 1.28 | [10.24 (8)] | 1.28 (1) | 3.84 (3) |

| | | | |
|---|---|---|---|
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2 | | | |

If *t-Service* is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location or the legacy Srxlev/Squal condition are met, and when to start detection, measurement, and evaluation is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than $T_{trigger}$, and $T_{trigger}$ = max($T_{detect,NR_Intra}$, $K_{carrier}$* $T_{detect,NR_Inter}$) when serving cell is below the search threshold, and $T_{trigger}$ = max($T_{detect,NR_Intra}$, $N_{layer}$* [60s]) when serving cell is above the search threshold, where

- $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell,
- $N_{layer}$ is the total number of higher priority NR carrier frequencies broadcasted in system information,
- $T_{detect,NR_Intra}$ refers to HST intra-frequency cell detection delay in IDLE/INACTIVE mode defined in TS 38.133 [6] Table 4.2.2.3-2,
- $T_{detect,NR_Inter}$ refers to HST inter-frequency cell detection delay in IDLE/INACTIVE mode defined in TS 38.133 [6] Table 4.2.2.4-2.

The requirements in this clause apply provided that the number of SMTCs for any inter-frequency carrier does not exceed the *parallelSMTC-r17*, otherwise UE may select one or subset of all the configured SMTCs sequentially until all of the SMTCs can be measured, the selection of SMTCs to be used is up to UE implementation, and longer measurement delay than the corresponding measurement period specified in Table 14.1.0.2-1 and Table 14.1.0.2-2 is expected.

The requirements in this clause apply provided that the valid information for the satellite serving the target cell has been provided by the serving cell.

The requirements in this clause apply provided that SSB of neighbour cells are within the time shifted SMTC.

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.4.

### 14.1.0.3 Measurements of inter-RAT NR – E-UTRA cells

This clause applies for the inter-RAT cell re-selection for TN carriers, and NTN carriers if configured. The requirements in this clause apply provided that network provides SIB19 and UE is configured with and one or more TN carriers.

UE is allowed to skip TN neighbour cells measurement in an area where there is no coverage of the frequency based on the provided TN cell coverage information and UE GNSS position information. Otherwise, UE shall perform TN measurement if its estimated distance to *tn-ReferenceLocation* is smaller than *tn-DistanceRadius*. The requirements apply provided that the actual distance between UE to *tn-ReferenceLocation* is smaller than *tn-DistanceRadius* – 50m.This clause considers the inter-RAT cell reselection from NTN to E-UTRAN TN in FR1.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ $T_{higher_priority_search}$ is described in clause 4.2.2.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply to inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

The parameter $N_{EUTRA_carrier}$ is the number of EUTRA TN carriers indicated by the serving cell, except for the frequency carrier where there is no coverage of that frequency based on the provide TN cell coverage information and UE GNSS position information.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, UE supports the enhanced inter-RAT E-UTRAN measurement requirements.

The parameter $N_{EUTRA_carrier}$ for a UE configured with idle mode DC measurements (while T331 is running), is the combined number of configured E-UTRA carriers in the neighbour frequency list and E-UTRA carriers configured for idle mode DC measurements.

NOTE: Combined total number means that if a carrier is an E-UTRA carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA/DC measurements, it only counts as one carrier.

The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band.
- SCH conditions specified in TS 36.133 [23, Annex B.1.2] are fulfilled for a corresponding Band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS 38.304 [30] within $N_{EUTRA_carrier}$ * $T_{detect,EUTRAN}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ when $T_{reselection}$ = 0 provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every $N_{EUTRA_carrier}$ * $T_{measure,EUTRAN}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,EUTRAN}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects, on an inter-RAT E-UTRAN carrier, a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but has not been reselected to, the filtering shall be such that a UE not configured with eDRX_IDLE cycle shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within $N_{EUTRA_carrier}$ * $T_{evaluate,EUTRAN}$ when $T_{reselection}$ = 0 as specified in Table 4.2.2.5-1 and 4.2.2.5-2 in TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6 dB for RSRP reselections based on absolute priorities or 4 dB for RSRQ reselections based on absolute priorities.

For UE not configured with eDRX_IDLE cycle, $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$ and $T_{evaluate,\ E\text{-}UTRAN}$ are specified in Table 4.2.2.5-1 and 4.2.2.5-2 in TS 38.133 [6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.11.

### 14.1.0.4 Measurements of inter-frequency NR cells with TN carrier

This clause applies for the inter-frequency cell re-selection for TN carriers, and NTN carriers if configured. The requirements in this clause apply provided that network provides SIB19 and UE is configured with and one or more TN carriers.

UE is allowed to skip TN neighbour cells measurement in an area where there is no coverage of the frequency based on the provided TN cell coverage information and UE GNSS position information. Otherwise, UE shall perform TN measurement if its estimated distance to *tn-ReferenceLocation* is smaller than *tn-DistanceRadius*. The requirements apply provided that the actual distance between UE to *tn-ReferenceLocation* is smaller than *tn-DistanceRadius* – 50m.This clause considers the inter-frequency cell reselection from NTN to TN in FR1.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2C.2.9 in TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, or the distance between UE and serving cell reference location is larger than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. The requirements apply provided that the distance exceeds the *distanceThresh* by a margin of 50 m. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [1] within $K_{carrier_TN} * T_{detect,NR_Inter_TN} + \sum_{i=1}^{K_{carrier_NTN}} K_{multi_SMTC,i} * T_{detect,NR_Inter_NTN}$ if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within$K_{carrier_TN} * T_{detect,NR_Inter_TN} + \sum_{i=1}^{K_{carrier_NTN}} K_{multi_SMTC,i} * T_{detect,NR_Inter_NTN_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least [5]dB in FR1 for reselections based on ranking or [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or [4]dB in FR1 for SS-RSRQ reselections based on absolute priorities.

The parameter $K_{multi_SMTC,i}$ is the scaling factor for measurement of multiple SMTCs or multiple satellites

- If SMTCs do not overlap with each other,
  - $K_{multi_{SMTC},i} = 1$, if GEO satellites are measured on the carrier;
  - $K_{multi_{SMTC},i} = \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if LEO satellites are measured on the carrier;
- If SMTCs partially overlap with each other,
  - $K_{multi_{SMTC},i} = N_{SMTC,overlap}$, if only GEO satellites are measured on the carrier;
  - $K_{multi_{SMTC},i} = \sum_{i=1}^{N_{SMTC,overlap}} \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if only LEO satellites are measured on the carrier;

where

$N_{LEO,i}$ is the number of LEO satellites to be measured within i-th SMTC,

$N_{LEO,simul}$ is the number of LEO satellites that UE can measure in parallel within an SMTC,$N_{SMTC,overlap}$ is the number of SMTCs that partially overlap with each other.

NOTE: For deriving $K_{multi_SMTC,i}$ for $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$ of frequency layer *i*, two SMTCs are considered as overlapping if they overlap in one or more occasions during a single $T_{detect,NR_Inter}$, $T_{measure,NR_Inter}$ or $T_{evaluate,NR_Inter}$.

The parameter $K_{carrier_TN}$ is the number of NR TN inter-frequency carriers indicated by the serving cell, except for the frequency carrier where there is no coverage of that frequency based on the provide TN cell coverage information and UE GNSS position information.

$T_{detect,NR_Inter_TN}$ ,$T_{measure,NR_Inter_TN}$ and $T_{evaluate,NR_Inter_TN}$ are the NR TN inter-frequency cell re-selection requirement defined in Table 4.2.2.4-1 in TS 38.133[6].

$T_{detect,NR_Inter_NTN}$ ,$T_{measure,NR_Inter_NTN}$ and $T_{evaluate,NR_Inter_NTN}$ are the NR NTN inter-frequency cell re-selection requirement defined in Table 4.2C.2.4-1 in TS 38.133[6].

$T_{detect,NR_Inter_NTN_enh,}$ $T_{measure,NR_Inter_NTN_enh}$ and $T_{evaluate,NR_Inter_NTN_enh}$ are the NR NTN inter-frequency cell re-selection requirement defined in Table 4.2C.2.4-2 in TS 38.133[6].

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133[6] Annex B.1.7 for a corresponding band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that re-selection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of re-selection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier_TN} * T_{measure,NR_Inter_TN} + \sum_{i=1}^{Kcarrier_NTN} K_{multi_{SMTC},i} * T_{measure,NR_Inter_NTN}$ (see TS 38.133 [6] Table 4.2C.2.4-1) if the UE does not support the feature for enhanced RRM requirements defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or every $K_{carrier_TN} * T_{measure,NR_Inter_TN} + \sum_{i=1}^{Kcarrier_NTN} K_{multi_{SMTC},i} * T_{measure,NR_Inter_enh_NTN_enh}$ (see TS 38.133 [6] Table 4.2C.2.4-2) if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17*is enabled, for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier_TN} * T_{evaluate,NR_Inter_TN} + \sum_{i=1}^{Kcarrier_NTN} K_{multi_{SMTC},i} * T_{evaluate,NR_Inter_NTN}$ if the UE does not support *Enhanced RRM requirements for measurements in IDLE and INACTIVE modes* defined in TS 38.306 [11] or if the *enhancedMeasurementLEO-r17* is not enabled, or within $K_{carrier_TN} * T_{evaluate,NR_Inter_TN} + \sum_{i=1}^{Kcarrier_NTN} K_{multi_{SMTC},i} * T_{evaluate,NR_Inter_NTN_enh}$ if the UE supports the feature for enhanced RRM requirements defined in TS 38.306 [11] and the *enhancedMeasurementLEO-r17* is enabled, when $T_{reselection} = 0$ as specified in Table 4.2C.2.4-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

  when *rangeToBestCell* is not configured:

  - the cell is at least [5]dB better ranked in FR1 or.

  when *rangeToBestCell* is configured:

  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them
    - the cell is at least [5]dB better ranked in FR1 if the current serving cell is among them. or
- [6]dB in FR1 for SS-RSRP reselections based on absolute priorities or

- [4]dB in FR1 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

The requirements in this clause apply provided that the valid information for the satellite serving the target cell has been provided by the serving cell.

The requirements in this clause apply provided that SSB of neighbour cells are within the time shifted SMTC.

The normative reference for this requirement is TS 38.133 [6] clause 4.2C.2.10.

## 14.1.1 NR SA FR1 Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Several test parameters and configuration are still in brackets

### 14.1.1.1 Test purpose

This test is to verify the requirement for the intra-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

### 14.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.1.

### 14.1.1.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.1.4.1-1, 14.1.1.4.1-3 and 14.1.1.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

#### 14.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.1.4.1-1.

**Table 14.1.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.1.4.1-2

**Table 14.1.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection for Satellite Access**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.1.4.1-1 | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.1.1.4.1-3.
2. Message contents are defined in clause 14.1.1.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.1.4.1-3: General test parameters for NR SA FR1 Cell reselection for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell 1 | |
| T2 end condition | Active cell | | Cell 2 | |
| | Neighbour cells | | Cell 1 | |
| Final condition | Active cell | | Cell 1 | |
| | Neighbour cells | | Cell 2 | |
| RF Channel Number | | | 1 | |
| Time offset between cells | | ms | 3 | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | Not configured | |
| Ephemeris information | | | Note 1 | |
| T1 | | s | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 40 (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 15 (NOTE 1) | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: If the test is performed in a NGSO configuration, and the scaling factor Kmulti_SMTC defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of times T2 and T3 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case.<br>Note 2: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | |

### 14.1.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.1.1.4.1-3. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2 and T3.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 1.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 14.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 14.5 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 until a test verdict has been achieved. Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.1.4.3 Message contents

FFS

### 14.1.1.5 Test requirements

Table 14.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell reselection for Satellite Access.

**Table 14.1.1.5-1: Cell specific parameters for NR SA FR1 Cell reselection for Satellite Access**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | | NSC.1 for Config 1<br>NSC.2 for Config 2 | | |
| PDSCH RMC configuration | | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET configuration | | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET configuration | | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| SSB configuration | | SSB.1 FR1 | | | SSB.5 FR1 | | |
| SMTC configuration | | SMTC.1 for Cell 1 | | | SMTC.4 for Cell 2 | | |
| RLM-RS | | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| Io | dBm/9.36 MHz | -53.94 | -51.91 | -51.91 | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 60 | | | 60 | | |
| Propagation Condition | | AWGN | | | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.1.4.1-3); or

66 s if $K_{multi_SMTC}$ is equal to 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to an already detected cell shall be less than:

8 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.1.4.1-3); or

14.5 s if $K_{multi_SMTC}$ is equal to 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $K_{multi_SMTC} * T_{detect, NR_Intra} + T_{SI-NR}$, and to an already detected cell can be expressed as: $K_{multi_SMTC} * T_{evaluate, NR_intra} + T_{SI-NR}$,

Where:

$T_{detect, NR_Intra}$ See Table 14.1.0.1-1 in clause 14.1.0.1

$T_{evaluate, NR_intra}$ See Table 14.1.0.1-1 in clause 14.1.0.1

$K_{multi_SMTC}$ is described in clause 14.1.0.1

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If $K_{multi_SMTC} = 1$, $K_{multi_SMTC} * T_{evaluate, NR_Intra} + T_{SI-NR} = 7.68$ s; allow 8 s. And $K_{multi_SMTC} * T_{detect, NR_intra} + T_{SI-NR} = 33.28$ s, allow 34s.

If K_multi_SMTC = 2, $K_{multi_SMTC} * T_{evaluate, NR_Intra} + T_{SI-NR} = 14.08$ s; allow 14.5 s. And $K_{multi_SMTC} * T_{detect, NR_intra} + T_{SI-NR} = 65.28$ s, allow 66s.

## 14.1.2 NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Applicability needs to be updated
- Exceptions to connection diagram may need to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets
- Annex E need to be updated

### 14.1.2.1 Test purpose

This test is to verify the requirement for the intra-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

### 14.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and enhanced RRM measurement requirements for NTN bands].

### 14.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.2.

### 14.1.2.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.2.4.1-1, 14.1.2.4.1-3 and 14.1.2.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE

has not registered with network for the tracking area containing cell 2. The flag *enhancedMeasurementLEO-r17* should be set.

#### 14.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.2.4.1-1.

**Table 14.1.2.4.1-1: Supported test configurations for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.2.4.1-2

**Table 14.1.2.4.1-2: Initial conditions for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.2.4.1-3.
2. Message contents are defined in clause 14.1.2.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.2.4.1-3: General test parameters for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell1 | |
| T2 end condition | Active cell | | Cell2 | |
| | Neighbour cells | | Cell1 | |
| Final condition | Active cell | | Cell1 | |
| | Neighbour cells | | Cell2 | |
| RF Channel Number | | | 1 | |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |

| | | | |
|---|---|---|---|
| PRACH configuration index | | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | Not configured | |
| T1 | s | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 40 (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 15 (NOTE 1) | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor $K_{multi_SMTC}$ defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of times T2 and T3 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | |

#### 14.1.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.1.2.4.1-3. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2 and T3.

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.2.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 11 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 20 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11a.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 14.1.2.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 6 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within 9 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T3, then count a success for the event "Re-select already detected Cell 1". Otherwise count a fail for the event "Re-select already detected Cell 1".

11. If the UE has re-selected to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 until a test verdict has been achieved. Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.2.4.3 Message contents

FFS

### 14.1.2.5 Test requirements

Table 14.1.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access.

**Table 14.1.2.5-1: Cell specific parameters for NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | | NSC.1 for Config 1<br>NSC.2 for Config 2 | | |
| PDSCH RMC configuration | | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET configuration | | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET configuration | | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| SSB configuration | | SSB.1 FR1 | | | SSB.X FR1 | | |
| SMTC configuration | | #1: SMTC.2 for Cell 1<br>#2: SMTC.7 for Cell 2 | | | #1: SMTC.2 for Cell 1<br>#2: SMTC.7 for Cell 2 | | |
| RLM-RS | | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| Io | dBm/9.36 MHz | -53.94 | -51.91 | -51.91 | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 60 | | | 60 | | |
| Propagation Condition | | AWGN | | | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

11 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.2.4.1-3); or

20 s if $K_{multi_SMTC}$ is equal to 2.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than:

6 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.2.4.1-3); or

9 s if $K_{multi_SMTC}$ is equal to 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $K_{multi_SMTC} * T_{detect, NR_Intra_enh} + T_{SI-NR}$, and to an already detected cell can be expressed as: $K_{multi_SMTC} * T_{evaluate, NR_intra_enh} + T_{SI-NR}$,

Where:

$T_{detect, NR_Intra_enh}$ See Table 14.1.0.1-2 in clause 14.1.0.1

$T_{evaluate, NR_Intra_enh}$ See Table 14.1.0.1-2 in clause 14.1.0.1

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If $K_{multi_SMTC} = 1$, $K_{multi_SMTC} * T_{evaluate, NR_Intra_enh} + T_{SI-NR} = 5.12$ s; allow 6 s. And $K_{multi_SMTC} * T_{detect, NR_Intra_enh} + T_{SI-NR} = 10.24$ s, allow 11 s.

If K_multi_SMTC = 2, $K_{multi_SMTC} * T_{evaluate, NR_Intra_enh} + T_{SI-NR} = 8.96$ s; allow 9 s. And $K_{multi_SMTC} * T_{detect, NR_Intra_enh} + T_{SI-NR} = 19.2$ s, allow 20s.

In this test, SMTC.2 (period 20ms, duration 5ms, offset 0ms) and SMTC.7 (period 20ms, duration 5ms, offset 5ms) are configured. These are non-overlapping SMTCs therefore, according to clause 14.1.0.1, $K_{multi_SMTC} = 1$ for GEO, $K_{multi_SMTC} = 1$ for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC ($N_{LEO,simul} = 1$), and $K_{multi_SMTC} = 2$ for LEO for Ues supporting measurement of two or more LEO satellites in parallel within an SMTC ($N_{LEO,simul} = \{2,3,4\}$).

## 14.1.3 NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated

- Applicability needs to be updated
- Exceptions to connection diagram may need to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets
- Annex E need to be updated
- T-service value may need to be updated

#### 14.1.3.1 Test purpose

This test is to verify the requirement for the intra-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

#### 14.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and time-based measurement initiation].

#### 14.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.3.

#### 14.1.3.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.3.4.1-1, 14.1.3.4.1-3 and 14.1.3.5-1. The test consists of two successive time periods, with time duration of T1 and T2, respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2.

##### 14.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.3.4.1-1.

**Table 14.1.3.4.1-1: Supported test configurations for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.3.4.1-2

**Table 14.1.3.4.1-2: Initial conditions for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.3.4.1-1 | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable Ues without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.3.4.1-3.
2. Message contents are defined in clause 14.1.3.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.3.4.1-3: General test parameters for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell1 | |
| T2 end condition | Active cell | | Cell2 | |
| | Neighbour cells | | Cell1 | |
| RF Channel Number | | | 1 | |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | Not configured | |
| T1 | | s | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 40 (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor $K_{multi_SMTC}$ defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of time T2 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | | |

### 14.1.3.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.
2. Set the parameters according to T1 in Table 14.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2, according to Table 14.1.3.4.3-FFS (this timestamp indicates the UE when Cell 1 will stop providing service). T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.3.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds for GSO configurations or for NGSO configurations for Ues supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for Ues supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

7. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 7a.

7a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

8. Repeat step 2-7 until a test verdict has been achieved.

#### 14.1.3.4.3 Message contents

FFS

### 14.1.3.5 Test requirements

Table 14.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access.

**Table 14.1.3.5-1: Cell specific parameters for NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | NSC.1 for Config 1t<br>NSC.2 for Config 2 | |
| PDSCH RMC configuration | | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration | | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration | | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS | | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| $Qhyst_s$ | dB | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 16 | -3.55 | -infinity | 3.24 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s / N_{oc}$ | dB | 16 | 13 | -infinity | 16.45 |
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -infinity | -81.55 |
| Io | dBm/9.36 MHz | -53.94 | -51.91 | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 40 | | 40 | |
| Propagation Condition | | AWGN | | | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.3.4.1-3); or

66 s if $K_{multi_SMTC}$ is equal to 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $K_{multi_SMTC}$ *$T_{detect, NR_Intra}$ + $T_{SI-NR}$,

Where:

$T_{detect, NR_Intra}$ See Table 14.1.0.1-1 in clause 14.1.0.1

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If $K_{multi_SMTC}$ = 1, $K_{multi_SMTC}$ *$T_{detect, NR_intra}$ + $T_{SI-NR}$ = 33.28 s, allow 34s.

If $K_{multi_SMTC}$ = 2, $K_{multi_SMTC}$ *$T_{detect, NR_intra}$ + $T_{SI-NR}$ = 65.28 s, allow 66s.

In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, $K_{multi_SMTC}$ = 1 for GEO, $K_{multi_SMTC}$ = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC ($N_{LEO,simul} = 1$), and $K_{multi_SMTC}$ = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC ($N_{LEO,simul} = \{2,3,4\}$).

## 14.1.4 NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Applicability needs to be updated
- Exceptions to connection diagram may need to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets
- Annex E need to be updated

Test requirements need to be updated from T2 start + 34/66 to T2 start + 38/70s14.1.4.1 Test purpose

This test is to verify the requirement for the intra-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.1.

### 14.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access [and location-based measurement initiation].

### 14.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.4.

### 14.1.4.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.4.4.1-1, 14.1.4.4.1-3 and 14.1.4.5-1. The test consists of two successive time periods, with time duration of T1 and T2, respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

At 4s after the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m.

#### 14.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.4.4.1-1.

**Table 14.1.4.4.1-1: Supported test configurations for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.4.4.1-2

**Table 14.1.4.4.1-2: Initial conditions for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable Ues without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.1.4.4.1-3.
2. Message contents are defined in clause 14.1.4.4.3.

3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Both Cell 1 and Cell 2 are satellite access cells].

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.4.4.1-3: General test parameters for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell1 | |
| T2 end condition | Active cell | | Cell2 | |
| | Neighbour cells | | Cell1 | |
| RF Channel Number | | | 1 | |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | Not configured | |
| T1 | | s | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 40 (NOTE 1) | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| NOTE 1: If the test is performed in a NGSO configuration, and the scaling factor $K_{multi_SMTC}$ defined in clause 14.1.0.1 is greater than 1, according to UE capabilities, the duration of time T2 shall be scaled for the same factor to allow the UE to complete the cell reselection within the duration of the test case. | | | | |

### 14.1.4.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.4.5-1. T2 starts.

5. After 4 seconds from the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m, according to Table 14.1.4.4.3-FFS.

6. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

7. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds for GSO configurations or for NGSO configurations for Ues supporting measurement of only one LEO satellite in parallel within an SMTC, or within 66 seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 2-8 until a test verdict has been achieved.

#### 14.1.4.4.3 Message contents

FFS

### 14.1.4.5 Test requirements

Table 14.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access.

**Table 14.1.4.5-1: Cell specific parameters for NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | NSC.1 for Config 1<br>NSC.2 for Config 2 | |
| PDSCH RMC configuration | | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration | | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration | | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS | | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| $Qhyst_s$ | dB | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 16 | -3.55 | -infinity | 3.24 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 16 | 13 | -infinity | 16.45 |
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -infinity | -81.55 |
| Io | dBm/9.36 MHz | -53.94 | -51.91 | Same as parameters specified in Cell 1 columns- | |
| Treselection | s | 0 | 0 | 0 | 0 |

| | | | |
|---|---|---|---|
| SintrasearchP | dB | 40 | 40 |
| Propagation Condition | | AWGN | |

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than:

34 s if $K_{multi_SMTC}$ is equal to 1 (see note on Table 14.1.4.4.1-3); or

66 s if $K_{multi_SMTC}$ is equal to 2.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $K_{multi_SMTC} * T_{detect,\ NR_Intra} + T_{SI-NR}$, and to an already detected cell can be expressed as: $K_{multi_SMTC} * T_{evaluate,\ NR_intra} + T_{SI-NR}$,

Where:

$T_{detect,\ NR_Intra}$ See Table 14.1.0.1-1 in clause 14.1.0.1

$T_{evaluate,\ NR_intra}$ See Table 14.1.0.1-1 in clause 14.1.0.1

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 20ms period and 80 ms period, respectively.

If $K_{multi_SMTC} = 1$, $K_{multi_SMTC} * T_{detect,\ NR_intra} + T_{SI-NR} = 33.28$ s, allow 34s.

If $K_{multi_SMTC} = 2$, $K_{multi_SMTC} * T_{detect,\ NR_intra} + T_{SI-NR} = 65.28$ s, allow 66s.

In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, $K_{multi_SMTC} = 1$ for GEO, $K_{multi_SMTC} = 1$ for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC ($N_{LEO,simul} = 1$), and $K_{multi_SMTC} = 2$ for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC ($N_{LEO,simul} = \{2,3,4\}$).

## 14.1.5 NR SA FR1-FR1 Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Several test parameters and configuration are still in brackets

### 14.1.5.1 Test purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

### 14.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.5.

### 14.1.5.4 Test description

The test scenario comprises of 2 NR carriers and 2 cells as given in tables 14.1.5.4.1-1, 14.1.5.4.1-3 and 14.1.5.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

#### 14.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.5.4.1-1.

**Table 14.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.5.4.1-2

**Table 14.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.1.5.4.1-3.
2. Message contents are defined in clause 14.1.5.4.3.
3. Cell 1 and Cell 2 are NR cells on two different carriers with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.5.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2 | Cell 2 | |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| Final condition | Active cell | | 1, 2 | Cell 1 | |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| RF Channel Number | | | 1, 2 | 1,2 | |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2 | SSB.1 FR1 | |
| SMTC configuration#1 | | | 1, 2 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| SMTC configuration#2 | | | 1, 2 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |

| | | | | |
|---|---|---|---|---|
| DRX cycle length | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | 1, 2 | Not configured | |
| Ephemeris information | | 1, 2 | Note 1 | |
| T1 | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 1, 2 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | |

#### 14.1.5.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.1.5.4.1-3. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.5.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 68 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC] from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 1.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 14.1.5.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of

two or more LEO satellites in parallel within an SMTC], from the beginning of time period T3, then count a success for the event "Re-select already detected Cell 1". Otherwise count a fail for the event "Re-select already detected Cell 1".

11. If the UE has re-selected to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 until a test verdict has been achieved. Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.5.4.3 Message contents

FFS

### 14.1.5.5 Test requirements

Table 14.1.5.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for Satellite Access.

**Table 14.1.5.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | 1 | SSC.1 | | | SSC.1 | | |
| | | 2 | SSC.2 | | | SSC.2 | | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | | -140 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | | | -100 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -98 | | | -100 | -98 | -98 |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| Io | dBm/9.36 MHz | 1, 2 | -54.33 | -54.33 | -54.33 | -70.48 | -70.05 | -56.26 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintersearchP | dB | 1, 2 | 60 | | | 60 | | |
| Propagation Condition | | 1, 2 | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period [T2], to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period [T3], to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate,\ NR_inter}$ + $T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter}$ + $T_{SI\text{-}NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7 in TS 38.133 [6].

$T_{evaluate,\ NR_inter}$ See Table 14.1.0.2-1 in clause 14.1.0.2

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell.

## 14.1.6 NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access

Editor's Note:

- Message contents are FFS
- Several test parameters and configuration are still in brackets

### 14.1.6.1 Test purpose

This test is to verify the requirement for the intra-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

### 14.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and enhanced RRM idle mode measurements in NTN bands.

### 14.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.6.

### 14.1.6.4 Test description

The test scenario comprises of 2 NR carriers and 2 cells as given in tables 14.1.6.4.1-1, 14.1.6.4.1-3 and 14.1.6.5-1. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

#### 14.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.6.4.1-1.

**Table 14.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.6.4.1-2

**Table 14.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.1.6.4.1-3.
2. Message contents are defined in clause 14.1.6.4.3.
3. Cell 1 and Cell 2 are NR cells on two different carriers with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.6.4.1-3: General test parameters for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial condition | Active cell | | Cell 1 | |
| T2 end condition | Active cell | | Cell 2 | |
| | Neighbour cells | | Cell 1 | |
| Final condition | Active cell | | Cell 1 | |
| | Neighbour cells | | Cell 2 | |
| RF Channel Number | | | 1,2 | |
| Time offset between cells | | ms | 3 | Asynchronous cells |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | SSB.1 FR1 | |
| SMTC configuration#1 | | | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | SMTC.6 | Configured in SIB2 of Cell 2 |

| | | | |
|---|---|---|---|
| SMTC configuration#2 | | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | SMTC.6 | Configured in SIB2 of Cell 2 |
| DRX cycle length | s | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | Not configured | |
| Ephemeris information | | Note 1 | |
| T1 | s | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | |

#### 14.1.6.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.1.2.4.1-3. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The flag *enhancedMeasurementNGSO-r17* should be set.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.6.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within [FFS seconds] for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC], from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 1.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 14.1.6.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 3 seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, [or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC], from the beginning of time period T3, then count a success for the event "Re-select already detected Cell 1". Otherwise count a fail for the event "Re-select already detected Cell 1".

11. If the UE has re-selected to Cell 1 within T3, after the re-selection or when T3 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 11a.

11a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

12. Repeat step 2-11 until a test verdict has been achieved. Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.6.4.3 Message contents

FFS

### 14.1.6.5 Test requirements

Table 14.1.6.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access.

**Table 14.1.6.5-1: Cell specific parameters for NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | |
| PDSCH RMC configuration | | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration | | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration | | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | OP.1 defined in A.2.1 | | | OP.1 defined in A.2.1 | | |
| Initial DL BWP configuration | | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | -130 | | | -130 | | |
| Pcompensation | dB | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | -100 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | -100 | -98 | -98 |
| $\hat{E}_s / N_{oc}$ | dB | 15.6 | 15.6 | 15.6 | -3.6 | -infinity | 13.6 |
| SS-RSRP Note3 | dBm/SCS | -82.4 | -82.4 | -82.4 | -103.6 | -infinity | -84.4 |
| Io | dBm/9.36 MHz | -54.33 | -54.33 | -54.33 | -70.48 | -70.05 | -56.26 |
| Treselection | s | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | |
|---|---|---|---|
| $S_{nonIntraSearchP}$ | dB | 40 Note1 | 50 |
| $Thresh_{x, highP}$ | dB | 48 | 38 Note1 |
| $Thresh_{serving, lowP}$ | dB | 44 | 44 |
| $Thresh_{x, lowP}$ | dB | 40 Note1 | 50 |
| Propagation Condition | | AWGN | |
| Note 1: Modified by TT analysis | | | |

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period [T3], to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$,

Where:

$T_{evaluate, NR_inter}$ See Table 14.1.0.2-2 in clause 14.1.0.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

## 14.1.7 NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Several test parameters and configuration are still in brackets
- Annex E need to be updated

### 14.1.7.1 Test purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

### 14.1.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based measurement initiation.

### 14.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.7.

### 14.1.7.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.7.4.1-1, 14.1.7.4.1-3 and 14.1.7.5-1. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. t-Service broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2.

#### 14.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.7.4.1-1.

**Table 14.1.7.4.1-1: Supported test configurations for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.7.4.1-2

**Table 14.1.7.4.1-2: Initial conditions for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.1.7.4.1-3.
2. Message contents are defined in clause 14.1.7.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.7.4.1-3: General test parameters for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell2 | |
| | Neighbour cells | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 14.1.7.4.2 Test procedure

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.
2. Set the parameters according to T1 in Table 14.1.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. *T-Service* broadcasted in SIB19 of Cell 1 is set to the time point that is 36s after start of T2, according to Table 14.1.7.4.3-FFS (this timestamp indicates the UE when Cell 1 will stop providing service). T1 starts.
3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.7.5-1. T2 starts.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.
6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within [36] seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.
7. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 7a.

7a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

8. Repeat step 2-7 until a test verdict has been achieved.

#### 14.1.7.4.3 Message contents

FFS

### 14.1.7.5 Test requirements

Table 14.1.7.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access.

**Table 14.1.7.5-1: Cell specific parameters for NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | NSC.1 for Config 1<br>NSC.2 for Config 2 | |
| PDSCH RMC configuration | | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration | | CR.1.1 FDD | | CR.1.1 FDD | |

| | | | | | |
|---|---|---|---|---|---|
| Dedicated CORESET configuration | | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS | | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| $Qhyst_s$ | dB | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 16 | 13 | -infinity | 16 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 16 | 13 | -infinity | 16 |
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -infinity | -82 |
| Io | dBm/9.36 MHz | -53.94 | -56.84 | -70.05 | -53.94 |
| Treselection | s | 0 | 0 | 0 | 0 |
| $S_{nonIntrasearchP}$ | dB | 50 | | 50 | |
| $Thresh_{x,highP}$ | dB | 48 | | 48 | |
| $Thresh_{serving,lowP}$ | dB | 54 | | 44 | |
| $Thresh_{x,lowP}$ | dB | 50 | | 40 | |
| Propagation Condition | | AWGN | | | |

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than [36] s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$,

Where:

$T_{evaluate,\ NR_inter}$ See Table 4.2C.2.4-1 in TS 38.133 [6] clause 4.2C.2.4

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 80ms period.

[In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.2, $K_{multi_SMTC}$ = 1 for GEO, $K_{multi_SMTC}$ = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC ($N_{LEO,simul} = 1$), and $K_{multi_SMTC}$ = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC ($N_{LEO,simul} = \{2,3,4\}$).]

## 14.1.8 NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Several test parameters and configuration are still in brackets
- Annex E need to be updated

#### 14.1.8.1 Test purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements for satellite access specified in clause 14.1.0.2.

#### 14.1.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and location-based measurement initiation.

#### 14.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.8.

#### 14.1.8.4 Test description

The test scenario comprises of 1 NR carrier and 2 cells as given in tables 14.1.8.4.1-1, 14.1.8.4.1-3 and 14.1.8.5-1. The test consists of two successive time periods, with time duration of T1and T2, respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

At 4s after the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m.

##### 14.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.8.4.1-1.

**Table 14.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.8.4.1-2

**Table 14.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.1.8.4.1-3.
2. Message contents are defined in clause 14.1.8.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell2 | |
| | Neighbour cells | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1, 2 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 14.1.8.4.2 Test procedure

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

For NGSO configurations, the number of LEO satellites that a UE can measure in parallel within an SMTC is a capability the UE reports via *maxNumber-NGSO-SatellitesWithinOneSMTC-r17*. This value will determine the requirement to be used in the test, as well as the duration of T2.

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.
2. Set the parameters according to T1 in Table 14.1.8.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.8.5-1. T2 starts.
5. After 4 seconds from the start of T2, the UE location is changed such that the distance to the reference location broadcasted in SIB19 of Cell 1 is exceeded by the configured value in *distanceThresh* plus 50m, according to Table 14.1.8.4.3-FFS.

6. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

7. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within [36] seconds for GSO configurations or for NGSO configurations for UEs supporting measurement of only one LEO satellite in parallel within an SMTC, or within FFS seconds for NGSO configurations for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 2-8 until a test verdict has been achieved.

#### 14.1.8.4.3 Message contents

FFS

### 14.1.8.5 Test requirements

Table 14.1.8.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access.

**Table 14.1.8.5-1: Cell specific parameters for NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Satellite information | | SSC.1 for Config 1<br>SSC.2 for Config 2 | | NSC.1 for Config 1<br>NSC.2 for Config 2 | |
| PDSCH RMC configuration | | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET configuration | | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET configuration | | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| SSB configuration | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | #1: SMTC.1 for Cell 1 and Cell 2 | | #1: SMTC.1 for Cell 1 and Cell 2 | |
| RLM-RS | | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | -130 | | -130 | |
| Pcompensation | dB | 0 | | 0 | |
| $Qhyst_s$ | dB | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 16 | 13 | -infinity | 16 |
| $N_{oc}$ Note2 | dBm/SCS | -98 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 16 | 13 | -infinity | 16 |
| SS-RSRP Note3 | dBm/SCS | -82 | -85 | -infinity | -82 |

| | | | | | |
|---|---|---|---|---|---|
| Io | dBm/9.36 MHz | -53.94 | -56.84 | -70.05 | -53.94 |
| Treselection | s | 0 | 0 | 0 | 0 |
| $S_{nonIntrasearchP}$ | dB | 50 | | 50 | |
| $Thresh_{x, highP}$ | dB | 48 | | 48 | |
| $Thresh_{serving, lowP}$ | dB | 54 | | 44 | |
| $Thresh_{x, lowP}$ | dB | 50 | | 40 | |
| Propagation Condition | | AWGN | | | |

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than [36] s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$,

Where:

$T_{evaluate, NR_inter}$ See Table 4.2C.2.4-1 in TS 38.133 [6] clause 4.2C.2.4

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case provided that SIB1 and SIB19 are scheduled with 80ms period.

[In this test, SMTC.1 (period 20ms, duration 1ms, offset 0ms) is configured on both cells. Since only one SMTC is configured there is no chance for overlap, therefore according to clause 14.1.0.1, $K_{multi_SMTC}$ = 1 for GEO, $K_{multi_SMTC}$ = 1 for LEO for UEs supporting measurement of only one LEO satellite in parallel within an SMTC ($N_{LEO,simul} = 1$), and $K_{multi_SMTC}$ = 2 for LEO for UEs supporting measurement of two or more LEO satellites in parallel within an SMTC ($N_{LEO,simul} = \{2,3,4\}$).]

## 14.1.9 NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access

### 14.1.9.1 Test purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements specified in clause 7.1.1.0.4, for UE fulfilling low mobility relaxed measurement criterion.

### 14.1.9.2 Test applicability

This test applies to all types of NR UE release 17 and forward satellite access and relaxed RRM idle mode measurements in NTN bands.

### 14.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.9.

### 14.1.9.4 Test description

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables 14.1.9.4.1-1, 14.1.9.4.1-3 and 14.1.9.5-1. The test consists of two successive time periods, with time duration of T1 and T2 respectively

#### 14.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.9.4.1-1.

**Table 14.1.9.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.9-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.9-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.9.4.1-2

**Table 14.1.9.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.9.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.1.9.4.1-3.
2. Message contents are defined in clause 14.1.9.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.9.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfills Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2 | Cell 1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| T2 end condition | Active cell | | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | | 1, 2 | SSB.1 FR1 | |
| SMTC configuration | | | 1, 2 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| Ephemeris information | | | | Note 1 | |
| T1 | | s | 1, 2 | 25 | T1 is defined so that cell re-selection reaction time is taken into account. |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2 | 25 | T2 is defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | |

#### 14.1.9.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells on two different NR carriers as given in table 14.1.9.4.1-3. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility".

The UE is configured with the relaxed measurement criterion for UE with low mobility defined in TS 38.304 [30] clause 5.2.4.9.1. So, Cell 2 and Cell 1 configure the UE as follows:

*lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 14.1.9.5-1;

*cellEdgeEvaluation* [13] criterion is not configured;

*combineRelaxedMeasCondition* [13] is not configured;

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 2 is the active cell and Cell 1 is the neighbor cell.

1a. Set the parameters according to T2 in Table 14.1.9.5-1. SS waits at least for 32sec ($T_{detect,NR_Inter}$) to ensure the UE can detect NR neighbor cell (Cell 1).

2. Set the parameters according to T1 in Table 14.1.9.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. If the UE responds on Cell 1 during time duration T1 within 17 seconds, from the beginning of time period T1, then count a success for the test.

4. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 4a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 1.

4a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

5. The SS shall switch the power setting from T1 to T2 as specified in Table 14.1.9.5-1. T2 starts.

6. The SS waits for random access requests information from the UE to perform cell re-selection to an already identified cell, Cell 2.

7. If the UE responds on Cell 2 during time duration T2 within 17 seconds, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat step 1a-8 until a test verdict has been achieved. Each of the events "Re-select already detected lower priority Cell 1" and "Re-select already detected higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.1.9.4.3-1: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.1.9.4.3-2: SIB2 (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 22 | Actual value = 22*2 = 44dB | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB3 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 14.1.9.4.3-3: SIB2 (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 23 | Actual value = 23*2 = 46dB | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 SEQUENCE { | | | |
| s-SearchDeltaP-r16 | dB15 | | |
| t-SearchDeltaP-r16 | s5 | | |
| } | | | |
| cellEdgeEvaluation-r16 | Not present | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 14.1.9.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | |
| deriveSSB-IndexFromCell | false | | |
| threshX-HighP | 22 | Actual value = 22*2 = 44dB | |
| threshX-LowP | 25 | Actual value = 25*2 = 50dB | |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.1.9.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | |
| deriveSSB-IndexFromCell | false | | |
| threshX-HighP | 24 | Actual value = 24*2 = 48dB | |
| threshX-LowP | 24 | Actual value = 24*2 = 48dB | |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | |
| } | | | |
| } | | | |
| } | | | |

### 14.1.9.5 Test requirements

Table 14.1.9.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access.

**Table 14.1.9.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.2.1 | | OP.1 defined in A.2.1 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 14 | 14 | -3.70 | 9.75 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 14 | 14 | -3.70 | 9.75 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -84 | -84 | -101.70 | -88.25 |
| Io | dBm/9.36 MHz | 1, 2 | -55.88 | -55.88 | -68.51 | -59.86 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 |
| SnonintersearchP | dB | 1, 2 | Not sent | | Not sent | |
| $Thresh_{x,highP}$ | dB | 1, 2 | 48 | | 44 | |
| $Thresh_{serving,lowP}$ | dB | 1, 2 | 44 | | 46 | |
| $Thresh_{x,lowP}$ | dB | 1, 2 | 48 | | 50 | |
| $S_{SearchDeltaP}$ | dB | 1, 2 | 3 | | 3 | |
| $T_{SearchDeltaP}$ | s | 1, 2 | 5 | | 5 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to an already detected lower priority cell for UE fulfilling low mobility relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to a lower priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling low mobility relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling low mobility relaxed measurements shall be less than 17s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a known lower priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$,

Where:

$T_{evaluate, NR_inter}$ See Table 4.2.2.10.2-1 in TS 38.133 [6] clause 4.2.2.10.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already detected higher priority cell, which we allow 17s for UE fulfilling low mobility relaxed measurements in the test case.

## 14.1.10 NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access

### 14.1.10.1 Test purpose

This test is to verify the requirement for the inter-frequency NR cell reselection requirements specified in clause 7.1.1.0.4, for UE fulfilling low mobility relaxed measurement criterion.

### 14.1.10.2 Test applicability

This test applies to all types of NR UE release 17 and forward satellite access and relaxed RRM idle mode measurements in NTN bands.

### 14.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.10.

### 14.1.10.4 Test description

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables 14.1.10.4.1-1, 14.1.10.4.1-3 and 14.1.10.5-1. The test consists of two successive time periods, with time duration of T1 and T2 respectively

#### 14.1.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.10.4.1-1.

**Table 14.1.10.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access**

| Configuration | Description |
|---|---|
| 14.1.10-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.1.10-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.10.4.1-2

**Table 14.1.10.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.1.10.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.1.10.4.1-3.
2. Message contents are defined in clause 14.1.10.4.3.
3. Cell 1 and Cell 2 are NR cells with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.10.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfills Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to Cell 1 |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2 | Cell 1 | The UE shall perform reselection to Cell 1 during T1 |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| T2 end condition | Active cell | | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2 |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | ms | 1, 2 | 3 | Asynchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | | 1, 2 | SSB.1 FR1 | |
| SMTC configuration | | | 1, 2 | SMTC pattern 2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC pattern 6 | Configured in SIB4 of Cell 2 |
| DRX cycle length | | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| Ephemeris information | | | | Note 1 | |
| T1 | | s | 1, 2 | 20 | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | 20 | T2 is defined so that cell re-selection reaction time is taken into account. |
| Note 1: Detailed ephemeris information is provided in TS 38.508-1 [14] | | | | | |

#### 14.1.10.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells on two different NR carriers as given in table 14.1.10.4.1-3. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility”.

The UE is configured with the relaxed measurement criterion for UE not-at-cell edge as defined in TS 38.304 [30] clause 5.2.4.9.2 in [30]. So, Cell 2 and Cell 1configures the UE as follows:

*cellEdgeEvaluation* [13] criterion is configured according to the parameters listed in Table 14.1.9.2-3;

*lowMobilityEvalutation* [13] criterion is not configured;

*combineRelaxedMeasCondition* [13] is not configured;

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 2 is the active cell and Cell 1 is the neighbor cell.

1a. Set the parameters according to T2 in Table 14.1.10.5-1. SS waits at least for 32sec ($T_{detect,NR_Inter}$) to ensure the UE can detect NR neighbor cell (Cell 1).

2. Set the parameters according to T1 in Table 14.1.10.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. If the UE responds on Cell 1 during time duration T1, within 17 seconds from the beginning of time period T1, then count a success for the test.

4. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 4a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 1.

4a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

5. The SS shall switch the power setting from T1 to T2 as specified in Table 14.1.10.5-1. T2 starts.

6. The SS waits for random access requests information from the UE to perform cell re-selection to an already identified cell, Cell 2.

7. If the UE responds on Cell 2 during time duration T2 within 17 seconds, from the beginning of time period T2, then count a success for the test.

8. If the UE has re-selected to Cell 2 within T2, after the re-selection or when T2 expires, the SS shall send an *RRCRelease* message to the UE and then proceed with step 1 for the next iteration. Otherwise proceed with step 8a.

8a. The SS shall switch off and on the UE, and skip to step 1 for the next iteration.

9. Repeat steps 1a-8 until a test verdict has been achieved. Each of the events “Re-select already detected lower priority Cell 1” and “Re-select already detected higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 14.1.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.1.10.4.3-1: SIB1 (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.1.10.4.3-2: SIB2 (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present | | |
| s-SearchThresholdP-r16 | 25 | Actual value = 25*2 = 50dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 14.1.10.4.3-3: SIB2 (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| } | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| lowMobilityEvaluation-r16 | Not present | | |
| cellEdgeEvaluation-r16 SEQUENCE { | Not present | | |
| s-SearchThresholdP-r16 | 17 | Actual value = 17*2 = 34dB | |
| s-SearchThresholdQ-r16 | Not present | | |
| } | | | |
| combineRelaxedMeasCondition-r16 | Not present | | |
| highPriorityMeasRelax-r16 | Not present | | |
| } | | | |
| } | | | |

**Table 14.1.10.4.3-4: SIB4 (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 SSB | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | |

| | | | |
|---|---|---|---|
| deriveSSB-IndexFromCell | false | | |
| cellReselectionPriority | 5 | Same as the priority in SIB 2 of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.1.10.4.3-5: SIB4 (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | |
| deriveSSB-IndexFromCell | false | | |
| cellReselectionPriority | 4 | Same as the priority in SIB 2 of Cell 1. | |
| } | | | |
| } | | | |
| } | | | |

### 14.1.10.5 Test requirements

Table 14.1.10.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access.

**Table 14.1.10.5-1: Cell specific parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | SR.1.1 FDD | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.2.1 | | OP.1 defined in A.2.1 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2 | -140 | | -140 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 16 | 14 | -3.65 | 16 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | -98 | -100 | -100 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -98 | -98 | -100 | -100 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 16 | 14 | -3.65 | 16 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -82 | -84 | -103.65 | -84 |
| Io | dBm/9.36 MHz | 1, 2 | -53.94 | -55.88 | -70.49 | -55.94 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 |
| SnonintersearchP | dB | 1, 2 | Not sent | | Not sent | |
| $Thresh_{x, highP}$ | dB | 1, 2 | 48 | | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2 | 44 | | 44 | |
| $Thresh_{x, lowP}$ | dB | 1, 2 | 50 | | 50 | |
| $S_{SearchThresholdP}$ | dB | 1, 2 | 50 | | 34 | |
| $S_{SearchThresholdQ}$ | s | 1, 2 | Not Configured | | | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge relaxed measurements shall be less than 17s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling not-at-cell-edge relaxed measurements shall be less than 17s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, NR_inter} + T_{SI-NR}$,

Where:

$T_{evaluate, NR_inter}$ See Table 4.2.2.10.3-1 in TS 38.133 [6] clause 4.2.2.10

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64s, allow 17s for the cell re-selection delay to an already detected lower priority cell and 16.64s for the cell re-selection delay to an already higher priority cell, which we allow 17s for UE fulfilling not-at-cell edge relaxed measurements in the test case.

## 14.1.11 NR SA FR1 inter-RAT Cell reselection with NTN Carrier for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete.

- Call setup and test procedure needs to be updated.

- Applicability needs to be updated.

- Annex E needs to be updated.

- T3 test configuration of Table 14.1.11.4.1-3 needs to be removed/updated dependent on RAN4 in TS 38.133.

### 14.1.11.1 Test purpose

This test is to verify the requirement for the NR NTN to E-UTRAN TN inter-RAT cell reselection requirements specified in TS 38.133 [6] clause 4.2C.2.11 when the E-UTRAN cell is of higher priority.

### 14.1.11.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access.

### 14.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.11.

### 14.1.11.4 Test description

The test scenario comprises of one NR cell and one E-UTRAN cell as given in Tables 14.1.11.4.1-1, 14.1.11.4.1-3, 14.1.11.5-1 and 14.1.11.5-2. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR Cell 1 is already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of higher priority than Cell 1.

#### 14.1.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.11.4.1-1.

**Table 14.1.11.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 14.1.11.4.1-2.

**Table 14.1.11.4.1-2: Initial conditions for NR NTN to E-UTRAN cell re-selection**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.11.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.1.11.4.1-3.

2. Message contents are defined in clause 14.1.11.4.3.

3. The test scenario comprises of one NR NTN cell and one E-UTRAN cell. Cell 1 is the NR NTN cell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.11.4.1-3: General test parameters for NR NTN to E-UTRAN cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell 1 | The UE camps on Cell 1 in the initial phase and during T2 period the UE reselects to Cell 2. |
| T2 end condition | Active cell | | 1 | Cell 2 | The UE shall perform reselection to cell 2 during T2. |
| | Neighbour cell | | 1 | Cell 1 | |
| T3 end condition | Active cell | | 1 | Cell 1 | The UE shall perform reselection to cell 1 during T3 for iteration of the tests. |
| | Neighbour cell | | 1 | Cell 2 | |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1 | 102 | The detailed configuration is specified in TS 38.211 [6] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | | 1 | 53 | As specified in Table 5.7.1-2 in TS 36.211 [23] |
| E-UTRAN PRACH | | | 1 | 53 | As specified in Table 5.7.1-2 in |
| T1 | | s | 1 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 14.1.11.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR NTN Cell (Cell 1) and an E-UTRA TN neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 14.1.11.5-1 and 14.1.11.5-2. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.11.5-1 and 14.1.11.5-2. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority cell, Cell 2.

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

8. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

9. Repeat step 2-8 until a test verdict has been achieved.

#### 14.1.11.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.1.11.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 2 and higher priority<br><br>Table H.2.3-3 with Condition higher priority |
| Default RRC messages and information elements contents exceptions | |

### 14.1.11.5 Test requirement

Tables 14.1.11.5-1 and 14.1.11.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

**Table 14.1.11.5-1: Cell specific test parameters for NR Cell 1**

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, | N/A | | |
| PDSCH parameters | | 1, | SR.1.1 FDD | | |
| RMSI CORESET parameters | | 1, | CR.1.1 FDD | | |
| Dedicated CORESET parameters | | 1 | CCR.1.1 FDD | | |
| SSB parameters | | 1 | SSB.1 FR1 | | |
| NR SMTC parameters | | 1 | SMTC.2 | | |
| OCNG Pattern | | 1 | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | |
| $N_{oc}$ | dBm/SCS | 1 | -98 | | |
| $N_{oc}$ | dBm/15 kHz | 1 | -98 | | |
| SS-RSRP | dBm/SCS | 1 | -84 | -84 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 14+TT | 14+TT | 14+TT |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 14+TT | 14+TT | 14+TT |
| Io | dBm/9.36 MHz | 1 | -55.88+TT | -55.88+TT | -55.88+TT |
| Treselection | s | 1 | 0+TT | | |
| SnonintrasearchP | dB | 1 | 50+TT | | |
| $Thresh_{x, highP}$ (Note 2) | dB | 1 | 48+TT | | |

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| $Thresh_{serving, lowP}$ | dB | 1 | 44+TT | | |
| $Thresh_{x, lowP}$ | dB | 1 | 50+TT | | |
| Propagation Condition | | 1 | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| NOTE 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | | |

**Table 14.1.11.5-2: Cell specific test parameters for E-UTRA Cell 2**

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 | | OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RANote 1 | dB | | | |
| OCNG_RBNote 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ | dBm/15 kHz | -98 | | |
| RSRP | dBm/15 KHz | -infinity | -86 | -102 |
| $\hat{E}_s / I_{ot}$ | dB | -infinity | 12+TT | -4+TT |
| $\hat{E}_s / N_{oc}$ | dB | -infinity | 12+TT | -4+TT |
| TreselectionEUTRAN | s | 0+TT | | |
| SnonintrasearchP | dB | Not sent | | |
| Threshx, highP | dB | 48+TT | | |
| Threshserving, lowP | dB | 44+TT | | |
| Threshx, lowP (Note 2) | dB | 50+TT | | |
| Propagation Condition | | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| NOTE 2: This refers to the value of $Thresh_{x, Low}$ which is included in E-UTRA system information, and is a threshold for the NR target cell | | | | |

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90 %.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7

$T_{evaluate,\ NR_inter}$ See Table 4.2C.2.4-1 in clause 4.2C.2.4

$T_{SI\text{-}E\text{-}UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

## 14.1.12 NR SA FR1-FR1 Cell re-selection with TN carrier for Satellite Access

Editor's Note: This test cases is incomplete in following aspects:

- MU and TT analysis is incomplete.

- Applicability needs to be updated.

- Several test parameters and configuration are still in brackets

- Annex E needs to be updated.

- Test configurations in Table 14.1.12.4.1-3 need to be updated dependent on RAN4 in TS 38.133

### 14.1.12.1 Test purpose

This test is to verify the requirement for the inter frequency NR NTN to TN cell re-selection requirements specified in clause TS 38.133 [6] clause 4.2C.2.10.

### 14.1.12.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access.

### 14.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.14.1.12.

### 14.1.12.4 Test description

The test scenario comprises of 2 cells on 2 different NR carriers, including NR NTN cell/carrier and NR TN cell/carrier respectively as given in Tables 14.1.12.4.1-1, 14.1.12.4.1-2 and14.1.12.4.1-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

#### 14.1.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.1.12.4.1-1.

**Table 14.1.12.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 14.1.12.4.1-2.

**Table 14.1.12.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.1.12.4.1-3.

2. Message contents are defined in clause 14.1.12.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.2.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.1.12.4.1-3: General test parameters for inter frequency NR cell re-selection test case**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell 1 | |
| T2 end condition | Active cell | | 1 | Cell 2 | |
| | Neighbour cells | | 1 | Cell 1 | |
| Final condition | Active cell | | 1 | Cell 1 | |
| | Neighbour cells | | 1 | Cell 2 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| SMTC configuration | | | 1 | SMTC.6 | Configured in SIB4 for Cell 1 and Cell 2 |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1 | 102 | The detailed configuration is specified in TS 38.211 [6] clause 6.3.3.2 |
| rangeToBestCell | | | 1 | Not configured | |
| Ephemeris information | | | 1 | [TBD] | The detailed configuration is specified in SIB19 |
| T1 | | s | 1 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 14.1.12.4.2 Test procedure

1. Ensure the UE is in [state RRC_IDLE with generic procedure parameters Connectivity NR and Test Mode On according to TS 38.508-1 [14] clause 4.5]. Cell 1 is an active cell and Cell 2 is powered off.

2. Set the parameters according to T1 in Table 14.1.12.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for this iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.1.12.5-1. T2 starts.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.
6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. The SS shall send an RRCRelease message to ensure that the UE is in state RRC_IDLE on Cell 1.
8. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity NR according to TS 38.508-1 [14] clause 4.5.
9. Repeat step 2-8 until a test verdict has been achieved.

### 14.1.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.1.12.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for Cell 1<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for Cell 2<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | |

### 14.1.12.5 Test requirement

Tables 14.1.12.5-1 defines the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

**Table 14.1.12.5-1: Cell specific test parameters for inter frequency NR cell re-selection test case**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | 1 | SSC.1 for GSO test<br>SSC.2 for NGSO test | | | | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -130 | | | -130 | | |

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Pcompensation | dB | 1 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 16+TT | -3.11+TT | 2.79+TT | -infinity | 2.79+TT | -3.11+TT |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98+TT | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98+TT | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 16+TT | 13+TT | 16+TT | -infinity | 16+TT | 13+TT |
| SS-RSRP Note3 | dBm/SCS | 1 | -82+TT | -85+TT | -82+TT | -infinity | -82+TT | -85+TT |
| Io | dBm/9.36 MHz | 1 | -53.94+TT | -52.21+TT | -52.21+TT | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 1 | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT | 0+TT |
| SintersearchP | dB | 1 | 60+TT | | | 60+TT | | |
| Propagation Condition | | 1 | AWGN | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T2, to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90 %.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7

$T_{evaluate,\ NR_inter}$ See Table 4.2C.2.4-1 in clause 4.2C.2.4

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority.

# 14.2 RRC_CONNECTED state mobility

## 14.2.1 Handover for SAN

### 14.2.1.0 Minimum conformance requirements

#### 14.2.1.0.1 Minimum conformance requirements for handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR SAN FR1 cell to NR SAN FR1 cell. The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, $K_{offset}$, and $K_{mac}$ for target NR SAN cell during $D_{handover}$, otherwise interruption time may be longer than the requirements in this clause.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.

##### 14.2.1.0.1.1 Handover delay

When the UE receives a RRC message implying handover to NR SAN cell, the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ msec from the end of the last TTI containing the RRC command when UE is configured with RACH-based handover.

When the UE receives a RRC message implying handover to NR SAN cell, the UE shall be ready to start the transmission of the new uplink PUSCH channel or PRACH channel within $D_{handover}$ msec from the end of the last TTI containing the RRC command when UE is configured with RACH-less handover.

Where:

- $D_{handover}$ equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 14.2.1.0.1.2 when UE is configured with RACH-based handover.
- $D_{handover}$ equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 14.2.1.0.1.3 when UE is configured with RACH-less handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.1

##### 14.2.1.0.1.2 Interruption time for RACH-based handover

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover to NR SAN cell is commanded,

the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Otherwise, no interruption time requirement is applied.

Where:

- $T_{search}$ is the time required to search the target NR SAN cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot $\geq$ -2 dB, then $T_{search} = T_{rs}$ ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot $\geq$ -2 dB, then $T_{search}$ = 3* $T_{rs}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.
- $T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.
- $T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.
- $T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

- $T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and [10] ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

- $T_{rs}$ is the SMTC periodicity of the target NR SAN cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

#### 14.2.1.0.1.3 Interruption time for RACH-less handover

When intra-frequency or inter-frequency RACH-less handover to NR SAN cell is commanded,

the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Otherwise, no interruption time requirement is applied.

Where:

- $T_{search}$ is same as the one defined in section 14.2.1.0.1.2.

- $T_{\Delta}$ is same as the one defined in section 14.2.1.0.1.2.

- $T_{processing}$ is same as the one defined in section 14.2.1.0.1.2.

- $T_{margin}$ is same as the one defined in section 14.2.1.0.1.2.

- $T_{IU}$ is the interruption uncertainty in acquiring the first UL transmission resource, which can be a configured grant based PUSCH, dynamic grant based PUSCH, according to NW configuration and scheduling, or PRACH if no valid configured grant based PUSCH is selected. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 38.133 [6] clause 9.2.5 for intra-frequency handover and TS 38.133 [6] clause 9.3.4 for inter-frequency handover.

### The normative reference for this requirement is TS 38.133 [6] clause 6.1C.1.2.214.2.1.0.2 Minimum conformance requirements for conditional handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handover from NR SAN FR1 cell to NR SAN FR1 cell. The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, $K_{offset}$, and $K_{mac}$ for target NR SAN cell during $D_{CHO}$, otherwise the measurement time, preparation time and interruption time may be longer than the requirements in clauses 14.2.1.0.2.2, 14.2.1.0.2.3 and 14.2.1.0.2.4.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.

#### 14.2.1.0.2.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13]. UE shall start RRM measurement before the time or distance condition is met, the time/distance condition is defined in clause 5.5.4 in TS 38.331[13]

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{CHO}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

- $T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [13].
- $T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover
- $T_{measure}$ is the measurements time stated in clause 14.2.1.0.2.2.
- $T_{CHO_execution}$ is the UE conditional execution preparation time for conditional handover in clause 14.2.1.0.2.3.
- $T_{interrupt}$ is the interruption time stated in clause 14.2.1.0.2.4.

The conditional handover delay requirements are applied if condition T1-2 is later than the end of $T_{measure}$ for time based CHO, or both condition D1-1 and condition D1-2 are fulfilled before the end of $T_{measure}$ for location-based CHO, otherwise no CHO requirement is applied.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.1.

#### 14.2.1.0.2.2 Measurement time

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the requirements for identifying a new detectable intra-frequency cell measured without Time To Trigger (TTT) and L3 filtering, $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$, defined in TS 38.133 [6] clauses 9.2C.5.1 and 9.2C.6.1 are used.

For time-based conditional intra-frequency handover:

- If condition T1-1 occurs earlier than $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, then the measurement time delay equal to $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ assuming UE only performs the measurements within SMTC window of the target cell.
- If condition T1-1 occurs later than $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until condition T1-1.

For location-based conditional intra-frequency handover:

- If both condition D1-1 and condition D1-2 are fulfilled earlier than $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, then the measurement time delay equal to $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ assuming UE only performs measurements within SMTC window of the target cell.
- If both condition D1-1 and condition D1-2 are fulfilled is later than $T_{Event_DU}$ plus $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ for intra-frequency handover, then the measurement time delay equal to the time from the end of $T_{event_DU}$ until time when both condition D1-1 and condition D1-2 are fulfilled.

For inter-frequency handover, the requirements for identifying a new detectable inter-frequency cell measured without Time To Trigger (TTT) and L3 filtering, $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$, defined in TS 38.133 [6] clause 9.3C.7.1 are used.

For time-based conditional inter-frequency handover:

- If condition T1-1 occurs earlier than $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equal to $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$ assuming that the UE uses only the SMTC window of the target inter-frequency carrier for performing the measurements. In this case $K_{satellite}=1$, $CSSF_{inter}=1$.
- If condition T1-1 occurs later than $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equals to the time from the end of $T_{event_DU}$ until condition T1-1.

For location-based conditional inter-frequency handover,

- If both condition D1-1 and condition D1-2 are fulfilled earlier than $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equal to $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$,

assuming that the UE uses only the SMTC window of the target inter-frequency carrier for performing the measurements. In this case $K_{satellite}$=1, $CSSF_{inter}$=1.

- If both condition D1-1 and condition D1-2 are fulfilled later than $T_{Event_DU}$ plus $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$, then the measurement time delay equal to the time from the end of $T_{event_DU}$ until time of both condition D1-1 and condition D1-2 are fulfilled.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period [$T_{identify_intra_without_index}$] or [$T_{identify_intra_with_index}$] for intra-frequency handover or [$T_{identify_inter_without_index}$] for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.2.

#### 14.2.1.0.2.3 Preparation time

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.3.

#### 14.2.1.0.2.4 Interruption time

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

- $T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.
- $T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and [10] ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]
- $T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.
- $T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.
- $T_{rs}$ is the SMTC periodicity of the target NR SAN cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.2.2.4.

### 14.2.1.1 NR SA FR1 Handover for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Several test parameters and configuration are still in brackets
- AT command related configuration is FFS

#### 14.2.1.1.1 Test purpose

To verify the requirement for Intra-frequency SAN Handover from FR1 to FR1 specified in clause 14.2.1.0.1.

#### 14.2.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.1.

#### 14.2.1.1.4 Test description

##### 14.2.1.1.4.1 Initial conditions

The test scenario comprises of one NR carrier and two satellite access cells as given in tables 14.2.1.1.4.1-3 and 14.2.1.1.5-1. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell with Event A3 report.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover.

This test shall be tested using any of the test configurations in Table 14.2.1.1.4.1-1.

**Table 14.2.1.1.4.1-1: Supported test configurations for NR SA FR1 Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.1-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.1-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.1.4.1-2

**Table 14.2.1.1.4.1-2: Initial conditions for NR SA FR1 Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.1.1.4.3.
2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test where Cell 2 is the target cell. Both Cell 1 and Cell 2 are satellite access cells.
3. The general test parameters are given in Table 14.2.1.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.1.4.1-3: General test parameters for NR SA FR1 Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellites configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellites configuration |
| UE position (N,S, H) | | | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | -1 | Modified by Test Tolerance |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 14.2.1.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.1.4.1-3. The handover delay is tested.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.

4. UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.1.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3.

7. SS shall transmit the *RRCReconfiguration* message implying handover to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 14.2.1.1.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

12. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

13. Repeat steps 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 14.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 14.2.1.1.4.3-1: Common Exception messages for NR SA FR1 Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells<br>Table H.3.1-4 with A3-offset = -1 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO for Config 2 |

14.2.1.1.5 Test requirements

Table 14.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Handover for Satellite Access.

**Table 14.2.1.1.5-1: Cell specific test parameters for NR SA FR1 Handover for Satellite Access**

| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 | | 1 | | | 1 | | |
| $BW_{channel}$ | | | MHz | 10: $N_{RB,c}$ = 52 | | | 10: $N_{RB,c}$ = 52 | | |
| BWP BW | | | MHz | 10: $N_{RB,c}$ = 52 | | | 10: $N_{RB,c}$ = 52 | | |
| $TA_{Common}$ | | Config 1,2 | s | 0 | | | 0 | | |
| $TA_{CommonDrift}$ | | | s | 0 | | | 0 | | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | | 0 | | |
| $K_{offset}$ | | Config 1 | ms | 239 | | | 239 | | |
| | | Config 2 | | 4 | | | 4 | | |
| $K_{mac}$ | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SMTC Configuration | | | | SMTC.1 | | | | | |
| SSB Configuration | | | | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/ 15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | | dBm/ SCS | -98 | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB_RP | | dBm/ SCS | -90 | -90 | -90 | -Infinity | -88 | -88 |
| Io Note3 | | dBm/ 9.36MHz | -61.41 | -57.67 | -57.67 | -61.41 | -57.67 | -57.67 |
| Propagation condition | | - | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13]. $T_{interrupt}$ is defined in clause 14.2.1.0.1.2.

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Here: $T_{search}$ = 0; $T_{IU}$ = 20ms; $T_{processing}$ = 20ms; $T_{\Delta}$ = 20ms; $T_{margin}$ = 2ms.

This gives a total of 72 ms.

## 14.2.1.2 NR SA FR1-FR1 Handover for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Several test parameters and configuration are still in brackets
- AT command related configuration is FFS

### 14.2.1.2.1 Test purpose

To verify the requirement for Inter-frequency SAN Handover from FR1 to FR1 specified in clause 14.2.1.0.1.

### 14.2.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.2.

#### 14.2.1.2.4 Test description

##### 14.2.1.2.4.1 Initial conditions

The test scenario comprises of two NR carriers and two satellite access cells as given in tables 14.2.1.2.4.1-3 and 14.2.1.2.5-1. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, the UE is configured to measure inter-frequency neighbour cell with Event A3 report and Gap Pattern 0 is configured in the test case.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover.

This test shall be tested using any of the test configurations in Table 14.2.1.2.4.1-1.

**Table 14.2.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.2-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.2-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.2.4.1-2

**Table 14.2.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.1.2.4.3.
2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test where Cell 2 is the target cell. Both Cell 1 and Cell 2 are satellite access cells.
3. The general test parameters are given in Table 14.2.1.2.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.2.4.1-3: General test parameters for NR SA FR1-FR1 Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellite configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | | | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |

| | | | |
|---|---|---|---|
| Time offset between cells | | 3 μs | Synchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤5 | |
| T3 | s | 1 | |

#### 14.2.1.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.2.4.1-3. The handover delay is tested.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.
2. Set the parameters according to T1 in Table 14.2.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.
4. UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.2.5-1.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3.
7. SS shall transmit the *RRCReconfiguration* message implying handover to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 14.2.1.2.5-1. T3 starts.
8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.
10. After T3 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
12. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.
13. Repeat steps 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 14.2.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells<br>Table H.3.1-4 with A3-offset = 0 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO for Config 2 |

14.2.1.2.5 Test requirements

Table 14.2.1.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 Handover for Satellite Access.

**Table 14.2.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 Handover for Satellite Access**

| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 | | 1 | | | 2 | | |
| $BW_{channel}$ | | | MHz | 10: $N_{RB,c}$ = 52 | | | 10: $N_{RB,c}$ = 52 | | |
| BWP BW | | | MHz | 10: $N_{RB,c}$ = 52 | | | 10: $N_{RB,c}$ = 52 | | |
| $TA_{Common}$ | | Config 1,2 | s | 0 | | | 0 | | |
| $TA_{CommonDrift}$ | | | s | 0 | | | 0 | | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | | 0 | | |
| $K_{offset}$ | | Config 1 | ms | 239 | | | 239 | | |
| | | Config 2 | | 4 | | | 4 | | |
| $K_{mac}$ | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SMTC Configuration | | | | SMTC.2 | | | SMTC.5 | | |
| SSB Configuration | | | | SSB.1 FR1 | | | SSB.5 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | | | dBm/ SCS | -98 | | | | | |
| $\hat{E}_s / I_{ot}$ | | | dB | 4 | 4 | 4 | -Infinity | 9 | 9 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4 | 4 | 4 | -Infinity | 9 | 9 |
| SSB_RP | | | dBm/ SCS | -94 | -94 | -94 | -Infinity | -89 | -89 |
| Io Note3 | | | dBm/ 9.36MHz | -64.59 | -64.59 | -64.59 | -70.05 | -60.53 | -60.53 |
| Propagation condition | | | - | AWGN | | | AWGN | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13]. $T_{interrupt}$ is defined in clause 14.2.1.0.1.2.

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Here: $T_{search}$ = 0; $T_{IU}$ = 20ms; $T_{processing}$ = 20ms; $T_{\Delta}$ = 20ms; $T_{margin}$ = 2ms.

This gives a total of 72 ms.

## 14.2.1.3 NR SA FR1 Time-based Conditional Handover for Satellite Access

Editor's Note:

- Several test parameters and configuration are still in brackets
- AT command related configuration is FFS

### 14.2.1.3.1 Test purpose

This test is to verify the requirement for intra-frequency SAN time-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

### 14.2.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based conditional handover.

### 14.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.3.

### 14.2.1.3.4 Test description

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. Immediately before the start of T1, the UE is configured to measure intra-frequency neighbour cell and with a time-based handover trigger to Cell 2 with Event *CondEvent* T1.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1 and time condition event *t1-Threshold-r17* is fulfilled.

#### 14.2.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.3.4.1-1.

**Table 14.2.1.3.4.1-1: Supported test configurations for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.3-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.3-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.3.4.1-2

**Table 14.2.1.3.4.1-2: Initial conditions for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.2.1.3.4.1-3.
2. Message contents are defined in clause 14.2.1.3.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.3.4.1-3: General test parameters for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | FDD duplex mode cell |
| | Neighbouring cell | | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellite configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | | | [(0, 0, 0)] | Set by AT command |
| *t1-Threshold-r17.condEventT1-r17* | | s | T1 | Entering condition at start of T2 (end of T1) |
| *duration-r17.condEventT1-r17* | | slot | 1000 | Give 1s search duration |
| *A3-Offset* in condition | | dB | -1 | Modified by Test Tolerance |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 2 | |

### 14.2.1.3.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.3.4.1-3. The handover delay is tested.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.
2. Set the parameters according to T1 in Table 14.2.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure time-based CHO condition on the UE, as specified in Tables 14.2.1.3.4.3-1 and 14.2.1.3.4.3-2.
4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.3.5-1. T2 starts.
6. If the UE transmits the PRACH preambles to Cell 2 less than 872 ms from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for the next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.
10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.2.1.3.4.3-1: Common Exception messages for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO_T_CHO for Config 2 |

**Table 14.2.1.3.4.3-2: *RRCReconfiguration* for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 14.2.1.3.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 14.2.1.3.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.3.4.3-3: *MeasConfig* (Table 14.2.1.3.4.3-2) for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 14.2.1.3.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-T1 | Table 14.2.1.3.4.3-5 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.3.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 1 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 14.2.1.3.4.3-4: *MeasObjectNR* (Table 14.2.1.3.4.3-3) for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 14.2.1.3.4.3-5: *ReportConfigNR-T1* (Table 14.2.1.3.4.3-3) for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventT1-r17 SEQUENCE { | | | |
| t1-Threshold-r17 | 100*T | T is the time difference in seconds between start of T2 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms | |
| duration-r17 | 10 | Each step represents 100ms (= 100 slots @ 15kHz SCS), so 1000 slots/100 slots = 10 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.3.4.3-6: *ReportConfigNR-A3* (Table 14.2.1.3.4.3-3) for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -2 | actuall value = -2*0.5 = -1dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.3.4.3-7: *ConditionalReconfiguration* (Table 14.2.1.3.4.3-2) for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>MeasId configured in Table 14.2.1.3.4.3-3 | |

| | | | |
|---|---|---|---|
| | | Event T1 | |
| MeasId[2] | 2 | entry 2<br>MeasId configured in Table 14.2.1.3.4.3-3 Event A3 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

### 14.2.1.3.5 Test requirements

Table 14.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 Time-based Conditional Handover for Satellite Access.

**Table 14.2.1.3.5-1: Cell specific parameters for NR SA FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2 | | 1 | | 1 | |
| $BW_{channel}$ | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| BWP BW | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| $TA_{Common}$ | | Config 1,2 | s | 0 | | 0 | |
| $TA_{CommonDrift}$ | | | s | 0 | | 0 | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | 0 | |
| $K_{offset}$ | | Config 1 | ms | 239 | | 239 | |
| | | Config 2 | ms | 4 | | 4 | |
| $K_{mac}$ | | Config 1,2 | ms | 0 | | 0 | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | |
| OCNG Patterns | | | | OP.1 | | | |
| SMTC Configuration | | | | SMTC.1 | | | |
| SSB Configuration | | | | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1,2 | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | | dBm/ SCS | -98 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -2.41 | -Infinity | 1.36 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | -Infinity | 10 |
| SSB_RP | | dBm/ SCS | -90 | -90 | -Infinity | -88 |
| Io Note3 | | dBm/ 9.36MHz | -61.41 | -57.67 | -61.41 | -57.67 |
| Propagation condition | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 872 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay is defined in clause 14.2.1.0.2.1, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ = start of T2

$T_{measure}$ = 600 + 200 ms; $T_{interrupt}$ = 62ms; $T_{CHO_execution}$ = 10ms.

This gives a total of 872 ms.

## 14.2.1.4 NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access

Editor's Note:

- Several test parameters and configuration are still in brackets
- AT command related configuration is FFS

### 14.2.1.4.1 Test purpose

This test is to verify the requirement for inter-frequency SAN time-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

### 14.2.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and time-based conditional handover.

### 14.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.4.

#### 14.2.1.4.4 Test description

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. Immediately before the start of T1, the UE is configured to measure inter-frequency neighbour cell with Gap pattern ID gp0 and time-based handover trigger to Cell 2 with Event *CondEvent* T1.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1 and after 1000ms of T2, time condition event *t1-Threshold-r17* is fulfilled.

##### 14.2.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.4.4.1-1.

**Table 14.2.1.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.4-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.4-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.4.4.1-2

**Table 14.2.1.4.4.1-2: Initial conditions for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.2.1.4.4.1-3.
2. Message contents are defined in clause 14.2.1.4.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.4.4.1-3: General test parameters for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | FDD duplex mode cell |
| | Neighbouring cell | | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellite configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | | | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T1+1 | Entering condition 1000ms after start of T2 |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| Gap Pattern Id | | | 0 | |
| Measurement gap offset | | | 9 | |

| | | | |
|---|---|---|---|
| A3-Offset in condition | dB | 0 | |
| Hysteresis | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | 3 μs | Synchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤ 2 | |

#### 14.2.1.4.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.4.4.1-3. The handover delay is tested.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.4.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure time-based CHO condition on the UE, as specified in Table 14.2.1.4.4.3-1 and Table 14.2.1.4.4.3-2.

4. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.4.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 later than 1000 ms and less than 1072 ms from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for the next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.2.1.4.4.3-1: Common Exception messages for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO_T_CHO for Config 2 |

**Table 14.2.1.4.4.3-2: *RRCReconfiguration* for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 14.2.1.4.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 14.2.1.4.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.4.4.3-3: *MeasConfig* (Table 14.2.1.4.4.3-2) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 14.2.1.4.4.3-4 | Cell 1 |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 14.2.1.4.4.3-4 | Cell 2 |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-T1 | Table 14.2.1.4.4.3-5 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.4.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 2 | | |

| | | | |
|---|---|---|---|
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with conditions gapUE, Pattern #0 and gap offset = 9 | | |
| } | | | |

**Table 14.2.1.4.4.3-4: *MeasObjectNR* (Table 14.2.1.4.4.3-3) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 1 | | Cell 1 |
| | ARFCN-ValueNR for Cell 2 | | Cell 2 |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.2 | | Cell 1 |
| | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.5 | | Cell 2 |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 14.2.1.4.4.3-5: *ReportConfigNR-T1* (Table 14.2.1.4.4.3-3) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventT1-r17 SEQUENCE { | | | |
| t1-Threshold-r17 | 100*T | T is the time difference in seconds between 1000ms after the start of T2 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms | |
| duration-r17 | 10 | Each step represents 100ms (=100 slots @ 15kHz SCS), so 1000 slots/100 slots = 10 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.4.4.3-6: *ReportConfigNR-A3* (Table 14.2.1.4.4.3-3) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 0 | actuall value = 0*0.5 = 0dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.4.4.3-7: *ConditionalReconfiguration* (Table 14.2.1.4.4.3-2) for NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>The MeasId configured in Table 14.2.1.4.4.3-3 Event T1 | |
| MeasId[2] | 2 | entry 2<br>The MeasId configured in Table 14.2.1.4.4.3-3 Event A3 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

14.2.1.4.5 Test requirements

Table 14.2.1.4.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access.

**Table 14.2.1.4.5-1: Cell specific parameters for NR SA FR1-FR1 Time-based Conditional Handover for Satellite Access**

| Parameter | Test configuration | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | Config 1, 2 | | 1 | | 2 | |
| $BW_{channel}$ | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| BWP BW | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $TA_{Common}$ | | Config 1, 2 | s | 0 | | 0 |
| $TA_{CommonDrift}$ | | | s | 0 | | 0 |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | 0 |
| $K_{offset}$ | | Config 1 | ms | 239 | | 239 |
| | | Config 2 | ms | 4 | | 4 |
| $K_{mac}$ | | Config 1, 2 | ms | 0 | | 0 |
| DRX Cycle | | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | |
| TRS configuration | | | | TRS.1.1 FDD | | |
| OCNG Patterns | | | | OP.1 | | |
| SMTC Configuration | | | | SMTC.2 | | SMTC.5 |
| SSB Configuration | | | | SSB.1 FR1 | | SSB.5 FR1 |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | |
| BWP configuration | Initial DL BWP | Config 1, 2 | | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | Config 1, 2 | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | Config 1, 2 | dBm/ 15kHz | -98 | | |
| $N_{oc}$ Note2 | | | dBm/ SCS | -98 | | |
| $\hat{E}_s / I_{ot}$ | | | dB | 4 | 4 | -Infinity | 9 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4 | 4 | -Infinity | 9 |
| SSB_RP | | | dBm/ SCS | -94 | -94 | -Infinity | -89 |
| Io Note3 | | | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -60.53 |
| Propagation condition | | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 later than 1000ms and less than 1072 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay is defined in clause 14.2.1.0.2.1, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ = start of T2

$T_{measure}$ = max(600 + 200, 1000) ms; $T_{interrupt}$ = 62ms; $T_{CHO_execution}$ = 10ms.

This gives a total of 1072 ms.

### 14.2.1.5 NR SA FR1 Distance-based Conditional Handover for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete
- *referenceLocation* coordinates need to be updated
- Several test parameters and configuration are still in brackets
- Annex F needs to be updated

#### 14.2.1.5.1 Test purpose

This test is to verify the requirement for intra-frequency SAN distance-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

#### 14.2.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, distance-based conditional handover, and inter-satellite measurements.

#### 14.2.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.5.

#### 14.2.1.5.4 Test description

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell. The RRC message implying distance-based handover to cell 2 with Event *CondEvent* D1 shall be sent to UE, at a time earlier than $T_{RRC}$ (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and offset better than cell 1 and location condition event *condEventD1-r17* is fulfilled.

##### 14.2.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.5.4.1-1.

**Table 14.2.1.5.4.1-1: Supported test configurations for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.5-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.5-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.5.4.1-2

**Table 14.2.1.5.4.1-2: Initial conditions for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.2.1.5.4.1-3.
2. Message contents are defined in clause 14.2.1.5.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.5.4.1-3: General test parameters for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | FDD duplex mode cell |
| | Neighbouring cell | | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellite configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) at T1 start | | | [(0, 0, 0)] | Set by AT command |
| UE moving speed | | km/h | [(108, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-700, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(1300, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [20] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [20] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 | |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 | |
| A3-Offset in condition | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 12 | |
| T2 | | s | ≤ 6 | |

### 14.2.1.5.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.5.4.1-3. Both handover delay and interruption length are tested.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.
2. Set the parameters according to T1 in Table 14.2.1.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall configure UE position and moving speed. Immediately after that, T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure distance-based CHO condition on the UE.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.5.5-1. T2 starts.
6. If the UE transmits the PRACH preambles to Cell 2 less than 872 ms from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for the next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.
10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.1.5.4.3 Message contents

**Table 14.2.1.5.4.3-1: Common Exception messages for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO_D_CHO for Config 2 |

**Table 14.2.1.5.4.3-2: *RRCReconfiguration* for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 14.2.1.5.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 14.2.1.5.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.5.4.3-3: *MeasConfig* (Table 14.2.1.5.4.3-2) for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |

| | | | |
|---|---|---|---|
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 14.2.1.5.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-D1 | Table 14.2.1.5.4.3-5 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.5.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 1 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 14.2.1.5.4.3-4: *MeasObjectNR* (Table 14.2.1.5.4.3-3) for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 14.2.1.5.4.3-5: *ReportConfigNR-D1* (Table 14.2.1.5.4.3-3) for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventD1-r17 SEQUENCE { | | | |
| distanceThreshFromReference1-r17 | [20] | 1000m = 20*50m | |
| distanceThreshFromReference2-r17 | [20] | 1000m = 20*50m | |
| referenceLocation1-r17 | FFS | Delta coordinates (-700,0,0) from UE initial coordinates, in meters | |
| referenceLocation2-r17 | FFS | Delta coordinates (1300,0,0) from UE initial coordinates, in meters | |
| hysteresisLocation-r17 | 0 | 0m = 0*10m | |
| timeToTrigger-r17 | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.5.4.3-6: *ReportConfigNR-A3* (Table 14.2.1.5.4.3-3) for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -2 | actuall value = -2*0.5 = -1dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.5.4.3-7: *ConditionalReconfiguration* (Table 14.2.1.5.4.3-2) for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>MeasId configured in Table 14.2.1.5.4.3-3 Event D1 | |
| MeasId[2] | 2 | entry 2<br>MeasId configured in Table 14.2.1.5.4.3-3 Event A3 | |
| } | | | |

| | | | |
|---|---|---|---|
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

14.2.1.5.5 Test requirements

Table 14.2.1.5.5-1 defines the primary level settings including test tolerances for NR SA FR1 Distance-based Conditional Handover for Satellite Access.

**Table 14.2.1.5.5-1: Cell specific parameters for NR SA FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2 | | 1 | | 1 | |
| $BW_{channel}$ | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| BWP BW | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| $TA_{Common}$ | | Config 1, 2 | s | 0 | | 0 | |
| $TA_{CommonDrift}$ | | | s | 0 | | 0 | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | 0 | |
| $K_{offset}$ | | Config 1 | ms | 239 | | 239 | |
| | | Config 2 | ms | 4 | | 4 | |
| $K_{mac}$ | | Config 1, 2 | ms | 0 | | 0 | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | |
| OCNG Patterns | | | | OP.1 | | | |
| SMTC Configuration | | | | SMTC.1 | | | |
| SSB Configuration | | | | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2 | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | Config 1, 2 | dBm/ 15kHz | -98+TT | | | |
| $N_{oc}$ Note2 | | | dBm/ SCS | -98+TT | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 8+TT | -3.3+TT | -Infinity | 2.36+TT |
| $\hat{E}_s/N_{oc}$ | | dB | 8+TT | 8+TT | -Infinity | 11+TT |
| SSB_RP | | dBm/SCS | -90+TT | -90+TT | -Infinity | -87+TT |
| Io[Note3] | | dBm/9.36MHz | -61.41+TT | -57.06+TT | -61.41+TT | -57.06+TT |
| Propagation condition | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The UE shall start to transmit the PRACH to Cell 2 less than 872 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay is defined in TS 38.133 [6] clause 6.1C.2, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ = start of T2

UE moving speed, v = (108km/h*1000/3600) = 30m/s.

At start of T2,

distance to source cell reference location is 30 m/s * 12 s – (-700)m = 1060m, and D1-1 = 1000m

distance to target cell reference location is 30 m/s * 12 s – 1300m = -940m, and D1-2 = 1000m

i.e. D1-1 and D1-2 conditions are fulfilled at start of T2 with >=50m location margin.

$T_{measure}$ = max(600 + 200 ms, 0) = 800 ms;

$T_{interrupt}$ = 62ms; $T_{CHO_execution}$ = 10ms.

This gives a total of 800ms + 62ms + 10ms = 872 ms.

## 14.2.1.6 NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete
- *referenceLocation* coordinates need to be updated
- Several test parameters and configuration are still in brackets
- Annex F needs to be updated

### 14.2.1.6.1 Test purpose

This test is to verify the requirement for inter-frequency SAN distance-based conditional handover from FR1 to FR1 specified in clause 14.2.1.0.2.

#### 14.2.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, distance-based conditional handover, and inter-satellite measurements.

#### 14.2.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.6.

#### 14.2.1.6.4 Test description

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying distance-based handover to cell 2 with Event D1 shall be sent to UE, at a time earlier than $T_{RRC}$ (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and offset better than cell 1 and after 11670ms of T2, location condition event *condEventD1-r17* is fulfilled.

##### 14.2.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.1.6.4.1-1.

**Table 14.2.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.6-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.6-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.6.4.1-2

**Table 14.2.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.2.1.6.4.1-3.
2. Message contents are defined in clause 14.2.1.6.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.6.4.1-3: General test parameters for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2 | Two NR NTN satellite RF channel |

| | | | | |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | FDD duplex mode cell |
| | Neighbouring cell | | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | RMC in [A.x] | For GSO satellite configuration |
| | Config 2 | | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) at T1 start | | | [(0, 0, 0)] | Set by AT command |
| UE moving speed | | km/h | [(108, 0, 0)] | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | [(-700, 0, 0)] | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | [(1300, 0, 0)] | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | [20] | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | [20] | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 | |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 | |
| A3-Offset in condition | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 1 | |
| T2 | | s | 12 | |

#### 14.2.1.6.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.2.1.6.4.1-3. Both handover delay and interruption length are tested.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Establish SRB2 and DRB. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 14.2.1.6.5-1. Propagation conditions are set according to Annex C clause C.2.2. The SS shall configure UE position and moving speed. Immediately after that, T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration-r16* on Cell 1 to configure distance-based CHO condition on the UE.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.6.5-1. T2 starts.

6. If the UE transmits the PRACH preambles to Cell 2 less than 11741 ms from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for the next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.1.6.4.3 Message contents

**Table 14.2.1.6.4.3-1: Common Exception messages for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO_D_CHO for Config 2 |

**Table 14.2.1.6.4.3-2: *RRCReconfiguration* for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 14.2.1.6.4.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 14.2.1.6.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.6.4.3-3: *MeasConfig* (Table 14.2.1.6.4.3-2) for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 14.2.1.6.4.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-D1 | Table 14.2.1.6.4.3-5 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 14.2.1.6.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 1 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 14.2.1.6.4.3-4: *MeasObjectNR* (Table 14.2.1.6.4.3-3) for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 14.2.1.6.4.3-5: *ReportConfigNR-D1* (Table 14.2.1.6.4.3-3) for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventD1-r17 SEQUENCE { | | | |
| distanceThreshFromReference1-r17 | [20] | 1000m = 20*50m | |
| distanceThreshFromReference2-r17 | [20] | 1000m = 20*50m | |
| referenceLocation1-r17 | FFS | Delta coordinates (-700,0,0) from UE initial coordinates, in meters | |
| referenceLocation2-r17 | FFS | Delta coordinates (1300,0,0) from UE initial coordinates, in meters | |
| hysteresisLocation-r17 | 0 | 0m = 0*10m | |
| timeToTrigger-r17 | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.6.4.3-6: *ReportConfigNR-A3* (Table 14.2.1.6.4.3-3) for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | -2 | actuall value = -2*0.5 = -1dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.1.6.4.3-7: *ConditionalReconfiguration* (Table 14.2.1.6.4.3-2) for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>MeasId configured in Table 14.2.1.6.4.3-3 Event D1 | |
| MeasId[2] | 2 | entry 2<br>MeasId configured in Table 14.2.1.6.4.3-3 Event A3 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

14.2.1.6.5 Test requirements

Table 14.2.1.6.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access.

**Table 14.2.1.6.5-1: Cell specific parameters for NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|

| | | Test configuration | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2 | | 1 | | 2 | |
| $BW_{channel}$ | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| BWP BW | | | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| $TA_{Common}$ | | Config 1, 2 | s | 0 | | 0 | |
| $TA_{CommonDrift}$ | | | s | 0 | | 0 | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | 0 | |
| $K_{offset}$ | | Config 1 | ms | 239 | | 239 | |
| | | Config 2 | ms | 4 | | 4 | |
| $K_{mac}$ | | Config 1, 2 | ms | 0 | | 0 | |
| DRX Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | |
| OCNG Patterns | | | | OP.1 | | | |
| SMTC Configuration | | | | SMTC.1 | | | |
| SSB Configuration | | | | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | |
| PRACH configuration | | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2 | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | Config 1, 2 | dBm/ 15kHz | -98+TT | | | |
| $N_{oc}$ Note2 | | | dBm/ SCS | -98+TT | | | |
| $\hat{E}_s / I_{ot}$ | | | dB | 4+TT | 4+TT | -Infinity | 9+TT |
| $\hat{E}_s / N_{oc}$ | | | dB | 4+TT | 4+TT | -Infinity | 9+TT |
| SSB_RP | | | dBm/ SCS | -94+TT | -94+TT | -Infinity | -89+TT |
| Io Note3 | | | dBm/ 9.36MHz | -64.59+TT | -64.59+TT | -70.05 | -60.53+TT |
| Propagation condition | | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 later than 11670ms and less than 11741 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay is defined in TS 38.133 [6] clause 6.1C.2, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{Event_DU}$ = start of T2

UE moving speed, v = (108km/h*1000/3600) = 30m/s.

At 11670ms after start of T2,

distance to source cell reference location is 30 m/s * 11.67 s – (-700)m = 1050m, and D1-1 = 1000m

distance to target cell reference location is 30 m/s * 11.67 s – 1300m = -950m, and D1-2 = 1000m

i.e. D1-1 and D1-2 conditions are fulfilled at T2 + 11670ms with >=50m location margin.

$T_{measure}$ = max(600 + 200 ms, 11670ms) = 11670ms;

$T_{interrupt}$ = 62ms; $T_{CHO_execution}$ = 10ms.

This gives a total of 11670ms + 62ms + 10ms = 11741 ms.

### 14.2.1.8 NR SA FR1 RACH-less Handover for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Several test parameters and configuration are still in brackets
- MU and TT analysis is incomplete
- Message contents need to be updated
- Applicability needs to be updated

#### 14.2.1.8.1 Test purpose

To verify the requirement for Intra-frequency SAN RACH-less Handover from FR1 to FR1 specified in clause 14.2.1.0.1.3.

#### 14.2.1.8.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access and [RACH-less handover].

#### 14.2.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.1.8.

#### 14.2.1.8.4 Test description

##### 14.2.1.8.4.1 Initial conditions

The test scenario comprises of one NR carrier and two satellite access cells as given in tables 14.2.1.8.4.1-3 and 14.2.1.8.5-1. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell with Event A3 report.

Starting T2, Cell 2 becomes detectable and offset better than Cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover. During T3, Cell 2 continuously schedules PUSCH for the UE.

This test shall be tested using any of the test configurations in Table 14.2.1.8.4.1-1.

**Table 14.2.1.8.4.1-1: Supported test configurations for NR SA FR1 RACH-less Handover for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.1.8-1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 14.2.1.8-2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.1.8.4.1-2

**Table 14.2.1.8.4.1-2: Initial conditions for NR SA FR1 RACH-less Handover for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.1.8.4.3.
2. Cell 1 and Cell 2 are NR FR1 cells with the power levels set according to clauses C.1.2 and C.1.3 for this test where Cell 2 is the target cell. Both Cell 1 and Cell 2 are satellite access cells.
3. The general test parameters are given in Table 14.2.1.8.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.1.8.4.1-3: General test parameters for NR SA FR1 RACH-less Handover for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Satellite configuration | Config 1 | | Cell 1: SSC.1<br>Cell 2: NSC.1 | For GSO satellites configuration |
| | Config 2 | | Cell 1: SSC.2<br>Cell 2: NSC.2 | For NGSO inter-satellites configuration |
| UE position (N,S, H) | | | [(0, 0, 0)] | Set by any preconfigured means |
| A3-Offset | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

#### 14.2.1.8.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.2.1.8.4.1-3. Both handover delay and interruption length are tested.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.
2. Set the parameters according to T1 in Table 14.2.1.8.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message, configuring measurement object.
4. UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.1.8.5-1.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3.
7. SS shall transmit the *RRCReconfiguration* message implying handover to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 14.2.1.8.5-1. T3 starts.
8. If the UE transmits the PUSCH to Cell 2 less than [52 + $T_{IU}$] ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.
10. After T3 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
11. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
12. Once the connection is released, the SS shall switch off and then on the UE and then proceed with step 1.
13. Repeat steps 2-12 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.2.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 14.2.1.8.4.3-1: Common Exception messages for NR SA FR1 RACH-less Handover for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells<br>Table H.3.1-4 with A3-offset = 0 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange<br>Table H.3.13-1<br>Table H.3.13-2 with Condition GSO for Config 1 or Condition NGSO for Config 2 |

14.2.1.8.5 Test requirements

Table 14.2.1.8.5-1 defines the primary level settings including test tolerances for NR SA FR1 RACH-less Handover for Satellite Access.

**Table 14.2.1.8.5-1: Cell specific test parameters for NR SA FR1 RACH-less Handover for Satellite Access**

| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 | | 1 | | | 1 | | |
| $BW_{channel}$ | | | MHz | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 | | |
| BWP BW | | | MHz | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 | | |
| $TA_{Common}$ | | Config 1,2 | s | 0 | | | 0 | | |
| $TA_{CommonDrift}$ | | | s | 0 | | | 0 | | |
| $TA_{CommonDriftVariation}$ | | | s | 0 | | | 0 | | |
| $K_{offset}$ | | Config 1 | ms | 258 | | | 258 | | |
| | | Config 2 | | 14 | | | 14 | | |
| $K_{mac}$ | | Config 1,2 | ms | 0 | | | 0 | | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | | | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | | | | CR.1.1 FDD | | | | | |
| TRS configuration | | | | TRS.1.1 FDD | | | | | |
| OCNG Patterns | | | | OP.1 | | | | | |
| SMTC Configuration | | | | SMTC.1 | | | | | |
| SSB Configuration | | | | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 15 kHz | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}^{Note2}$ | | Config 1,2 | dBm/ 15 kHz | -98+TT | | | | | |
| $N_{oc}^{Note2}$ | | | dBm/ SCS | -98+TT | | | | | |

| Parameter | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| $\hat{E}_s / I_{ot}$ | | dB | 8+TT | -3.3+TT | -3.3+TT | -Infinity | 2.36+TT | 2.36+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 8+TT | 8+TT | 8+TT | -Infinity | 11+TT | 11+TT |
| SSB_RP | | dBm/ SCS | -90+TT | -90+TT | -90+TT | -Infinity | -87+TT | -87+TT |
| Io Note3 | | dBm/ 9.36 MHz | -61.41+TT | -57.06+TT | -57.06+TT | -61.41+TT | -57.06+TT | -57.06+TT |
| Propagation condition | | - | AWGN | | | AWGN | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | | |
| NOTE 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The UE shall start to transmit the PUSCH to Cell 2 less than 52 + $T_{IU}$ ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90 %.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13]. $T_{interrupt}$ is defined in clause 14.2.1.0.1.3.

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Here: $T_{search}$ = 0; $T_{IU}$ is the interruption uncertainty in acquiring the first UL transmission resource for PUSCH, which is scheduled by Cell 2 at the fist DL slot not earlier than 52 ms after the beginning of T3; $T_{processing}$ = 20 ms; $T_{\Delta}$ = 20 ms; $T_{margin}$ = 2 ms.

This gives a total of 52 + $T_{IU}$ ms.

## 14.2.2 RRC Connection Mobility Control for SAN

### 14.2.2.1 RRC Re-establishment for SAN

#### 14.2.2.1.0 Minimum conformance requirements for RRC Re-establishment for Satellite Access

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re-establish_delay} = T_{UE_re-establish_delay} + T_{UL_grant}$$

$T_{UL_grant}$: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 of TS 38.331 [13] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re-establish_delay} = 50 \text{ ms} + T_{identify_intra_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1, and

- the conditions of SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.17 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clause 10.1.4 are fulfilled for a corresponding NR Band for FR1, and

- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.18 for a corresponding NR Band are fulfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in Table 14.2.2.1.0-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in Table 14.2.2.1.0-2.

$T_{SMTC}$: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2*, $T_{smtc}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{SI-NR}$: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [13] for the target NR cell.

$T_{PRACH}$: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{PRACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

$N_{freq}$: It is the total number of NR frequencies to be monitored for RRC re-establishment; $N_{freq}$ = 1 if the target intra-frequency NR cell is known, else $N_{freq}$ = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

The requirements in this clause apply provided that the ephemeris information provided by the serving cell for the target cell is valid during UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$).

**Table 14.2.2.1.0-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| Serving cell SSB Ês/Iot (dB) | FR of target NR cell | $T_{identify_intra_NR}$ [ms] | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x $T_{SMTC}$) | $K_{multi_SMTC}$ * MAX (800 ms, 10 x $T_{SMTC}$) |
| < -8 | FR1 | N/A | k * 800 ms Note1, 3 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB. | | | |
| Note 2: $K_{multi_SMTC}$ is defined in TS 38.133 [6] clause 9.2C.5.1. | | | |
| Note 3: k = 1 if the cells on the target frequency are served by GEO. k = (N+1) if the cells on the target frequency are served by LEO, where N is the number of different satellites associated to the list of configured neighbor cells in ntn-NeighCellConfigList and ntn-NeighCellConfigListExt. | | | |

**Table 14.2.2.1.0-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB Ês/Iot (dB) | FR of target NR cell | $T_{identify_inter_NR,\ i}$ [ms] |
|---|---|---|

| | | Known NR cell | Unknown NR cell |
|---|---|---|---|
| ≥ -8 | FR1 | MAX (200 ms, 6 x $T_{SMTC,i}$) | K_satellite * MAX (800 ms, 13 x $T_{SMTC,i}$) |
| < -8 | FR1 | N/A | k * 800 ms Note1, 3 |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.<br>Note 2: K_satellite is defined in TS 38.133 [6] clause 9.3C.4.<br>Note 3: k = 1 if the cells on the target frequency are served by GEO. k = (N+1) if the cells on the target frequency are served by LEO, where N is the number of different satellites associated to the list of configured neighbor cells in ntn-NeighCellConfigList and ntn-NeighCellConfigListExt. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2C.1.

### 14.2.2.1.1 NR SA FR1 RRC Re-establishment for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Message contents may need to be updated
- Applicability may need to be updated
- Several test parameters and configuration are still TBD or need to be recalculated
- Re-establishment delay calculation needs to be aligned with legacy tests

#### 14.2.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in clause 14.2.2.1.0.

#### 14.2.2.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.2.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.1.1.

#### 14.2.2.1.1.4 Test description

The test parameters are given in Table 14.2.2.1.1.4.1-3 and Table 14.2.2.1.1.5-1 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

##### 14.2.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.1.1.4.1-1.

**Table 14.2.2.1.1.4.1-1: Supported test configurations for NR SA FR1 RRC Re-establishment for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.2.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.2.2.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.1.1.4.1-2.

**Table 14.2.2.1.1.4.1-2: Initial conditions for NR SA FR1 RRC Re-establishment for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.1.1.4.3.
2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 1 and Cell 2 are satellite access cells.
3. The test parameters are given in Table 14.2.2.1.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.1.1.4.1-3: General test parameters for NR SA FR1 RRC Re-establishment for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cells | | 1, 2 | Cell2 | |
| Final condition | Active cell | | 1, 2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| N310 | | - | 1, 2 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.2 | |
| DRX cycle length | | s | 1, 2 | OFF | |
| PRACH configuration | | | 1, 2 | PRACH.1 FR1 | |
| T1 | | s | 1, 2 | 5 | |
| T2 | | ms | 1, 2 | 640 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1C of TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1C.5 of TS 38.133 [6]) |
| T3 | | s | 1, 2 | 2 | |

### 14.2.2.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 14.2.2.1.1.5-1. T1 starts.
3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within [FFS ms (= FFSms + FFS s) from the beginning of time period T2], then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.2.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.1.1.4.3-1: Common Exception messages for NR SA FR1 RRC Re-establishment for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.2.2.1.1.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 RRC Re-establishment for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms3000 | | |
| n311 | n1 | | |
| } | | | |

#### 14.2.2.1.1.5 Test Requirement

Table 14.2.2.1.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RRC Re-establishment for Satellite Access.

**Table 14.2.2.1.1.5-1: Cell-specific test parameters for NR SA FR1 RRC Re-establishment for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | 1 | SSC.1 | | | NSC.1 | | |
| | | 2 | SSC.2 | | | NSC.2 | | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | 1, 2 | OP.1 | | | OP.1 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | 1, 2 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 7 | -infinity | -infinity | 4 | 4 | 4 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| Propagation Condition | | 1, 2 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra-frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 \text{ ms} + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR} = 200$ ms

$T_{SI}$ = 1280 ms, provided that SIB1 and SIB19 are scheduled with 20ms period; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of [1545] ms, allow [1.6] s in the test case.

### 14.2.2.1.2 NR SA FR1-FR1 RRC Re-establishment for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Message contents may need to be updated

- Applicability may need to be updated
- Several test parameters and configuration are still TBD or need to be recalculated
- Re-establishment delay calculation needs to be aligned with legacy tests

#### 14.2.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in clause 14.2.2.1.0.

#### 14.2.2.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.2.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.1.2.

#### 14.2.2.1.2.4 Test description

The test parameters are given in Table 14.2.2.1.2.4.1-3 and Table 14.2.2.1.2.5-1 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

##### 14.2.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.1.2.4.1-1.

**Table 14.2.2.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.2.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.2.2.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.1.2.4.1-2.

**Table 14.2.2.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.1.2.4.3.

2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Cell 1 and Cell 2 are satellite access cells.

3. The test parameters are given in Table 14.2.2.1.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.1.2.4.1-3: General test parameters for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cells | | 1, 2 | Cell2 | |
| Final condition | Active cell | | 1, 2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 ms | Asynchronous cells |
| N310 | | - | 1, 2 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.2 | |
| DRX cycle length | | s | 1, 2 | OFF | |
| PRACH configuration | | | 1, 2 | PRACH.1 FR1 | |
| T1 | | s | 1, 2 | 5 | |
| T2 | | ms | 1, 2 | 640 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1C of TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1C.5 of TS 38.133 [6] ) |
| T3 | | s | 1, 2 | 5 | |

### 14.2.2.1.2.4.2 Test Procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 14.2.2.1.2.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within [FFS ms (= FFSms + FFS s) from the beginning of time period T2], then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.2.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.2.2.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms5000 | | |
| n311 | n1 | | |
| } | | | |

#### 14.2.2.1.2.5 Test Requirement

Table 14.2.2.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1-FR1 RRC Re-establishment for Satellite Access.

**Table 14.2.2.1.2.5-1: Cell-specific test parameters for NR SA FR1-FR1 RRC Re-establishment for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information | | 1 | SSC.1 | | | NSC.1 | | |
| | | 2 | SSC.2 | | | NSC.2 | | |
| RF Channel Number | | 1, 2 | 1 | | | 2 | | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern | | 1, 2 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | 1, 2 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -98 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -98 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -62.26 |
| Propagation Condition | | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter-frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50\ ms + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 2$

$T_{identify_intra_NR}$ = 800 ms

$T_{identify_inter_NR}$ = 800 ms

$T_{SI}$ = 1280 ms, provided that SIB1 and SIB19 are scheduled with 20ms period; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target inter-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of [2945] ms, allow [3] s in the test case.

## 14.2.2.2 Random Access for SAN

### 14.2.2.2.0 Minimum conformance requirements for random access for Satellite Access

The UE shall select the type of random access at initiation of the random access procedure based on network configuration, as specified in clause 5.1.1 in TS 38.321 [12].

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [8] and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as specified in table 6.3.4.2-1 of TS 38.101-1 [2] for FR1. The relative power applied to additional preambles shall have an accuracy as specified in table 6.3.4.3-1 of TS 38.101-1 [2] for FR1.

The UE shall indicate a random access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in clause 5.1.4 in TS 38.321 [12].

The requirements in this clause apply for UE in SA operation mode.

The UE initial transmission timing error shall be less than or equal to $\pm T_{e_NTN}$ where the timing error limit value $T_{e_NTN}$:

- is specified in table 14.2.2.2.0-1 for FR1-NTN.

**Table 14.2.2.2.0-1: $T_{e_NTN}$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_{e_NTN}$ |
|---|---|---|---|
| FR1-NTN | 15 | 15 | 29*64*$T_c$ |
| | | 30 | 24*64*$T_c$ |
| | | 60 | N/A |
| | 30 | 15 | 24*64*$T_c$ |
| | | 30 | 22*64*$T_c$ |
| | | 60 | N/A |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

The UE shall meet the $T_{e_NTN}$ requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_c$.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_{e_NTN}$ then the UE shall adjust the timing such that timing error is to within $\pm T_{e_NTN}$. The reference timing shall be $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satellite position update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ between the previous transmission and the current transmission, in one adjustment shall be $T_{q_NTN}$.

2) The minimum aggregate adjustment rate, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satellite position update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ during the last one second, shall be $T_{p_NTN}$ per second.

3a) For a FR1-NTN UE or a FR2-NTN fixed UE, the maximum aggregate adjustment rate, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satelliteposition update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ during the last 200 ms, shall be $T_{q_NTN}$ per 200 ms.

Where, the maximum autonomous time adjustment step $T_{q_NTN}$ and the aggregate adjustment rate $T_{p_NTN}$ are specified in table 14.2.2.2.0-2.

**Table 14.2.2.2.0-2: $T_{q_NTN}$ Maximum Autonomous Time Adjustment Step and $T_{p_NTN}$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_{q_NTN}$ | $T_{p_NTN}$ |
|---|---|---|---|
| FR1-NTN | 15 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 30 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 60 | N/A | N/A |
| FR2-NTN | 60 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| | 120 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

### 14.2.2.2.0.1 Contention based random access

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SSB is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the

selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

#### 14.2.2.2.0.2 Non-Contention based random access

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with any of the SSBs and/or CSI-RSs is configured, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs or the selected CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, or from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions or the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from UE, as specified in clause 5.1.4 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to UE's C-RNTI is received, as specified in clause 5.1.4 in TS 38.321 [12].

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

### 14.2.2.2.1 NR SA FR1 4-step contention based random access for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- MU and TT analysis is incomplete
- Test applicability in 38.522 is missing

#### 14.2.2.2.1.1 Test purpose

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 14.2.2.2.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.2.2.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.2.1.

#### 14.2.2.2.1.4 Test description

##### 14.2.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 14.2.2.2.1.4.1-1.

**Table 14.2.2.2.1.4.1-1: Supported test configurations for contention based random access test for satellite access**

| Configuration | Description |
|---|---|
| 1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.2.1.4.1-2.

**Table 14.2.2.2.1.4.1-2: Initial conditions for NR SA FR1 RRC Re-establishment for Satellite Access**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.2.1.4.1-1 | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.2.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 are satellite access cells.
3. The test parameters are given in Table 14.2.2.2.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.2.1.4.1-3: General test parameters for contention based random access test for satellite access**

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1 | | SSB pattern 1 in FR1 | As defined in A.3.10 in TS 38.133 [6], except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | | Config 2 | | SSB pattern 2 in FR1 | |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3.10 in TS 38.133 [6] |
| SS/PBCH block index | | | | 0,1 | Different from the definition in A.3.10 in TS 38.133 [6] |
| Duplex Mode for Cell 1 | | Config 1 | | FDD | |
| | | Config 2 | | FDD | |
| CSI-RS for tracking | | Config 1, 2 | | TRS.1.1 FDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.3.2.1 in TS 38.133 [6] |
| PDSCH parameters Note 4 | | Config 1, 2 | | SR.1.1 FDD | As defined in A.3.1.1 in TS 38.133 [6] |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.1.1 FDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | dB | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | dB | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | dB | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | dB | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2 | dBm/15 kHz | -98 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2 | dBm/15 kHz | -98 | |

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -115 | |
| Io Note 2 | | Config 1, 2 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331. |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | | FR1 PRACH configuration 1 | As defined in A.3.8. |
| Propagation Condition | | | - | AWGN | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
NOTE 3: Void
NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### 14.2.2.2.1.4.2 Test Procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14].

2. Set the parameters according to Table 14.2.2.2.1.4.1-3.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.1.4.2. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 14.2.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.1.4.2. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 14.2.2.2.1.4.2.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

   7.1. Repeat steps 1-3.

   7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

   7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

   7.5. The UE shall re-transmit the msg3.

   7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

   8.1. Repeat steps 1-3.

   8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

   8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

   8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.1.4.2.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

   9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.1.4.2.

#### 14.2.2.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 14.2.2.2.1.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 14.2.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |
| } | | | |

**Table 14.2.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |

| | | | |
|---|---|---|---|
| totalNumberOfRA-Preambles | 48 | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n48 | | FR1 |
| } | | | |
| groupBconfigured SEQUENCE { | | | |
| numberOfRA-PreamblesGroupA | 48 | | |
| } | | | |
| ra-ContentionResolutionTimer | sf48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | |
| } | | | |

**Table 14.2.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | FR1 |
| msg1-FDM | one | | FR1 |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 14.2.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 14.2.2.2.1.5 Test requirement

Tables 14.2.2.2.1.5-1, 14.2.2.2.1.5-2 and 14.2.2.2.1.5-3 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 14.2.2.2.1.5-1.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 14.2.2.2.1.5-2.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 14.2.2.2.1.5-3.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 14.2.2.2.1.5-1.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 14.2.2.2.1.5-2.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 14.2.2.2.1.5-3.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 14.2.2.2.1.5-1.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 14.2.2.2.1.5-3.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table14.2.2.2.1.5-1.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 14.2.2.2.1.5-3.

**Table 14.2.2.2.1.5-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal | ± 9.0 dB + TT |

**Table 14.2.2.2.1.5-2: Relative power tolerance**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 2.5 + TT |

**Table 14.2.2.2.1.5-3: $T_{e_NTN}$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_{e_NTN}$ |
|---|---|---|---|
| FR1-NTN | 15 | 15 | TT + 29*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [6] | | | |

### 14.2.2.2.2 NR SA FR1 4-step non-contention based random access for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- MU and TT analysis is incomplete
- Test applicability in 38.522 is missing

#### 14.2.2.2.2.1 Test purpose

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

#### 14.2.2.2.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.2.2.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.2.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.2.2.

#### 14.2.2.2.2.4 Test description

##### 14.2.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 14.2.2.2.2.4.1-1.

**Table 14.2.2.2.2.4.1-1: Supported test configurations for non-contention based random access test for satellite access**

| Configuration | Description |
|---|---|
| 1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.2.2.4.1-2.

**Table 14.2.2.2.2.4.1-2: Initial conditions for NR SA FR1 RRC Re-establishment for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.2.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.2.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 are satellite access cells.
3. The test parameters are given in Table 14.2.2.2.2.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.2.2.4.1-3: General test parameters for non-contention based random access test satellite access**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB pattern 1 in FR1 | SSB pattern 1 in FR1 | As defined in A.3.10 in TS 38.133 [6], except for number of SSBs per SS-burst and |
| | Config 2 | | SSB pattern 2 in FR1 | SSB pattern 2 in FR1 | |

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| | | | | | SS/PBCH block index as below |
| Number of SSBs per SS-burst | | | 2 | 2 | Different from the definition in A.3.10 in TS 38.133 [6] |
| SS/PBCH block index | | | 0,1 | 0,1 | Different from the definition in A.3.10 in TS 38.133 [6] |
| CSI-RS Configuration | Config 1, 2 | | N/A | CSI-RS.1.1 FDD | As defined in A.3.1.4 in TS 38.133 [6] |
| Duplex Mode for Cell 1 | Config 1, 2 | | FDD | FDD | |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.1 FDD | TRS.1.1 FDD | |
| OCNG Pattern Note 1 | | | OP.1 | OP.1 | As defined in A.3.2.1 in TS 38.133 [6] |
| PDSCH parameters Note 4 | Config 1, 2 | | SR.1.1 FDD | SR.1.1 FDD | As defined in A.3.1.1 in TS 38.133 [6] |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.1 FDD | CCR.1.1 FDD | |
| NR RF Channel Number | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | |
| EPRE ratio of PBCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | dB | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | dB | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | dB | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ Config 1, 2 | dBm/15 kHz | -98 | -98 | |
| | $\hat{E}_s / N_{oc}$ | dB | 3 | 3 | |
| | SS-RSRP Note 3 | dBm/ SCS | -95 | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ Config 1, 2 | dBm/15 kHz | -98 | -98 | |
| | $\hat{E}_s / N_{oc}$ | dB | -17 | -17 | |
| | SS-RSRP Note 3 | dBm/ SCS | -115 | -115 | |
| Io Note 2 | Config 1, 2 | dBm | -65.3/9.36 MHz | -65.3/9.36 MHz | For symbols without SSB index 1 |
| ss-PBCH-BlockPower | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A.3.8.2 in TS 38.133 [6] |
| Propagation Condition | | - | AWGN | AWGN | |

| Parameter | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. | | | | |
| NOTE 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. | | | | |
| NOTE 3: Void | | | | |
| NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | |

#### 14.2.2.2.2.4.2 Test Procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Ensure the UE will choose SSB with index 0 to complete this procedure. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 14.2.2.2.2.4.1-3 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 14.2.2.2.2.4.1-3 Subtest 2.

   5.2. Repeat steps 1-3.

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 14.2.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

7.1. Repeat steps 1-3.

7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 14.2.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 14.2.2.2.2.5.

#### 14.2.2.2.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 14.2.2.2.2.4.3-0: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Common exceptions to the contents of TS 38.508-1 [14] | Table 4.6.3-115 with SSB-Index 0<br>Table 4.6.3-120 with SSB-Index 0 |

**Table 14.2.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-62 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FrequencyInfoUL-SIB SEQUENCE { | | | |
| p-Max | 23 | 23 dBm | |
| } | | | |

**Table 14.2.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-128 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| totalNumberOfRA-Preambles | 48 | | |
| rsrp-ThresholdSSB | RSRP_51 | | Subtest 1 |
| prach-RootSequenceIndex CHOICE { | | | |
| 0 | | | |
| } | | | |
| msg1-SubcarrierSpacing | kHz 15 | | |
| } | | | |

**Table 14.2.2.2.2.4.3-3: CellGroupConfig for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | ServCellIndex | | |
| reconfigurationWithSync SEQUENCE { | | | |
| newUE-Identity | 1 | | |
| t304 | ms1000 | | |
| rach-ConfigDedicted | | | |
| uplink | RACH-ConfigDedicated for Non-Contention Based Random Access | Table 6.3.2.2.2.4.3-4 | |
| } | | | |
| spCellConfigDedicated SEQUENCE { | | | |
| firstActiveDownlinkBWP-Id | BWP-Id | | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| srs-Config | SRS-Config | | |
| } | | | |
| firstActiveUplinkBWP-Id | BWP-Id | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.2.2.2.4.3-4: RACH-ConfigDedicated for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-129 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigDedicated::= SEQUENCE { | | | |
| cfra SEQUENCE { | | | |
| occasions SEQUENCE { | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| } | | | |
| resources CHOICE { | | | |
| ssb SEQUENCE { | | | |
| ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF { | 1 entry | | |
| ssb[1] | 0 | | |
| ra-PreambleIndex[1] | 40 | | Subtest 1 |
| } | | | |
| ra-ssb-OccasionMaskIndex | 1 | | Subtest 1 |
| } | | | |
| csirs SEQUENCE { | | | |
| csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF { | | | |
| ra-OccasionList | 1 | | Subtest 2 |
| ra-PreambleIndex[1] | 40 | | Subtest 2 |
| } | | | |
| rsrp-ThresholdCSI-RS | RSRP_51 | | Subtest 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.2.2.2.2.4.3-5: RACH-ConfigGeneric for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 102 | | |

| | | | |
|---|---|---|---|
| msg1-FDM | one | | |
| zeroCorrelationZoneConfig | 11 | | |
| preambleReceivedTargetPower | -120 | | |
| preambleTransMax | n6 | | |
| powerRampingStep | dB2 | | |
| ra-ResponseWindow | sl10 | | |
| } | | | |

**Table 14.2.2.2.2.4.3-6: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '1100 0000'B | | |
| } | | | |
| ss-PBCH-BlockPower | -5 | | |
| } | | | |

### 14.2.2.2.2.5 Test requirement

Tables 14.2.2.2.2.5-1, 14.2.2.2.2.5-2 and 14.2.2.2.2.5-3 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 14.2.2.2.2.5-1.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 14.2.2.2.2.5-2.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 14.2.2.2.2.5-3.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table14.2.2.2.2.5-1.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 14.2.2.2.2.5-2.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 14.2.2.2.2.5-3.

**Table 14.2.2.2.2.5-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal | ± 9.0 dB + TT |

**Table 14.2.2.2.2.5-2: Relative power tolerance**

| Power step ΔP (Up or down) (dB) | PRACH (dB) |
|---|---|
| 2 ≤ ΔP < 3 | ± 2.5 + TT |

**Table 14.2.2.2.2.5-3: $T_{e_NTN}$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_{e_NTN}$ |
|---|---|---|---|
| FR1-NTN | 15 | 15 | TT + 29*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [6] | | | |

## 14.2.2.3 RRC Connection Release with Redirection for SAN

### 14.2.2.3.0 Minimum conformance requirements

This clause contains requirements on the UE regarding RRC connection release with redirection procedure. RRC connection release with redirection is initiated by the RRCRelease message with redirection to NR from NR specified in TS 38.331 [13]. The RRC connection release with redirection procedure is specified in clause 5.3.8 of TS 38.331 [13].

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detetable when for each relevant SSB, the following side conditions are met,

- the conditions of SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.5 for a corresponding NR Band are fulfilled.

- $T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

- $T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depends on the FR of the target NR cell. It is defined in Table 14.2.2.3.0-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and $T_{meas}$ is the measurement time due to cell selection criteria evaluation.

- $T_{SI\text{-}NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. $T_{RACH:}$ It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{RACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

- $T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with $T_{rs}$ = 20 ms if the SSB transmission periodicity is not larger than 20 ms; otherwise,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

The requirements in this clause apply provided that the ephemeris information provided by the serving cell for the target cell is valid during time delay ($T_{connection_release_redirect_NR}$).

**Table 14.2.2.3.0-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| FR of target NR cell | $T_{identify-NR}$ |
|---|---|
| FR1 | K_satellite * MAX (680 ms, 11 x $T_{rs}$) |
| Note 1: If the UE has been provided with higher layer signaling of *smtc2* specified in TS 38.331 [13] prior to the redirection command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |
| Note 2: K_satellite is defined in TS 38.133 [6] clause 9.3C.4. | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2C.3.

### 14.2.2.3.1 NR SA FR1-FR1 RRC connection release with redirection for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- MU and TT analysis is incomplete
- Message contents need to be updated
- Applicability needs to be updated
- Annex E and F need to be updated

#### 14.2.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR to NR requirements for Satellite Access specified in clause 14.2.2.3.0.

#### 14.2.2.3.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.2.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 14.2.2.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.3.1.

#### 14.2.2.3.1.4 Test description

##### 14.2.2.3.1.4.1 Initial conditions

Supported test configurations are shown in table 14.2.2.3.1.4.1-1. The time delay is tested by using the parameters in table 14.2.2.3.1.4.1-3, and 14.2.2.3.1.5-1.

**Table 14.2.2.3.1.4.1-1: Redirection from NR to NR test configurations**

| Configuration | Description |
|---|---|
| 14.2.2.3.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.2.2.3.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.3.1.4.1-2.

**Table 14.2.2.3.1.4.1-2: Initial conditions for NR SA FR1-FR1 RRC connection release with redirection for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.3.1.4.3.
2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
3. The test parameters are given in Table 14.2.2.3.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 14.2.2.3.1.4.2 Test Procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.2.2.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.2.3.1.4.3 Message Contents

FFS

### 14.2.2.3.1.5 Test Requirement

Table 14.2.2.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case for satellite access.

**Table 14.2.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1, 2 | | FDD | | | |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 | | | |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.1 FDD | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 2 | | SR.1.1 FDD | | | |
| CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | |
| SMTC configuration | Config 1,2 | | SMTC.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98+TT | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98+TT | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4+TT | 4+TT | -infinity | 4+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4+TT | 4+TT | -infinity | 4+TT |
| Io Note3 | Config 1,2 | dBm/9.36MHz | -64.59+TT | -64.59+TT | -70.05+TT | -64.59+TT |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
|---|---|

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.
The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

Where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR}$ = 680 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

$T_{RACH}$ = 170 ms in the test.

This gives a total of 2240 ms.

### 14.2.2.4 NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- MU and TT analysis is incomplete
- Annex F needs to be updated

#### 14.2.2.4.1 Test purpose

This test is to verify the requirement for RACH-based hard satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 14.2.2.4.4.

#### 14.2.2.4.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access and either hard satellite switching with re-synchronization or soft satellite switching with re-synchronization.

#### 14.2.2.4.3 Minimum conformance requirement

The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, $K_{offset}$, and $K_{mac}$ for target NR SAN cell during $D_{switch_unchangedPCI}$, otherwise interruption time may be longer than the requirements in clause 14.2.2.4.3.2.

Requirements for hard satellite switching are applicable for UEs that support *hardSatelliteSwitchResyncNTN-r18* or *softSatelliteSwitchResyncNTN-r18* [11] when the network configures hard satellite switching with resynchronization [13]; or for UEs that support *hardSatelliteSwitchResyncNTN*-r18 but do not support *softSatelliteSwitchResyncNTN-r18* when the network configures soft satellite switching with resynchronization.

##### 14.2.2.4.3.1 Satellite switching delay

When the UE receives a broadcast message implying satellite switching within re-synchronization, the UE shall be ready to start the transmission of the new uplink PRACH channel or transmission of the new uplink PUSCH channel within $D_{switch_unchangedPCI}$ msec.

Where:

- $D_{switch_unchangedPCI}$ equals to the interruption time stated in clause 14.2.2.4.3.2.

#### 14.2.2.4.3.2 Interruption time for hard satellite switch with re-sync

The interruption time is the time between *t-service* and the time when the UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite.

When intra-frequency hard switch to NR SAN cell is commanded,

the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Otherwise, no interruption time requirement is applied.

Where:

- $T_{search}$ is the time required to search the target NR SAN cell assuming the target cell is not already known when UE starts synchronizing with target satellite. If the target cell Es/Iot $\geq$ -2 dB, then $T_{search} = T_{first_SSB}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.
- $T_{\Delta}$ is same as the one defined in TS 38.133 [6] section 6.1C.1.2.2.1.
- $T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 10 ms.
- $T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2 ms.
- $T_{first_SSB}$ is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, and if *ssb-TimeOffset* is configured, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from the *SSB-TimeOffset* reference point as defined in TS 38.331 [13] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *T-service* until the satellite switch completion.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.3.

### 14.2.2.4.4 Test description

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in Tables 14.2.2.4.4.1-1, 14.2.2.4.4.1-3, 14.2.2.4.5-1 and 14.2.2.4.5-2. Both satellite switching delay and interruption length are tested.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, The SIB19 implying *t-service-r17* and target satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in Table 14.2.2.4.5-1.

At the start of time duration T2, Cell 2 becomes detectable and *t-service-r17* of Cell 1 is fulfilled.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.4.

#### 14.2.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.4.4.1-1.

**Table 14.2.2.4.4.1-1: Supported test configurations for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.2.4-1 | NGSO, NR FDD, 15 kHz SSB SCS, 10 MHz BW |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.4.4.1-2.

**Table 14.2.2.4.4.1-2: Initial conditions for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.4.4.3.
2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
3. The test parameters are given in Table 14.2.2.4.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.4.4.1-3: General test parameters for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | |
| Final condition | Active cell | | Cell 2 | |
| UE position (N,S, H) | | | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

### 14.2.2.4.4.2 Test Procedure

In this test Cell 1 and Cell 2 have the same physical cell identity. This identity does not change across iterations.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.2.2.4.5-1. Propagation conditions are set according to Annex C clause C.2.2. Cell 1 broadcasts SIB19 according to Table 14.2.2.4.4.3-1. T1 starts.
3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.4.5-1. At the same time, *t-Service-r17* of Cell 1 expires, causing the UE to trigger a satellite switch.
4. The UE shall start satellite switching on Cell 2. If the UE transmits the uplink PRACH channel to Cell 2 less than 52.5 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
5. After T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
6. Once the connection is released, the SS shall switch off and then on the UE.
7. Repeat steps 1-6 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.2.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.4.4.3-1: SIB19 for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: 38.508-1 Table 7.6.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB19-r17 ::= SEQUENCE { | | | |
| ntn-Config-r17::= SEQUENCE { | | | |
| epochTime-r17 | Not present | | |
| ntn-UlSyncValidityDuration-r17 | s5 | | |
| cellSpecificKoffset-r17 | 14 | | |
| kmac-r17 | Not present | | |
| ta-Info-r17 SEQUENCE { | | | |
| ta-Common-r17 | 0 | | |
| ta-CommonDrift-r17 | 0 | | |
| ta-CommonDriftVariant-r17 | 0 | | |
| } | | | |
| ntn-PolarizationDL-r17 | linear | | |
| ntn-PolarizationUL-r17 | linear | | |
| ephemerisInfo-r17 | EphemerisInfo-r17 | 38.508-1 Clause 7.6.2 | |
| ta-Report-r17 | Not present | | |
| } | | | |
| t-service-r17 | 100*T | T is the time difference in seconds between end of T1 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms | |
| ntn-NeighCellConfig-r17 | Not present | | |
| satSwitchWithResync-r18 | SatSwitchWithReSync-r18 | Table 14.2.2.4.4.3-2 | |
| } | | | |

**Table 14.2.2.4.4.3-2: *SatSwitchWithReSync-r18* for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: 38.508-1 Table 4.6.2-18C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SatSwitchWithReSync-r18 ::= SEQUENCE { | | | |
| ntn-Config-r18::= SEQUENCE { | | | |
| epochTime-r17 | Not present | | |
| ntn-UlSyncValidityDuration-r17 | s5 | | |
| cellSpecificKoffset-r17 | 14 | | |
| kmac-r17 | Not present | | |
| ta-Info-r17 SEQUENCE { | | | |
| ta-Common-r17 | 0 | | |
| ta-CommonDrift-r17 | 0 | | |
| ta-CommonDriftVariant-r17 | 0 | | |
| } | | | |
| ntn-PolarizationDL-r17 | linear | | |
| ntn-PolarizationUL-r17 | linear | | |
| ephemerisInfo-r17 | EphemerisInfo-r17 | 38.508-1 Clause 7.6.3.2 | |
| ta-Report-r17 | Not present | | |
| } | | | |
| t-ServiceStart-r18 | Not present | | |
| ssb-TimeOffset-r18 | 0 | | |
| } | | | |

#### 14.2.2.4.5 Test Requirement

Table 14.2.2.4.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access.

**Table 14.2.2.4.5-1: Cell-specific test parameters for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Parameter | | Unit | Cell 1[Note1] | | Cell 2[Note1] | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite configuration[Note2] | | | SSC.2 | N/A | N/A | SSC.2 |
| $BW_{channel}$ | | MHz | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 |
| BWP BW | | MHz | 10: $N_{PRB,c}$ = 52 | | | 10: $N_{PRB,c}$ = 52 |
| $K_{mac}$ | | ms | 0 | | | 0 |
| DRX Cycle | | ms | Not Applicable | | | Not Applicable |
| PDSCH Reference measurement channel | | | SR.1.1 FDD | | | SR.1.1 FDD |
| CORESET Reference Channel | | | CR.1.1 FDD | | | CR.1.1 FDD |
| TRS configuration | | | TRS.1.1 FDD | | | TRS.1.1 FDD |
| OCNG Patterns | | | OP.1 | | | OP.1 |
| SMTC Configuration | | | SMTC.1 | | | SMTC.1 |
| SSB Configuration | | | SSB.1 FR1 | | | SSB.1 FR1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | 15 kHz |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | 15 kHz |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | FR1 PRACH configuration 1 |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | DLBWP.0.1 |
| | Dedicated DL BWP | | DLBWP.1.1 | | | DLBWP.1.1 |
| | Initial UL BWP | | ULBWP.0.1 | | | ULBWP.0.1 |
| | Dedicated UL BWP | | ULBWP.1.1 | | | ULBWP.1.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ [Note3] | | dBm/ 15 kHz | -98+TT | | | |
| $N_{oc}$ [Note3] | | dBm/ SCS | -98+TT | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8+TT | -Infinity | -Infinity | 8+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 8+TT | -Infinity | -Infinity | 8+TT |
| SSB_RP | | dBm/ SCS | -90+TT | -Infinity | -Infinity | -90+TT |
| Io[Note4] | | dBm/ 9.36 MHz | -61.41+TT | -61.41+TT | -61.41+TT | -61.41+TT |
| Propagation condition | | - | AWGN | | | |

NOTE 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.
NOTE 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.
NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 5: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

**Table 14.2.2.4.5-2: Target Satellite configuration pattern for NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access**

| Parameter | TSC.1 |
|---|---|

| | |
|---|---|
| Interval between adjacent epoch time | 2.56 s |
| ntn-UlSyncValidityDuration | 5 s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ssb-TimeOffset | 0 |

The UE shall start to transmit the PRACH to Cell 2 less than 52.5 ms from the beginning of time period T2.

The rate of correct satellite switch observed during repeated tests shall be at least 90 %.

NOTE: The hard satellite switch with re-sync delay $D_{switch_unchangedPCI}$ can be expressed as: $T_{interrupt}$, where:

$T_{interrupt}$ is defined in clause 14.2.2.4.3.2.

$$D_{switch_unchangedPCI} = T_{interrupt} = T_{search} + T_{processing} + T_{\Delta} + T_{margin}\ \text{ms}$$

Here: $T_{search} = T_{first_SSB} = 0.5\text{ms}$; $T_{processing} = 10\text{ms}$; $T_{\Delta} = 20\text{ms}$; $T_{margin} = 2\text{ms}$.

Besides, interruption uncertainty $T_{IU} = 20\text{ms}$ in acquiring the first PRACH transmission resource is needed.

This gives a total of 52.5 ms.

## 14.2.2.5 NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

MU and TT analysis is incomplete

Annex F needs to be updated

### 14.2.2.5.1 Test purpose

This test is to verify the requirement for RACH-less soft satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 14.2.2.5.4.

### 14.2.2.5.2 Test applicability

This test applies to all types of NR UE release 18 and forward supporting satellite access and soft satellite switching with re-synchronization.

### 14.2.2.5.3 Minimum conformance requirement

The requirements in this clause apply provided that UE has the valid and applicable parameters of ephemeris information, common TA, DL and UL Polarization information, $K_{offset}$, and $K_{mac}$ for target NR SAN cell during $D_{switch_unchangedPCI}$, otherwise interruption time may be longer than the requirements in clause 14.2.2.5.3.2.

Requirements for soft satellite switching are applicable for UEs that support *softSatelliteSwitchResyncNTN-r18* [11] when network configures soft satellite switching with resynchronization [13].

#### 14.2.2.5.3.1 Satellite switching delay

When the UE receives a broadcast message implying satellite switching within re-synchronization, the UE shall be ready to start the transmission of the new uplink PRACH channel or transmission of the new uplink PUSCH channel within $D_{switch_unchangedPCI}$ msec.

Where:

- $D_{switch_unchangedPCI}$ equals to the interruption time stated in clause 14.2.2.5.3.2.

#### 14.2.2.5.3.2 Interruption time for hard satellite switch with re-sync

The Satellite switch delay is from *t-serviceStart* to the time instance when UE is ready to receive any DL channel/signal and transmit any UL channel/signal from/to the target satellite.

When intra-frequency soft switch to NR SAN cell is commanded,

the satellite switch time shall be less than $T_{soft_switch}$

$$T_{soft_switch} = \max(\textit{t-service} - \textit{t-seviceStart}, T_{search} + T_{\Delta} + T_{margin}) + T_{processing} \text{ ms}$$

Where:

- $T_{search}$ is the time required to search the target NR SAN cell assuming the target cell is not already known when the handover command is received by the UE. If the target cell Es/Iot $\geq$ -2 dB, then $T_{search} = T_{first_SSB}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.
- $T_{\Delta}$ is same as the one defined in TS 38.133 [6] section 6.1C.2.2.2.1.
- $T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 10 ms.
- $T_{margin}$ is same as the one defined in TS 38.133 [6] section 6.1C.2.2.2.1.
- $T_{first_SSB}$ is the time to the end of the first complete SSB burst of target satellite, the location of which is determined by the periodicity and location of SSB of the source satellite, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from *SSB-TimeOffset* reference point as defined in TS 38.331 [13] to UE.

During the time period from *t-seviceStart* to *t-service*, scheduling restriction as defined in TS 38.133 [6] clause 9.2C.5.3 is allowed, with the exception that the locations of SSB symbols of target satellite where scheduling restriction applies are determined by the periodicity and location of SSB of the source satellite, the *ssb-TimeOffset* and the difference between propagation delay of the serving satellite and the target satellite counted from the *SSB-TimeOffset* reference point as defined in TS 38.331 [13] to UE.

UE is allowed to skip measurements for other cells and satellites than the target satellite and source satellite from *t-seviceStart* to the satellite switch completion.

The requirement in this clause applies and UE is required to keep the connection (DL and UL) with the source NGSO satellite, under the following conditions:

- SSBs from the two satellites are spaced apart from each other at least by 1 OFDM symbol in the time domain at UE Rx side.

The normative reference for this requirement is TS 38.133 [6] clause 6.1C.3.

### 14.2.2.5.4 Test description

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in Tables 14.2.2.5.4.1-1, 14.2.2.5.4.1-3, 14.2.2.5.5-1 and 14.2.2.5.5-2. Satellite switching delay is tested.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively.

At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, The SIB19 implying *t-service-r17* and target satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in table 14.2.2.5.5-1. The configured grant PUSCH transmission in the Cell 2 is configured in the RRC message from Cell 1.

At the start of time duration T2, Cell 2 becomes detectable and *t-ServiceStart-r18* is fulfilled.

At the start of time duration T3, *t-service-r17* of Cell 1 is fulfilled.

The normative reference for this requirement is TS 38.133 [6] clause A.14.2.2.5.

#### 14.2.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.2.2.5.4.1-1.

**Table 14.2.2.5.4.1-1: Supported test configurations for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Configuration | Description |
|---|---|
| 14.2.2.5-1 | NGSO, NR FDD, 15 kHz SSB SCS, 10 MHz BW |

Configure the test equipment and the DUT according to the parameters in Table 14.2.2.5.4.1-2.

**Table 14.2.2.5.4.1-2: Initial conditions for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.2.2.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.2.2.5.4.3.
2. The power levels and settings for Cell 1 and Cell 2 are set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
3. The test parameters are given in Table 14.2.2.5.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.2.2.5.4.1-3: General test parameters for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell | | Cell 1 | |
| Final condition | Active cell | | Cell 2 | |
| UE position (N,S, H) | | | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| timeDomainOffset | | | 0 | |
| timeDomainAllocation | | | 0 | PUSCH MappingType A<br>*startSymbol S=0*<br>*Length* L=14 |
| timeReferenceSFN-r16 | | | sfn512 | |
| Periodcity | | | sym10x14 | |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | ms | 100 | |
| T3 | | s | ≤5 | |

#### 14.2.2.5.4.2 Test Procedure

In this test Cell 1 and Cell 2 have the same physical cell identity. This identity does not change across iterations.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.2.2.5.5-1. Propagation conditions are set according to Annex C clause C.2.2. Cell 1 broadcasts SIB19 according to Table 14.2.2.5.4.3-2. T1 starts.

3. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.2.2.5.5-1. Cell 2 becomes detectable and *t-ServiceStart-r18* is fulfilled on Cell 2, however *t-Service-r17* on Cell 1 is not yet fulfilled.

4. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 14.2.2.5.5-1. At the same time, *t-Service-r17* of Cell 1 expires, causing the UE to trigger a satellite switch.

5. The UE shall start satellite switching on Cell 2. If the UE transmits the uplink PUSCH channel to Cell 2 less than 130 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T3 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. Once the connection is released, the SS shall switch off and then on the UE.

8. Repeat steps 1-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.2.2.5.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.2.2.5.4.3-1: Common Exception messages for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | 38.508-1 [14] Table 4.6.3-15 with condition CG_Config |

**Table 14.2.2.5.4.3-2: SIB19 for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: 38.508-1 Table 7.6.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB19-r17 ::= SEQUENCE { | | | |
| ntn-Config-r17::= SEQUENCE { | | | |
| epochTime-r17 | Not present | | |
| ntn-UlSyncValidityDuration-r17 | s5 | | |
| cellSpecificKoffset-r17 | 14 | | |
| kmac-r17 | Not present | | |
| ta-Info-r17 SEQUENCE { | | | |
| ta-Common-r17 | 0 | | |
| ta-CommonDrift-r17 | 0 | | |
| ta-CommonDriftVariant-r17 | 0 | | |
| } | | | |
| ntn-PolarizationDL-r17 | linear | | |
| ntn-PolarizationUL-r17 | linear | | |
| ephemerisInfo-r17 | EphemerisInfo-r17 | 38.508-1 Clause 7.6.2 | |
| ta-Report-r17 | Not present | | |
| } | | | |
| t-service-r17 | 100*T | T is the time difference in seconds between end of T2 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms | |
| ntn-NeighCellConfig-r17 | Not present | | |
| satSwitchWithResync-r18 | SatSwitchWithReSync-r18 | Table 14.2.2.4.4.3-3 | |
| } | | | |

**Table 14.2.2.5.4.3-3: *SatSwitchWithReSync-r18* for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: 38.508-1 Table 4.6.2-18C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SatSwitchWithReSync-r18 ::= SEQUENCE { | | | |
| ntn-Config-r18::= SEQUENCE { | | | |
| epochTime-r17 | Not present | | |
| ntn-UlSyncValidityDuration-r17 | s5 | | |
| cellSpecificKoffset-r17 | 14 | | |
| kmac-r17 | Not present | | |
| ta-Info-r17 SEQUENCE { | | | |
| ta-Common-r17 | 0 | | |
| ta-CommonDrift-r17 | 0 | | |
| ta-CommonDriftVariant-r17 | 0 | | |
| } | | | |
| ntn-PolarizationDL-r17 | linear | | |
| ntn-PolarizationUL-r17 | linear | | |
| ephemerisInfo-r17 | EphemerisInfo-r17 | 38.508-1 Clause 7.6.3.2 | |
| ta-Report-r17 | Not present | | |
| } | | | |
| t-ServiceStart-r18 | 100*T | T is the time difference in seconds between end of T1 and the 00:00:00 UTC on Gregorian calendar date 1 January, 1900. Units in 10ms | |
| ssb-TimeOffset-r18 | 10 | | |
| } | | | |

**Table 14.2.2.5.4.3-4: *ConfiguredGrantConfig* for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: TS 38.508-1 [14], clause 4.6.3-26 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConfiguredGrantConfig ::= SEQUENCE { | | | |
| periodicity | sym10x14 | | |
| rrc-ConfiguredUplinkGrant SEQUENCE { | | | |
| timeDomainOffset | 0 | | |
| timeDomainAllocation | 0 | | |
| timeReferenceSFN-r16 | sfn512 | | |
| } | | | |

**Table 14.2.2.5.4.3-5: *MAC-CellGroupConfig* for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Derivation Path: TS 38.508-1, Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| tag-Config SEQUENCE { | | | |
| tag-ToReleaseList | Not present | | |
| tag-ToAddModList SEQUENCE (SIZE (1..maxNrofTAGs)) OF SEQUENCE { | 1 entry | | |
| tag-Id[1] | 0 | | |
| timeAlignmentTimer[1] | infinity | | |
| } | | | |
| } | | | |

14.2.2.5.5 Test Requirement

Table 14.2.2.5.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access.

**Table 14.2.2.5.5-1: Cell-specific test parameters for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Parameter | | Unit | Cell 1[Note1] | | | Cell 2[Note1] | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite configuration[Note2] | | | SSC.2 | | N/A | N/A | SSC.2 | |
| $BW_{channel}$ | | MHz | 10: $N_{PRB,c}$ = 52 | | | | 10: $N_{PRB,c}$ = 52 | |
| BWP BW | | MHz | 10: $N_{PRB,c}$ = 52 | | | | 10: $N_{PRB,c}$ = 52 | |
| $K_{mac}$ | | ms | 0 | | | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | | Not Applicable | |
| PDSCH Reference measurement channel | | | SR.1.1 FDD | | | | SR.1.1 FDD | |
| CORESET Reference Channel | | | CR.1.1 FDD | | | | CR.1.1 FDD | |
| TRS configuration | | | TRS.1.1 FDD | | | | TRS.1.1 FDD | |
| OCNG Patterns | | | OP.1 | | | | OP.1 | |
| SMTC Configuration | | | SMTC.1 | | | | SMTC.5 | |
| SSB Configuration | | | SSB.1 FR1 | | | | SSB.5 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | | 15 kHz | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | | N/A | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | | | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ [Note2] | | dBm/ 15 kHz | -98+TT | | | | | |
| $N_{oc}$ [Note2] | | dBm/ SCS | -98+TT | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4+TT | 4+TT | -Infinity | -Infinity | 9+TT | 9+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4+TT | 4+TT | -Infinity | -Infinity | 9+TT | 9+TT |
| SSB_RP | | dBm/ SCS | -94+TT | -94+TT | -Infinity | -Infinity | -89+TT | -89+TT |
| Io[Note3] | | dBm/ 9.36 MHz | -64.59+TT | -64.59+TT | -70.05+TT | -70.05+TT | -60.53+TT | -60.53+TT |
| Propagation condition | | - | AWGN | | | | | |

NOTE 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.

NOTE 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.

NOTE 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Parameter | Unit | Cell 1[Note1] | | | Cell 2[Note1] | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| NOTE 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| NOTE 5: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |

**Table 14.2.2.5.5-2: Target Satellite configuration pattern for NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access**

| Parameter | TSC.2 |
|---|---|
| Interval between adjacent epoch time | 2.56 s |
| ntn-UlSyncValidityDuration | 5 s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |
| ssb-TimeOffset | 10 |
| t-ServiceStart | T2 |

The UE shall start to transmit the PUSCH to Cell 2 less than 130 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90 %.

NOTE: The satellite switch with re-sync delay $D_{switch_unchangedPCI}$ can be expressed as: $T_{soft_switch}$, where:

$$T_{soft_switch} = \max(t\text{-}service - t\text{-}seviceStart, T_{search} + T_{\Delta} + T_{margin}) + T_{IU} + T_{processing} \text{ ms}$$

Here: *t-service - t-seviceStart*= 100ms; $T_{search}$ = 10.5ms; $T_{\Delta}$ = 20ms; $T_{margin}$ = 2ms, $T_{processing}$ = 10ms.

Besides, interruption uncertainty $T_{IU}$ = 20ms in acquiring the first configured grant based PUSCH transmission resource is needed.

This gives a total of 130 ms.

# 14.3 Timing for Satellite Access

## 14.3.1 UE transmit timing for Satellite Access

### 14.3.1.0 Minimum conformance requirements

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_{\mathrm{c}}$ before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. UE initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.1.

#### 14.3.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_{e_NTN}$ where the timing error limit value $T_{e_NTN}$ is specified in Table 14.3.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS, or it is the PRACH transmission, or it is the msgA transmission.

The UE shall meet the $T_{e_NTN}$ requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_{\mathrm{c}}$.

The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

$N_{\mathrm{TA}}$ for PRACH is defined as 0. $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_{\mathrm{c}}$ (in $T_{\mathrm{c}}$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. or after the last update in $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ or $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$.

The value of $N_{\mathrm{TA\text{-}offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\text{-}offset}}$ is defined in TS 38.133 [6] Table 7.1.2-2.

$N_{\mathrm{TA,adj}}^{\mathrm{common}}$ and $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ are as defined in TS 38.211 [7].

**Table 14.3.1.0.1-1: $T_{e_NTN}$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_{e_NTN}$ |
|---|---|---|---|
| 1 | 15 | 15 | 29*64*$T_c$ |
| | | 30 | 24*64*$T_c$ |
| | | 60 | N/A |
| | 30 | 15 | 24*64*$T_c$ |
| | | 30 | 22*64*$T_c$ |
| | | 60 | N/A |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell, the updating of $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ and the updating of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$, except when the timing advance in TS 38.133 [6] clause 7.3C is applied.

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.2.

### 14.3.1.0.2 Minimum conformance requirements for gradual timing adjustment

When the transmission timing error between the UE and the reference timing exceeds $\pm T_{e_NTN}$ then the UE shall adjust the timing such that timing error is to within $\pm T_{e_NTN}$. The reference timing shall be $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_{\mathrm{c}}$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satellite position update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ between the previous transmission and the current transmission, in one adjustment shall be $T_{q_NTN}$.

2) The minimum aggregate adjustment rate, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satellite position update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ during the last one second, shall be $T_{p_NTN}$ per second.

3) The maximum aggregate adjustment rate, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ due to satellite position update and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ during the last 200ms, shall be $T_{q_NTN}$ per 200 ms.

Where, the maximum autonomous time adjustment step $T_{q_NTN}$ and the aggregate adjustment rate $T_{p_NTN}$ are specified in Table 14.3.1.0.2-1.

**Table 14.3.1.0.2-1: $T_{q_NTN}$ Maximum Autonomous Time Adjustment Step and $T_{p_NTN}$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_{q_NTN}$ | $T_{p_NTN}$ |
|---|---|---|---|
| 1 | 15 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |

| | | | |
|---|---|---|---|
| | 30 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 60 | N/A | N/A |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1C.2.1

## 14.3.1.1 NR SA FR1 UE transmit timing accuracy for Satellite Access

Editor's Note:

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Applicability may need to be updated
- Exceptions to connection diagram may need to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets
- Whether GNSS is used and its config is FFS

### 14.3.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the reference cell and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clauses 14.3.1.0.1 and 14.3.1.0.2. Supported test configurations are shown in Table 14.3.1.1.4.1-1.

### 14.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access. Test 2 requires support of long DRX cycle.

### 14.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.3.1.0.1 and 14.3.1.0.2.

The normative reference for this requirement is 38.133 [6] clause A.14.3.1.1

### 14.3.1.1.4 Test Description

The test consists of a single NR cell (PCell). Table 14.3.1.1.5-1 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table 14.3.1.1.5-2.

#### 14.3.1.1.4.1 Initial Conditions

This test shall be tested in one of the configurations defined in Table 14.3.1.1.4.1-1.

**Table 14.3.1.1.4.1-1: Supported test configurations for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.3.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.3.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.3.1.1.4.1-2

**Table 14.3.1.1.4.1-2: Initial conditions for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. Message contents are defined in clause 14.3.1.1.4.3.
2. Cell 1 is the NR PCell with the power level set according to clauses [C.1.2 and C.1.3] for this test. [Cell 1 is a satellite access cell].
3. The initial test environment conditions are setup according to section 14.0.5, with the following exceptions:
   - For GSO instead of TS 38.508-1 [14] Tables 7.6.2.1-1a and 7.6.2.1-1b, use Tables 7.6.2.2-1, 7.6.2.2-3 and 7.6.2.2-5.
   - For NGSO (LEO-600) instead of TS 38.508-1 [14] Tables 7.6.2.1-2a and 7.6.2.1-2b, use Tables 7.6.2.2-4 and 7.6.2.2-6.
   - For NGSO (LEO-1200) instead of TS 38.508-1 [14] Tables 7.6.2.1-3a and 7.6.2.1-3b, use Table 7.6.2.2-2.

### 14.3.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell). The downlink timing of the NR Cell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5]. Cell 1 is the active cell.
2. Set up NR Cell according to parameters given in Table 14.3.1.1.5-1.
3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with periodic SRS transmissions according to clause 14.3.1.1.4.3. In Test 2, the UE is also configured with DRX configuration according to Table 14.3.1.1.5-2, for Test 1 and Test 2, correspondingly.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. After connection set up with the cell, and before the DL timing adjustment, the test equipment shall verify that the timing of the NR cell is within $\left(N_{\mathrm{TA}} + N_{\mathrm{TA\text{-}offset}} + N_{\mathrm{TA,adj}}^{\mathrm{common}} + N_{\mathrm{TA,adj}}^{\mathrm{UE}}\right) \times T_{\mathrm{c}} \pm \left(T_{\mathrm{e_NTN}} - T_{\mathrm{GNSS_margin}}\right)$ of the first detected path of DL SSB.
   a. The $N_{\mathrm{TA_offset}}$ value (in $T_c$ units) is 25600
   b. The $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ value is derived from the higher-layer parameters *TACommon*, *TACommonDrift*, and *TACommonDriftVariation*.
   c. The $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ value is computed by the UE based on UE position and serving-satellite-ephemeris-related higher-layers parameters.
   d. The $T_{\mathrm{e_NTN}}$ values depend on the DL and UL SCS for which the test is being run and are given in Table 14.3.1.1.5-4.

e. The $T_{\text{GNSS_margin}}$ is the margin for the GNSS position definition error considered in the core requirement, which needs to be substracted for the test requirement, due to the usuage of AT commands in the test. $T_{\text{GNSS_margin}} = [327,68] \times T_c$

6. The test system shall adjust the timing of the DL path by values given in Table 14.3.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

**Table 14.3.1.1.4.2-1: Adjustment Value for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| SCS of SSB signals (kHz) | Adjustment Value | |
|---|---|---|
| | Test1 | Test2 |
| 15 | +64*64$T_c$ | +32*64$T_c$ |

7. For Test 1, the test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 14.3.1.1.5-5. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity) and checks these against the following rules:

   - Rule 1: the SS shall check that the maximum amount of the magnitude of the timing change, apart from a change of $N_{\text{TA,adj}}^{\text{UE}}$ due to satellite position update and $N_{\text{TA,adj}}^{\text{common}}$ between the previous transmission and the current transmission, in one adjustment shall be $T_{q_NTN}$, as specified in Table 14.3.1.1.5-5.

   - Rule 2: to check that the minimum adjustment rate is within Rule 2 as specified in clause 14.3.1.0.1 and Table 14.3.1.1.5-5, the SS shall measure the change in SRS transmission timing, apart from a change of $N_{\text{TA,adj}}^{\text{UE}}$ due to satellite position update and $N_{\text{TA,adj}}^{\text{common}}$, over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot.

   - Rule 3: to check that the maximum aggregate adjustment rate is within Rule 3 as specified in clause 14.3.1.0.1 and Table 14.3.1.1.5-5, the SS shall measure the change in SRS transmission timing, apart from a change of $N_{\text{TA,adj}}^{\text{UE}}$ due to satellite position update and $N_{\text{TA,adj}}^{\text{common}}$, over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS), as long as the resulting slot is a valid UL slot.

   The three rules apply until the UE transmit timing offset is within the limits specified in Table 14.3.1.1.5-5 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of this test step, where T=DL_timing_change[Ts]/[5.5+TT]Ts and DL_timing_change is specified in Table 14.3.1.1.4.2-1.

8. Once the UE transmit timing is within the limits specified in step 7, the test system shall verify that the UE transmit timing offset is within $\left(N_{\text{TA}} + N_{\text{TA-offset}} + N_{\text{TA,adj}}^{\text{common}} + N_{\text{TA,adj}}^{\text{UE}}\right) \times T_c \pm (T_{\text{e_NTN}} - T_{\text{GNSS_margin}})$ of the first detected path of DL SSB (similar to test step 5). For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

9. The SS shall transmit an *RRCRelease* message to release the UE from the NR cell.

### 14.3.1.1.4.3 Message contents

Editor's Note: Message contents are FFS

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.3.1.1.4.3-0: Common Exception messages for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

**Table 14.3.1.1.4.3-1: *SRS-Config* for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl1 | 0 | | Test 1 |
| sl320 | 3 | | Test 2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.3.1.1.4.3-2: *DRX-Config* for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-56 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| DRX-Config ::= CHOICE { | | | |
| drx-InactivityTimer | ms1 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms320 | 0 | | |
| } | | | |
| } | | | |

14.3.1.1.5 Test Requirements

Tables 14.3.1.1.5-1, 14.3.1.1.5-2, 14.3.1.1.5-3, 14.3.1.1.5-4 and 14.3.1.1.5-5 define the primary level settings including test tolerances for NR SA FR1 UE transmit timing accuracy for Satellite Access.

**Table 14.3.1.1.5-1: Cell Specific Test Parameters for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Parameter | Unit | Config | Test1 | Test2 |
|---|---|---|---|---|
| SSB ARFCN | | 1,2 | 1 | 1 |
| Serving satellite configuration | | 1 | SSC.1 | |
| | | 2 | SSC.2 | |
| $BW_{channel}$ | MHz | 1,2 | 10: $N_{RB,c}$ = 52 | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1 | |

| | | | | |
|---|---|---|---|---|
| | | | ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>ULBWP.1.1 | |
| DRX Cycle | ms | 1,2 | N/A | DRX.8[Note5] |
| PDSCH Reference measurement channel | | 1,2 | SR.1.1 FDD | |
| RMSI CORESET Reference Channel | | 1,2 | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | | 1,2 | CCR.1.1 FDD | |
| OCNG Patterns | | 1,2 | OP.1 | |
| SSB configuration | | 1,2 | SSB.1 FR1 | |
| SMTC Configuration | | 1,2 | SMTC.1 | |
| TRS configuration | | 1,2 | TRS.1.1 FDD | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2 | -98 | -98 |
| $\hat{E}_s / I_{ot}$ | | 1,2 | 3.3 | 3.3 |
| $\hat{E}_s / N_{oc}$ | | 1,2 | 3.3 | 3.3 |
| SS-RSRP[Note3] | dBm/SCS | 1,2 | -94.7 | -94.7 |
| Io[Note3] | dBm/9.36MHz | 1,2 | -65.08 | -65.08 |
| Propagation condition | | 1,2 | AWGN | |
| SRS Config | | 1,2 | SRSConf.1[Note6] | SRSConf.2[Note6] |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRX related parameters are given in Table 14.3.1.1.5-3

Note 6: SRS configs are given in Table 14.3.1.1.5-2

**Table 14.3.1.1.5-2: SRS Configuration for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | |
| | resourceType | Periodic | Periodic | |
| | Usage | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | |

| | | | | |
|---|---|---|---|---|
| | resourceMapping repetitionFactor | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | |
| | freqDomainShift | 0 | 0 | |
| | freqHopping c-SRS | 14 | 14 | Matches $N_{RB,c}$ |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1, 0 | sl320, 3 | Offset to align with DRX periodicity |
| | sequenceId | 0 | 0 | Any 10 bit number |

**Table 14.3.1.1.5-3: DRX-Configuration for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Field | Test 2 |
|---|---|
| | Value |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| longDRX-CycleStartOffset | 320 ms |
| shortDRX | Disabled |
| TimeAlignmentTimer | Infinity |
| Note: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13] | |

**Table 14.3.1.1.5-4: $T_e$ Timing Error Limit for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_{e_NTN}$ |
|---|---|---|---|
| 1 | 15 | 15 | $34.5*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 14.3.1.1.5-5: $T_{q_NTN}$ Maximum Autonomous Time Adjustment Step and $T_{p_NTN}$ Minimum Aggregate Adjustment rate for NR SA FR1 UE transmit timing accuracy for Satellite Access**

| Frequency Range | SCS of uplink signals (kHz) | $T_{q_NTN}$ | $T_{p_NTN}$ | Maximum Adjustment Rate |
|---|---|---|---|---|
| 1 | 15 | $6.875*64*T_c$ | $1.025*64*T_c/1000ms$ | $7.475*64*T_c/200ms$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | | |

## 14.3.2 Timing Advance for Satellite Access

### 14.3.2.0 Minimum conformance requirements

UE shall adjust the timing of its uplink transmission timing from the beginning of uplink time slot $n+ k+1+2^{\mu} \cdot K_{\text{offset}}$ for a timing advance command received in time slot $n$, and the value of $k$, $\mu$ and $K_{\text{offset}}$ are defined in clause 4.2 in TS 38.213 [8]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The normative reference for this requirement is TS 38.133 [6] clause 7.3C.2.1.

#### 14.3.2.0.1 Minimum conformance requirements for UE Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions, apart from a change of $N_{\mathrm{TA,adj}}^{\mathrm{UE}}$ and $N_{\mathrm{TA,adj}}^{\mathrm{common}}$ between the preceding uplink transmission and the current transmission, with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 14.3.2.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 14.3.2.0.1-1: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 |
|---|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ | N/A |

The normative reference for this requirement is TS 38.133 [6] clause 7.3C.2.2

### 14.3.2.1 NR SA FR1 Timing Advance adjustment accuracy for Satellite Access

Editor's Note:

- Message contents are FFS

#### 14.3.2.1.1 Test purpose

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 14.3.2.0.

#### 14.3.2.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

#### 14.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.3.2.0.1 and 14.3.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.3.2.1

#### 14.3.2.1.4 Test Description

In all test cases, single cell served by SAN is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 14.3.2.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

The UE shall be provided with the valid information about the SAN serving cell before the test. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [12]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [8] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in Table 14.3.2.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

The UE shall adjust its uplink timing at slot n+k+$1+2^{\mu}\cdot K_{\mathrm{offset}}$ for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

#### 14.3.2.1.4.1 Initial Conditions

This test shall be tested in one of the configurations defined in Table 14.3.2.1.4.1-1.

**Table 14.3.2.1.4.1-1: Supported test configurations for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.3.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.3.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.3.2.1.4.1-2

**Table 14.3.2.1.4.1-2: Initial conditions for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. Message contents are defined in clause 14.3.2.1.4.3.
2. Cell 1 is the NR PCell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.
3. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.3.2.1.4.1-3: General test parameters for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For 15 kHz SCS $N_{TA_new} = N_{TA_old} + 8192*T_c$ (based on equation in clause 4.2 of TS 38.213 [8]) |
| T1 | s | 5 | |
| T2 | s | 5 | |

#### 14.3.2.1.4.2 Test procedure

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [12], shall be configured so that it does not expire in the duration of the test.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5]. Cell 1 is the active cell.

2. Set up NR Cell according to parameters given in Table 14.3.2.1.5-1.
3. The SS shall transmit an *RRCReconfiguration* message configuring the UE with periodic SRS transmissions according to clause 14.3.2.1.4.3.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element with value set to 31. This results in zero adjustment of the Timing Advance, and therefore establishes a reference value for the timing advance used by the UE. T2 starts once T1 expires.
6. During time period T2, the test equipment shall send Timing Advance command MAC Control Elements, with a Timing Advance value of 39 as specified in table 14.3.2.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.
7. The UE shall adjust its uplink timing at slot $n+ k+1+2^{\mu} \cdot K_{\text{offset}}$ for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.
8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure whether the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 14.3.2.1.5-3 to the signalled timing advance value compared to the timing of preceding uplink transmission. If the UE adjusts its timing within the requirement, the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
9. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
10. After the RRC connection is released, the SS shall switch OFF and then ON the UE to proceed with the next iteration.
11. Repeat step 1-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.3.2.1.4.3-0: Common Exception messages for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | FFS |

**Table 14.3.2.1.4.3-1: *SRS-Config* for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 12 | | |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl5 | 2 | Once every 5 slots | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

14.3.2.1.5 Test Requirements

Tables 14.3.2.1.5-1 and 14.3.2.1.5-2 define the primary level settings including test tolerances for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access.

**Table 14.3.2.1.5-1: Cell Specific Test Parameters for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Parameter | | Unit | Test1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1,2 | | FDD | |
| Satellite information | Config 1 | | SSC.1 | |
| | Config 2 | | SSC.2 | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | |
| BWP BW | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 FDD | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 FDD | |
| TRS configuration | Config 1,2 | | TRS.1.1 FDD | |
| OCNG Patterns | | | OCNG pattern 1 | |
| SMTC configuration | Config 1,2 | | SMTC.1 FR1 | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |

| | | | |
|---|---|---|---|
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 |
| $\hat{E}_s / I_{ot}$ | | dB | 3.3 |
| $\hat{E}_s / N_{oc}$ | | dB | 3.3 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -65.08 |
| Propagation condition | | - | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table 14.3.2.1.5-2: SRS Configuration for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Field | | Value | Comment |
|---|---|---|---|
| c-SRS | Config 1,2 | 12 | Frequency hopping is disabled |
| b-SRS | | 0 | |
| b-hop | | 0 | |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 | |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5=2 for SCS 15kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 | |
| repetitionFactor | | n1 | |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 | |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | | |

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. $k+1+2^{\mu} \cdot K_{offset}$ slots after the reception of the timing advance command, where k=5.

The Timing Advance adjustment accuracy shall be within the limits specified in Table 14.3.2.1.5-3.

**Table 14.3.2.1.5-3: UE Timing Advance adjustment accuracy for NR SA FR1 Timing Advance adjustment accuracy for Satellite Access**

| Sub Carrier Spacing, SCS kHz | 15 |
|---|---|
| UE Timing Advance adjustment accuracy | ±344 $T_c$ |

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

# 14.4 Signalling characteristics

## 14.4.1 Radio link monitoring for Satellite Access

### 14.4.1.0 General

The requirements in this clause apply for radio link monitoring on PCell and the UE is configured with only PCell, which is served by satellite access node (SAN).The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 14.4.1.0-1. For SSB based radio link monitoring, $Q_{out_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.1-1. For CSI-RS based radio link monitoring, $Q_{out_CSI\text{-}RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.2-1.

The threshold $Q_{in}$ is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at $Q_{out}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 14.4.1.0-1. For SSB based radio link monitoring, $Q_{in_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.1-2. For CSI-RS based radio link monitoring, $Q_{in_CSI\text{-}RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.1.0.2-2.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 14.4.1.0-1 by default. All requirements in this clause are applicable for BLER Configuration #0 in Table 14.4.1.0-1.

**Table 14.4.1.0-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out}$ | $BLER_{in}$ |
|---|---|---|
| 0 | 10% | 2% |

UE shall be able to monitor up to $N_{RLM}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number $L_{max}$ of SSBs per half frame according to TS 38.213 [8], where $N_{RLM}$ is specified in Table 14.4.1.0-2 according TS 38.213 [8], and meet the requirements as specified in this clause. UE is not required to meet the requirements in this clause if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 14.4.1.0-2: Maximum number of RLM-RS resources $N_{RLM}$**

| Carrier frequency range of PCell | $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|---|---|---|
| FR1, ≤ 3 GHz[Note] | 4 | 2 |
| FR1, > 3 GHz[Note] | 8 | 4 |
| NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [8]. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.1.

#### 14.4.1.0.1 Minimum conformance requirements for SSB based Radio Link Monitoring for Satellite Access

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 14.4.1.0.1.

**Table 14.4.1.0.1-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 4dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

**Table 14.4.1.0.1-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ [ms] period becomes better than the threshold $Q_{in_SSB}$ within $T_{Evaluate_in_SSB}$ [ms] evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 14.4.1.0.1-1 for FR1.

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
- $N_{total} / N_{available}$ with $N_{available} > 0$

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

**Table 14.4.1.0.1-1: Evaluation period $T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) | $T_{Evaluate_in_SSB}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil(10 × P) × $T_{SSB}$) | Max(100, Ceil(5 × P) × $T_{SSB}$) |
| DRX cycle≤320ms | Max(200, Ceil(15 × P) × Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320ms | Ceil(10 × P) × $T_{DRX}$ | Ceil(5 × P) × $T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.2.1 and 8.1C.2.2.

#### 14.4.1.0.1.1 Measurement restrictions for SSB based RLM for Satellite Access

The UE is required to be capable of measuring SSB for RLM without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.2.3.

### 14.4.1.0.2 Minimum conformance requirements for CSI-RS based Radio Link Monitoring for Satellite Access

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period

specified in clause 14.4.1.0.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

**Table 14.4.1.0.2-1: PDCCH transmission parameters for out-of-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 4dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

**Table 14.4.1.0.2-2: PDCCH transmission parameters for in-sync evaluation**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_CSI-RS}$ within $T_{Evaluate_out_CSI-RS}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS}$ ms period becomes better than the threshold $Q_{in_CSI-RS}$ within $T_{Evaluate_in_CSI-RS}$ ms evaluation period.

- $T_{Evaluate_out_CSI-RS}$ and $T_{Evaluate_in_CSI-RS}$ are defined in Table 14.4.1.0.2-1 for FR1.

The requirements of $T_{Evaluate_out_CSI-RS}$ and $T_{Evaluate_in_CSI-RS}$ apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
- $N_{total} / N_{available}$ with $N_{available} > 0$

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

The values of $M_{out}$ and $M_{in}$ used in Table 14.4.1.0.2-1 are defined as:

- $M_{out} = 20$ and $M_{in} = 10$, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 14.4.1.0.2-1: Evaluation period $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ for FR1**

| Configuration | $T_{Evaluate_out_CSI\text{-}RS}$ (ms) | $T_{Evaluate_in_CSI\text{-}RS}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil($M_{out}$×P)×$T_{CSI\text{-}RS}$) | Max(100, Ceil($M_{in}$×P) × $T_{CSI\text{-}RS}$) |
| DRX ≤ 320ms | Max(200, Ceil(1.5×$M_{out}$×P)× Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) | Max(100, Ceil(1.5×$M_{in}$×P)× Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) |
| DRX > 320ms | Ceil($M_{out}$×P) × $T_{DRX}$ | Ceil($M_{in}$×P) × $T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI\text{-}RS}$ equal to 5 ms, 10ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | | |

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.3.1 and 8.1C.3.2.

### 14.4.1.0.2.1 Measurement restrictions for SSB based RLM for Satellite Access

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS for RLM measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 8.1C.3.3.

## 14.4.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

### 14.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

### 14.4.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.4.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.1.

### 14.4.1.1.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.1.4.1-1. The test parameters are given in Tables 14.4.1.1.4.1-3, 14.4.1.1.5-1, and 14.4.1.1.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

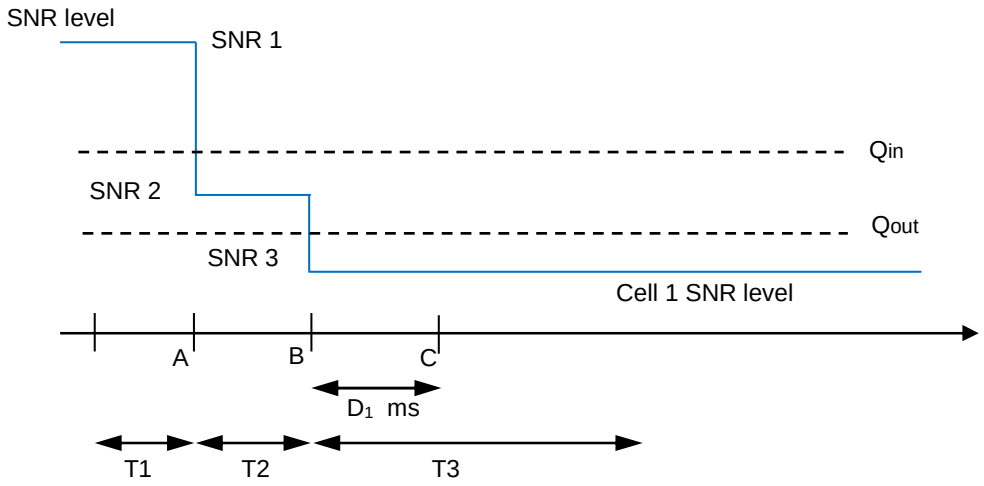



**Figure 14.4.1.1.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

### 14.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.1.4.1-1.

**Table 14.4.1.1.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.1.4.1-2.

**Table 14.4.1.1.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.1.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.1.3 FDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 15 kHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | *OFF* |
| Gap pattern ID | | | | *gp0* |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 | | CSI-RS.1.1 FDD |
| CSI-RS for tracking | | Config 1, 2 | | TRS.1.1 FDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

#### 14.4.1.1.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.1.4.1-3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.1.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.1.5-1. T3 starts.
7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.1.5-1.
9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.1.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.1.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

14.4.1.1.5 Test Requirement

Table 14.4.1.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access.

**Table 14.4.1.1.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| **Parameter** | | **Unit** | **Test 1** | | |
|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/ 15kHz | -98 | | |
| | Config 2 | | -98 | | |
| $N_{oc}$ | Config 1 | dBm/ SCS | -98 | | |
| | Config 2 | | -98 | | |
| Propagation condition | | | NTN-TDLC5-200 | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 14.4.1.1.4-1. | | | | | |

**Table 14.4.1.1.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| **Field** | **Test 1** |
|---|---|
| | **Value** |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

### 14.4.1.2 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

#### 14.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

#### 14.4.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.4.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.2.

#### 14.4.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.2.4.1-1. The test parameters are given in Tables 14.4.1.2.4.1-3 and 14.4.1.2.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

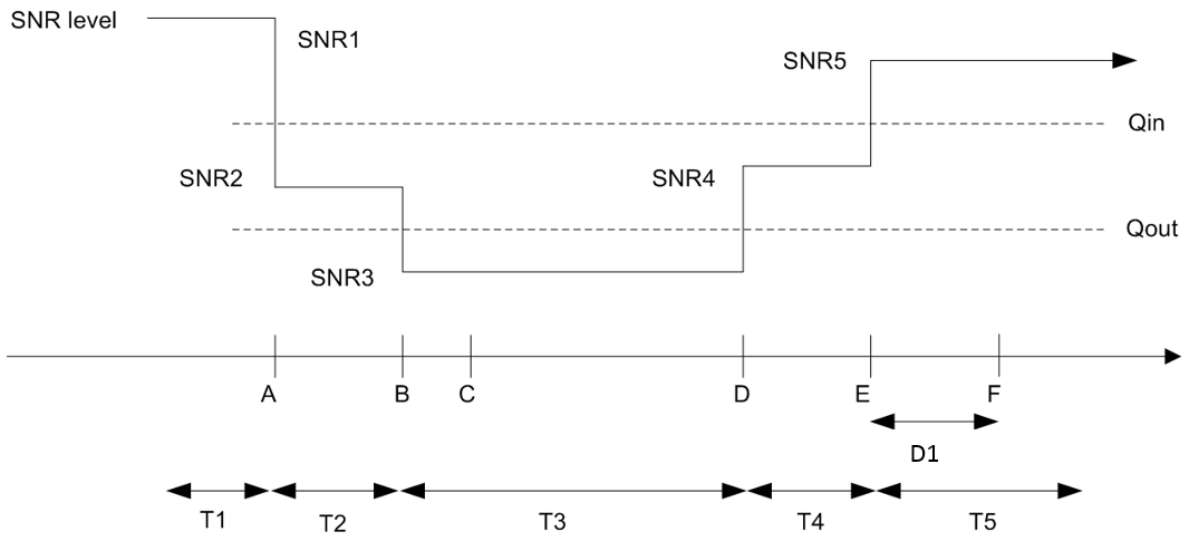



**Figure 14.4.1.2.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

### 14.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.2.4.1-1.

**Table 14.4.1.2.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.2.4.1-2.

**Table 14.4.1.2.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.2.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.2.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.1.1 FDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 15 kHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |

| | | | |
|---|---|---|---|
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.2.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.2.4.1-3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.2.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.2.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.2.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.2.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.2.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

14.4.1.2.5 Test Requirement

Table 14.4.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access.

**Table 14.4.1.2.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | | | |
| | Config 2 | | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 4: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 14.4.1.2.4-1. |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.1.3 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

### 14.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

### 14.4.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX.

### 14.4.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.3.

### 14.4.1.3.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.3.4.1-1. The test parameters are given in Tables 14.4.1.3.4.1-3, 14.4.1.3.5-1, and 14.4.1.3.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

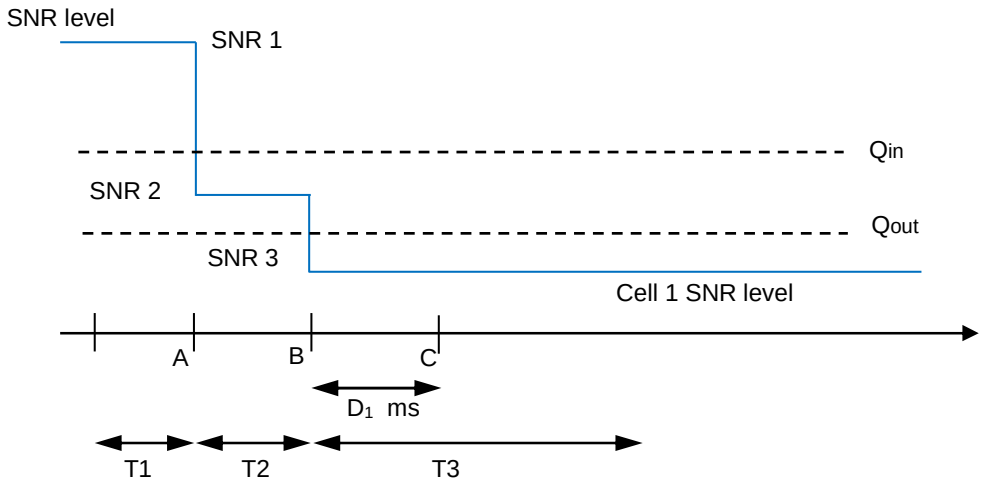



**Figure 14.4.1.3.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

### 14.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.3.4.1-1.

**Table 14.4.1.3.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.3.4.1-2.

**Table 14.4.1.3.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.3.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.3.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | Config 1, 2 | | MHz | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | Config 1, 2 | | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | | CCR.1.3 FDD |
| SSB Configuration | Config 1, 2 | | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | | 15 kHz |
| PRACH Configuration | Config 1, 2 | | | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| Out of sync transmission parameters | | DCI format | | 1-0 |
| | | Number of Control OFDM symbols | | 2 |
| | | Aggregation level | CCE | 8 |
| | | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | | DMRS precoder granularity | | REG bundle size |
| | | REG bundle size | | 6 |
| DRX Configuration | | | | DRX.3 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |

| | | | |
|---|---|---|---|
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.68 |
| T3 | | s | 0.68 |
| D1 | | s | 0.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.3.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.3.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.3.4.3.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.3.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.3.5-1. T3 starts.
7. If the SS:

   a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.
8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.3.5-1.
9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.3.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.3.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

14.4.1.3.5 Test Requirement

Table 14.4.1.3.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access.

**Table 14.4.1.3.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | |
| | Config 2 | | -98 | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | |
| | Config 2 | | -98 | | |
| Propagation condition | | | NTN-TDLC5-200 | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 14.4.1.3.4-1.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

### 14.4.1.4 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

#### 14.4.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell SSB based radio link monitoring requirements in clause 14.4.1.0.

#### 14.4.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX.

#### 14.4.1.4.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.4.

#### 14.4.1.4.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.4.4.1-1. The test parameters are given in Tables 14.4.1.4.4.1-3 and 14.4.1.4.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

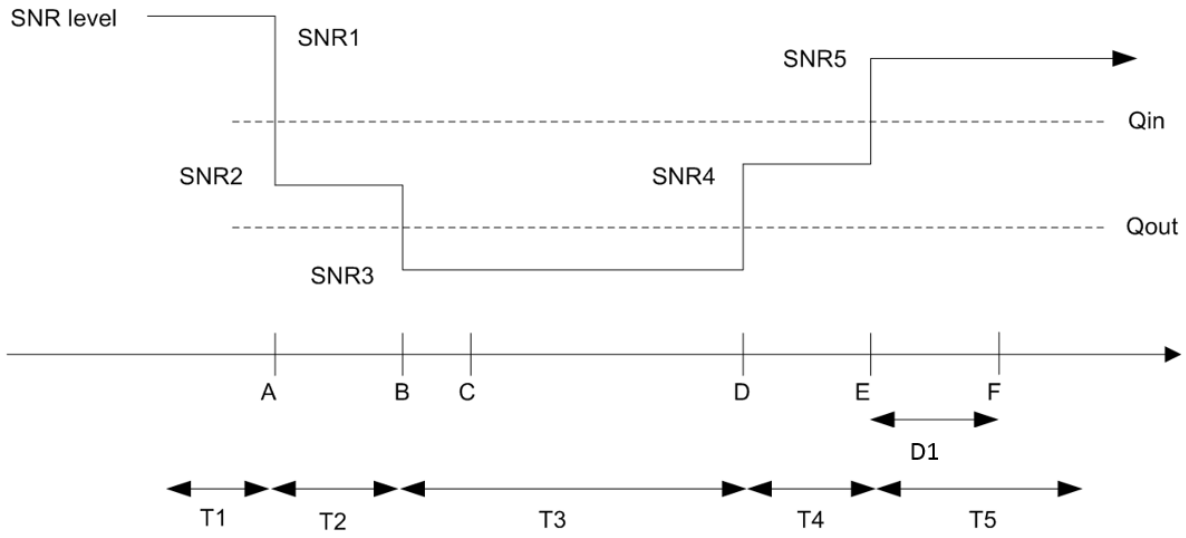



**Figure 14.4.1.4.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

### 14.4.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.4.4.1-1.

**Table 14.4.1.4.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.4.4.1-2.

**Table 14.4.1.4.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.4.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.4.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| $BW_{channel}$ | | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 | | CCR.1.1 FDD |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | | 15 kHz |
| PRACH Configuration | | Config 1, 2 | | PRACH.1 FR1 |
| SSB index assigned as RLM RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low |
| In sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out of sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |

| | | | |
|---|---|---|---|
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| CSI-RS for tracking | Config 1, 2 | | TRS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.4.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.4.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.4.4.3.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.4.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.4.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.4.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.4.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.4.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.4.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-8 with Condition SSB RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition SSB RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.4.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 14.4.1.4.5 Test Requirement

Table 14.4.1.4.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access.

**Table 14.4.1.4.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |
| $N_{oc}$ | Config 1 | dBm/SCS | -98 | | | | |
| | Config 2 | | -98 | | | | |

| Propagation condition | | NTN-TDLC5-200 |
|---|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | |
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. | |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. | |
| Note 4: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 14.4.1.4.4-1. | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

### 14.4.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

### 14.4.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

### 14.4.1.5.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.5.

### 14.4.1.5.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.5.4.1-1. The test parameters are given in Tables 14.4.1.5.4.1-3, 14.4.1.5.5-1, and 14.4.1.5.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.5.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

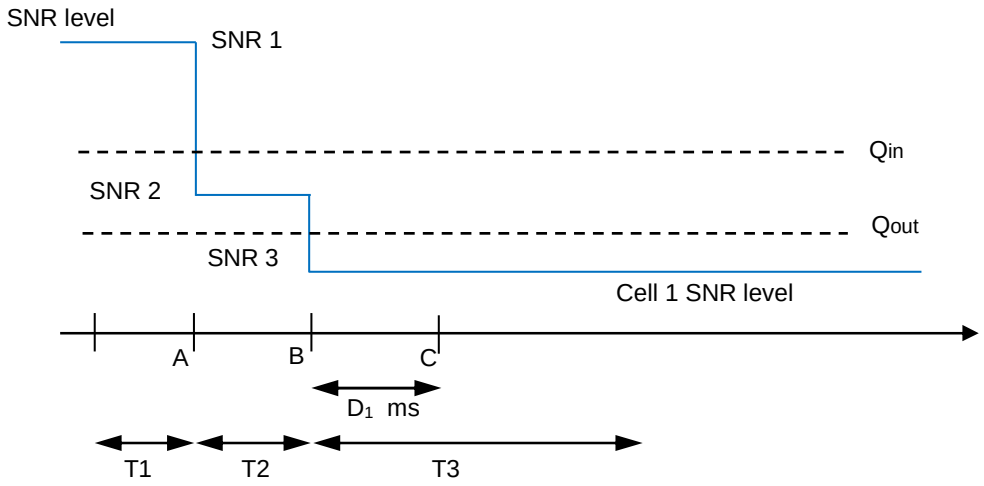



**Figure 14.4.1.5.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

### 14.4.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.5.4.1-1.

**Table 14.4.1.5.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.5.4.1-2.

**Table 14.4.1.5.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.5.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.5.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.5.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.5.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Satellite information | Config 1 | | SSC.1 |
| | Config 2 | | SSC.2 |
| Duplex mode | Config 1, 2 | | FDD |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.3 FDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| TRS configuration | Config 1, 2 | | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.5.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.5.4.1-3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.5.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.5.5-1. T3 starts.
7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.5.5-1.
9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.5.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.5.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.5.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

14.4.1.5.5 Test Requirement

Table 14.4.1.5.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access.

**Table 14.4.1.5.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| **Parameter** | | **Unit** | **Test 1** | | |
|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15kHz | -98 | | |
| Propagation condition | | | NTN-TDLC5-200 | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.1.5.4-1.

**Table 14.4.1.5.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| **Field** | **Test 1** |
|---|---|
| | **Value** |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

### 14.4.1.6 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

#### 14.4.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the SAN PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

#### 14.4.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

#### 14.4.1.6.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.6.

#### 14.4.1.6.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.6.4.1-1. The test parameters are given in Tables 14.4.1.6.4.1-3 and 14.4.1.6.5-1 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.6.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. In the test, DRX configuration is not enabled. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

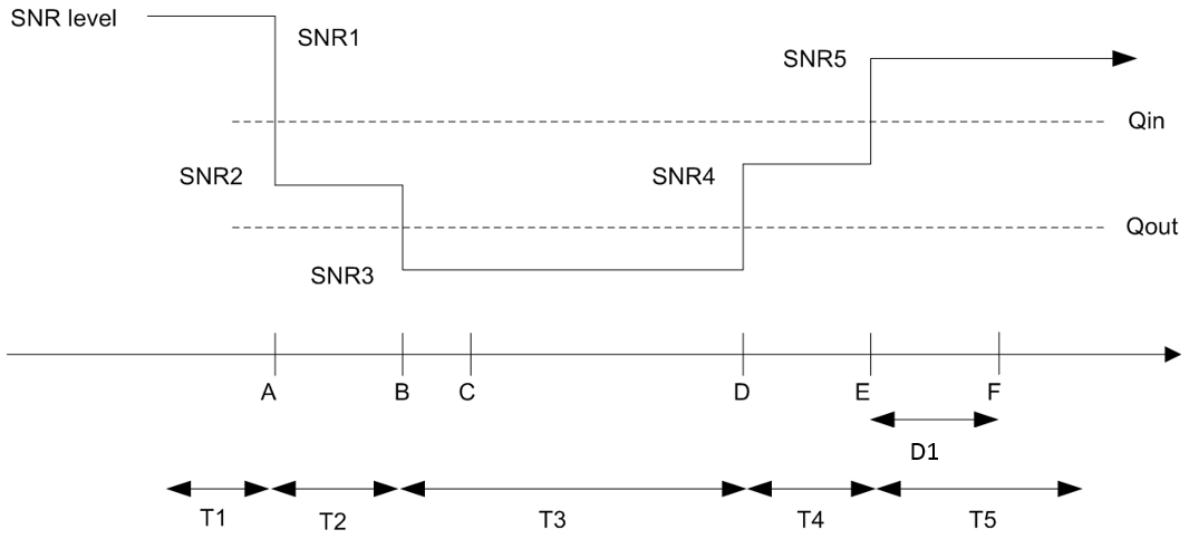



**Figure 14.4.1.6.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

### 14.4.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.6.4.1-1.

**Table 14.4.1.6.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.6.4.1-2.

**Table 14.4.1.6.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.6.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.6.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.6.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Satellite information | Config 1 | | SSC.1 |
| | Config 2 | | SSC.2 |
| Duplex mode | Config 1, 2 | | FDD |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.1 FDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| TRS configuration | Config 1, 2 | | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |

| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
|---|---|---|---|
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | S | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.6.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.6.4.1-3.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.6.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.6.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.6.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.6.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.6.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.6.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED,<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.6.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms1000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

14.4.1.6.5 Test Requirement

Table 14.4.1.6.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access.

**Table 14.4.1.6.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in non-DRX mode for Satellite Access**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15kHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 14.4.1.6.4-1.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.1.7 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

### 14.4.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

### 14.4.1.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, CSI-RS based RLM and long DRX.

### 14.4.1.7.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.7.

### 14.4.1.7.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 14.4.1.7.4.1-1. The test parameters are given in Tables 14.4.1.7.4.1-3, 14.4.1.7.5-1, and 14.4.1.7.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 14.4.1.7.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

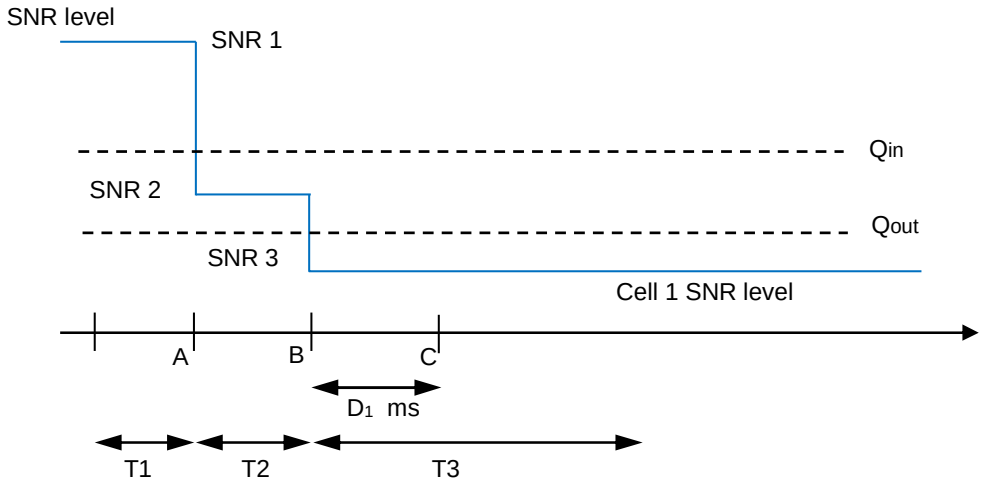



**Figure 14.4.1.7.4-1: SNR variation for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

### 14.4.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.7.4.1-1.

**Table 14.4.1.7.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.7.4.1-2.

**Table 14.4.1.7.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.1.7.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.7.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.7.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Satellite information | Config 1 | | SSC.1 |
| | Config 2 | | SSC.2 |
| Duplex mode | Config 1, 2 | | FDD |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.3 FDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| TRS configuration | Config 1, 2 | | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |

| | | | |
|---|---|---|---|
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 14.4.1.7.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.7.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting and DRX according to section 14.4.1.7.4.3.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 14.4.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.7.5-1. T3 starts.

7. If the SS:

a) detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

b) does not detect any uplink power higher than OFF power from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise, the number of failed tests is increased by one and proceed with step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 14.4.1.7.5-1.
9. If the UE has re-established the connection within 2 seconds, proceed with step 11. Otherwise, proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 1-9 until the confidence level according to Annex G clause G.2.3 is achieved.

### 14.4.1.7.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.7.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition L3 FILTERING NEEDED<br>Table H.3.1-3 with Condition RLM<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.7.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

### 14.4.1.7.5 Test Requirement

Table 14.4.1.7.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access.

**Table 14.4.1.7.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | dB | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | dB | | | |
| EPRE ratio of PSS to SSSSSS_beta | dB | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15kHz | -98 | | |
| Propagation condition | | | NTN-TDLC5-200 | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.1.7.4-1.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.1.8 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access

Editor's Note: This test is complete, but the following aspect needs to be updated:

- Modified parameters for RLM testing with 4RX antenna connection are not specified in TS 38.133

### 14.4.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the SAN PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS based radio link monitoring requirements in clause 14.4.1.0.

### 14.4.1.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, CSI-RS based RLM and long DRX.

### 14.4.1.8.3 Minimum conformance requirement

The minimum requirements are specified in clause 14.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.1.8.

### 14.4.1.8.4 Test description

In the test, UE is configured to perform RLM based on CSI-RS, with *detectionResource* included in *RadioLinkMonitoringRS* set to CSI-RS, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table

14.4.1.8.4.1-1. The test parameters are given in Tables 14.4.1.8.4.1-3, 14.4.1.8.5-1 and 14.4.1.8.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 14.4.1.8.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

The UE shall be provided with valid information about the SAN serving each cell in the test before the test.

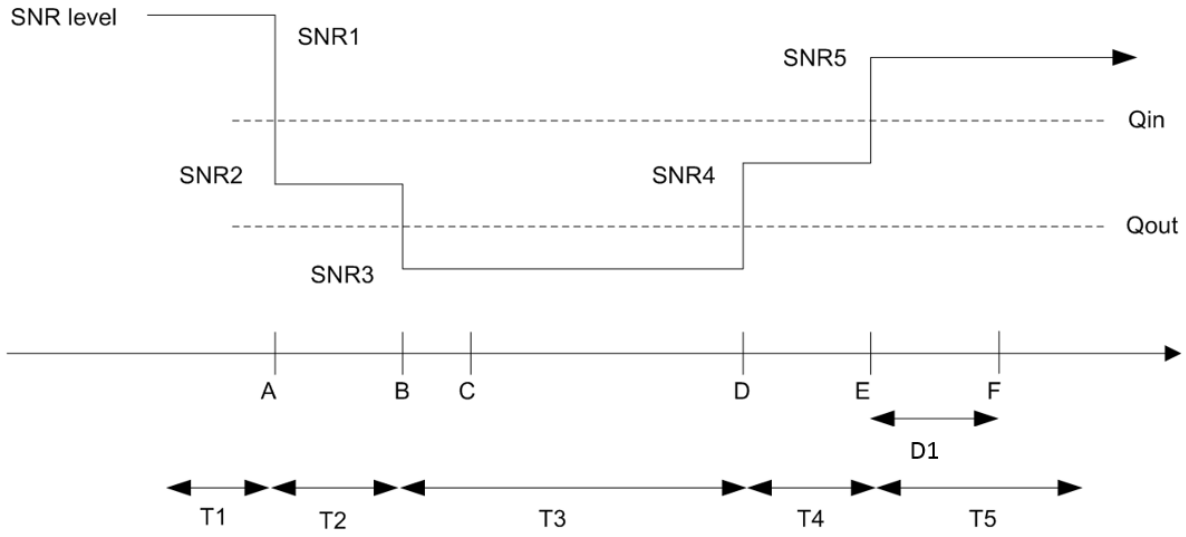



**Figure 14.4.1.8.4-1: SNR variation for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

### 14.4.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.1.8.4.1-1.

**Table 14.4.1.8.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.1.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.1.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.1.8.4.1-2.

**Table 14.4.1.8.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 14.4.1.8.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.1.8.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.1.8.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Satellite information | Config 1 | | SSC.1 |
| | Config 2 | | SSC.2 |
| Duplex mode | Config 1, 2 | | FDD |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.1 FDD |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| TRS configuration | Config 1, 2 | | TRS.1.1 FDD |
| CSI-RS for RLM | Config 1, 2 | | Resource #4 in TRS.1.1 FDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |

| | | | |
|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | | CSI-RS.1.1 FDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.1.8.4.2 Test Procedure

The test consists of a single satellite access NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 14.4.1.8.4.1-3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern, periodic CSI reporting and DRX according to section 14.4.1.8.4.3.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 14.4.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.1.8.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.1.8.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.1.8.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.1.8.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 4-9 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.1.8.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

**Table 14.4.1.8.4.3-1: Common Exception messages for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.1-8 with Condition CSI-RS RLM<br>Table H.3.5-4<br>Table H.3.5-9 with Condition CSI-RS RLM<br>Table H.3.7-1 with condition DRX.3<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.1.8.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms2000 | | |
| n310 | n1 | | |
| t311 | ms1000 | | |
| n311 | n1 | | |
| } | | | |

#### 14.4.1.8.5 Test Requirement

Table 14.4.1.8.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access.

**Table 14.4.1.8.5-1: Cell-specific test parameters for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM RS in DRX mode for Satellite Access**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | dB | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SNR on RLM-RS | Config 1, 2 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 2 | dBm/15kHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | | |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | | |
| Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. | | | | | | | |
| Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | | | |
| Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | | |
| Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | | | |
| Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 14.4.1.8.4-1. | | | | | | | |

**Table 14.4.1.8.5-2: Measurement gap configuration for NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM RS in DRX mode for Satellite Access**

| Field | Test 1 |
|---|---|
| | Value |
| *gapOffset* | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap0 | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.2 Beam Failure Detection and Link recovery procedures for satellite access

### 14.4.2.00 General

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set $\overline{q}_0$ as specified in TS 38.213 [8] in order to detect beam failure on PCell and the UE is configured with only PCell, which is served by satellite access node (SAN).

The RS resource configurations in the set $\overline{q}_0$ on PCell can be periodic CSI-RS resources and/or SSBs.

On each RS resource configuration in the set $\overline{q}_0$, the UE shall estimate the radio link quality and compare it to the threshold $Q_{out_LR}$ for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold $Q_{out_LR}$ is defined as the level at which the downlink radio level link of a given resource configuration on set $\overline{q}_0$ cannot be reliably received and shall correspond to the $BLER_{out}$ = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.2.0.1-1. For CSI-RS based beam failure detection, $Q_{out_LR_CSI\text{-}RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 14.4.2.0.3-1.

Upon request the UE shall deliver configuration indexes from the set $\overline{q}_1$ as specified in TS 38.213 [8] , to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold $Q_{in_LR}$, which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the $Q_{in_LR}$ threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the $Q_{in_LR}$ threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided

by higher layer parameter *powerControlOffsetSS*. The RS resource configurations in the set $\overline{q}_1$ can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.1.

## 14.4.2.0 Minimum conformance requirements

### 14.4.2.0.1 Minimum conformance requitements for SSB based beam failure detection

[TS 38.133, clause 8.5C.2.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in this clause.

**Table 14.4.2.0.1-1: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5C.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 14.4.2.0.1-2 for FR1.

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
- $N_{total} / N_{available}$ with $N_{available} > 0$

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
- same as $N_{outside_MG}$, otherwise

- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

**Table 14.4.2.0.1-2: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR1**

| Configuration | $T_{Evaluate_BFD_SSB}$ (ms) |
|---|---|
| no DRX | Max(50, Ceil(5 × P) × $T_{SSB}$) |
| DRX cycle ≤ 320ms | Max(50, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320ms | Ceil(5 × P) × $T_{DRX}$ |
| Note: $T_{SSB}$ is the periodicity of SSB in the set $\overline{q}_0$ . $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.2.

### 14.4.2.0.2 Measurement restriction for SSB based beam failure detection

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.2.3.

### 14.4.2.0.3 Minimum conformance requitements for CSI-RS based beam failure detection

[TS 38.133, clause 8.5C.3.1]

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_0$ of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set $\overline{q}_0$ for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform beam failure detection measurements on the CSI-RS configured for BFD if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP.

**Table 14.4.2.0.3-1: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|

| | |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

[TS 38.133, clause 8.5C.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 14.4.2.0.3-1 for FR1.

The requirements of $T_{Evaluate_BFD_CSI-RS}$ apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
- $N_{total} / N_{available}$ with $N_{available} > 0$

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

The values of $M_{BFD}$ used in Table 14.4.2.0.3-2 are defined as

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in set $\overline{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 14.4.2.0.3-2 are defined as

For each CSI-RS resource in the set $\overline{q}_0$ configured for PCell SA

- $P_{BFD}$ = 1.

**Table 14.4.2.0.3-2: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR1**

| Configuration | $T_{Evaluate_BFD_CSI-RS}$ (ms) |
|---|---|
| no DRX | $Max(50, Ceil(M_{BFD} \times P \times P_{BFD}) \times T_{CSI-RS})$ |
| DRX cycle ≤ 320ms | $Max(50, Ceil(1.5 \times M_{BFD} \times P \times P_{BFD}) \times Max(T_{DRX}, T_{CSI-RS}))$ |
| DRX cycle > 320ms | $Ceil(M_{BFD} \times P \times P_{BFD}) \times T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\overline{q}_0$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.3.2.

### 14.4.2.0.4 Measurement restriction for CSI-RS based beam failure detection

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following scenarios.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.3.3.

### 14.4.2.0.5 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set $\overline{q}_0$ is worse than $Q_{out_LR}$, layer 1 of the UE shall send a beam failure instance indication to the higher layers

The beam failure instance evaluation for the RS resources in set $\overline{q}_0$ shall be performed as specified in clause 6 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{SSB\text{-}RS,M}$) ) or max(2ms, $T_{CSI\text{-}RS,M}$), where $T_{SSB\text{-}RS,M}$ and $T_{CSI\text{-}RS,M}$ is the shortest periodicity of all RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$ .

When DRX is used, for SSB based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{SSB\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{CSI\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.4.

#### 14.4.2.0.6 Minimum conformance requitements for SSB based candidate beam detection

[TS 38.133, clause 8.5C.5.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_1$ configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

[TS 38.133, clause 8.5C.5.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate_CBD_SSB}$ ms period becomes better than the threshold $Q_{in_LR}$ provided SSB_RP and SSB Ês/Iot are according to Annex Table B.2.19.1 of TS 38.133 [6] for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 14.4.2.0.6-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB}$ is defined in Table 14.4.2.0.6-1 for FR1.

where,

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor}$ * $N_{total}$ / $N_{outside_MG}$ with $N_{available}$ = 0
- $N_{total}$ / $N_{available}$ with $N_{available}$ > 0

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target RLM-RS

- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

The values of $P_{CBD}$ used in Table 14.4.2.0.6-1 are defined as

For each SSB resource in the set $\bar{q}_1$ configured for PCell.

- $P_{CBD} = 1$.

**Table 14.4.2.0.6-1: Evaluation period $T_{Evaluate_CBD_SSB}$ for FR1**

| Configuration | $T_{Evaluate_CBD_SSB}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | Max(25, Ceil($3 \times P \times P_{CBD}$) $\times T_{SSB}$) |
| DRX cycle > 320ms | Ceil($3 \times P \times P_{CBD}$) $\times T_{DRX}$ |
| Note: $T_{SSB}$ is the periodicity of SSB in the set $\bar{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.5.2.

### 14.4.2.0.7 Measurement restriction for SSB based candidate beam detection

For FR1, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions;
- If SSB and CSI-RS have different SCS-es,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for CBD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.5.3.

### 14.4.2.0.8 Minimum conformance requitements for CSI-RS based candidate beam detection

[TS 38.133, clause 8.5C.6.1]

The requirements in this clause apply for each CSI-RS resource in the set $\bar{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

[TS 38.133, clause 8.5C.6.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_LR}$ within $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period provided CSI-RS $\hat{E}s/Iot$ is according to Annex Table B.2.19.2 of TS 38.133 [6] for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 14.4.2.0.8-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI\text{-}RS}$ is defined in Table 14.4.2.0.8-1 for FR1.

P value for an RLM-RS resource to be measured is defined as

- $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
- $N_{total} / N_{available}$ with $N_{available} > 0$

For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

The values of $M_{CBD}$ used in Table 14.4.2.0.8-1 are defined as

- $M_{CBD} = 3$, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{CBD}$ used in Table 8.5C.6.2-1 are defined as

For each CSI-RS resource in the set $\bar{q}_1$ configured for SA

- $P_{CBD} = 1$.

**Table 14.4.2.0.8-1: Evaluation period $T_{Evaluate_CBD_CSI-RS}$ for FR1**

| Configuration | $T_{EvaluateC_CBD_CSI-RS}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320ms | $Max(25, Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{CSI-RS})$ |
| DRX cycle > 320ms | $Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.6.2.

### 14.4.2.0.9 Measurement restriction for CSI-RS based candidate beam detection

For FR1, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for CBD measurement, the UE shall be able to perform CSI-RS based CBD measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for CBD measurement, the UE shall be able to perform CSI-RS based CBD measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS based CBD measurement for without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer measurement period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for CBD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for CBD measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 8.5C.6.3.

### 14.4.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access

#### 14.4.2.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell which is served by satellite access node (SAN) and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

#### 14.4.2.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.1.

#### 14.4.2.1.4 Test description

The test parameters are given in Tables 14.4.2.1.4.1-1, 14.4.2.1.4.1-3 and 14.4.2.1.5-1 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 14.4.2.1.4-1 shows the variation of the downlink SNR of the SSB in set $q_0$ in the active cell to emulate SSB based beam failure. Figure 14.4.2.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

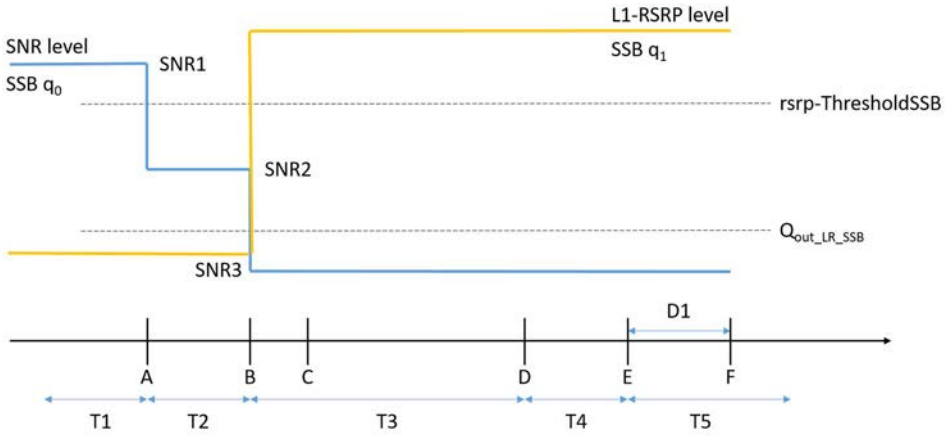



**Figure 14.4.2.1.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### 14.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.1.4.1-1.

**Table 14.4.2.1.4.1-1: Supported test configurations for FR1 Pcell**

| Configuration | Description |
|---|---|
| 14.4.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.2.1.4.1-2.

**Table 14.4.2.1.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.2.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.2.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.2.1.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |

| | | | | |
|---|---|---|---|---|
| NTN reference Serving satellite configuration | Config 1 | | SSC.1 | |
| | Config 2 | | SSC.2 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,2 | | FDD | |
| BWchannel | Config 1,2 | MHz | 10: NRB,c = 52 | |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | |
| TDD Configuration | Config 1,2 | | Not Applicable | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 FDD | |
| SSB Configuration | Config 1,2 | | SSB.3 FR1 | |
| SMTC Configuration | Config 1,2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 15 KHz | |
| PRACH Configuration | Config 1,2 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| gapOffset | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table |

| | | | | |
|---|---|---|---|---|
| | | | | 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.1.1 FDD | |
| CSI-RS for tracking | Config 1,2 | | TRS.1.1 FDD | |
| SSB Index assigned as RLM RS | | | 0, 1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.24 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.13 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 14.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.2.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.1.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

and

c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition "Short_DCI" with the following exceptions:

**Table 14.4.2.1.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-6 with Condition BFD<br>Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range)<br>Table H.3.1-4 with A3-offset = 0<br><br>Table H.3.1-8 with Condition SSB BFD<br><br>Table H.3.1-10 with Condition SSB<br><br>Table H.3.1-10A<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.2.1.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |

| | | | |
|---|---|---|---|
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.2.1.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 14.4.2.1.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 14.4.2.1.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 14.4.2.1.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

14.4.2.1.5 Test requirements

Tables 14.4.2.1.4.1-3 and 14.4.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX.

**Table 14.4.2.1.5-1: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1,2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1,2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1,2 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| $N_{oc}$ | Config 1,2 | dBm/15 KHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.2.1.4-1.
Note 9: Void.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access

### 14.4.2.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell which is served by satellite access node (SAN) and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

### 14.4.2.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.2.

### 14.4.2.2.4 Test description

The test parameters are given in Tables 14.4.2.2.4.1-1, 14.4.2.2.4.1-3 and 14.4.2.2.5-1 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 14.4.2.2.4-1 shows the variation of the downlink SNR of the SSB in set $q_0$ in the active cell to emulate SSB based beam failure. Figure 14.4.2.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ of the candidate beam used for link recovery.

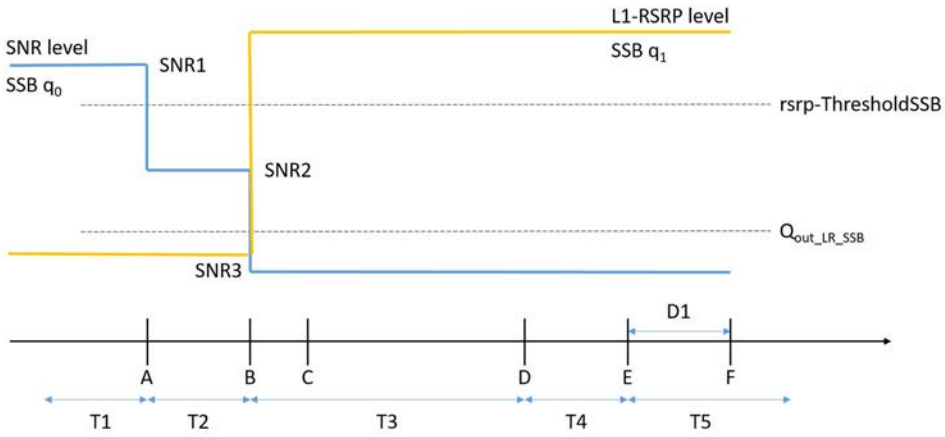



**Figure 14.4.2.2.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in DRX mode**

#### 14.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.2.4.1-1.

**Table 14.4.2.2.4.1-1: Supported test configurations for FR1 Pcell**

| Configuration | Description |
|---|---|
| 14.4.2.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |

| | |
|---|---|
| 14.4.2.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.2.2.4.1-2.

**Table 14.4.2.2.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.2.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.2.2.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.2.2.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| NTN reference Serving satellite configuration | Config 1 | | SSC.1 | |
| | Config 2 | | SSC.2 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,2 | | FDD | |
| BWchannel | Config 1,2 | MHz | 10: NRB,c = 52 | |
| DL initial BWP configuration | Config 1,2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1,2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1,2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1,2 | | ULBWP.1.1 | |
| TDD Configuration | Config 1,2 | | Not Applicable | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 FDD | |
| SSB Configuration | Config 1,2 | | SSB.3 FR1 | |
| SMTC Configuration | Config 1,2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 15 KHz | |
| PRACH Configuration | Config 1,2 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |

| | | | | |
|---|---|---|---|---|
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | Table A.5-1 |
| Gap pattern ID | | | N.A. | |
| gapOffset | | | 0 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.1.1 FDD | |
| CSI-RS for tracking | Config 1,2 | | TRS.1.1 FDD | |
| SSB Index assigned as RLM RS | | | 0, 1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 5.17 | |
| T3 | | s | 3.24 | |
| T4 | | s | 0 | |

| | | | |
|---|---|---|---|
| T5 | s | 1.97 | |
| D1 | s | 1.93 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 14.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.2.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.2.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.2.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.2.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.4.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition "Short_DCI" with the following exceptions:

**Table 14.4.2.2.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition SSB BFD<br>Table H.3.1-10 with Condition SSB<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.2.2.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.2.2.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 14.4.2.2.4.3-4: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 14.4.2.2.4.3-5: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

**Table 14.4.2.2.4.3-6: PDCCH *Search Space* for USS**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 2 | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n1 | | |
| aggregationLevel4 | n1 | | |
| aggregationLevel8 | n0 | | |
| } | | | |
| } | | | |

14.4.2.2.5 Test requirements

Tables 14.4.2.2.4.1-3 and 14.4.2.2.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

**Table 14.4.2.2.5-1: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

| **Parameter** | | **Unit** | **Test 1** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1,2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1,2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1,2 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| $N_{oc}$ | Config 1,2 | dBm/15 KHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 4: | Void. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.2.2.4-1. |
| Note 9: | Void. |

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access

### 14.4.2.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell which is served by satellite access node (SAN) and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

### 14.4.2.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.3.

### 14.4.2.3.4 Test description

The test parameters are given in Tables 14.4.2.3.4.1-1, 14.4.2.3.4.1-3 and 14.4.2.3.5-1 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 14.4.2.3.4-1 shows the variation of the downlink SNR of the CSI-RS in set $q_0$ in the active cell to emulate CSI-RS based beam failure. Figure 14.4.2.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

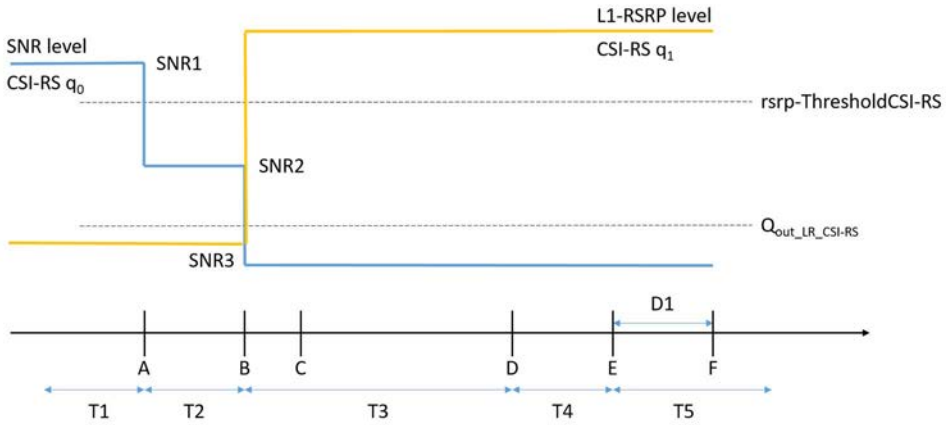



**Figure 14.4.2.3.4-1: SNR and L1-RSRP variation CSI-RS for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

### 14.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.3.4.1-1.

**Table 14.4.2.3.4.1-1: Supported test configurations for FR1 Pcell**

| Configuration | Description |
|---|---|
| 14.4.2.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.2.3.4.1-2.

**Table 14.4.2.3.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.2.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.4.2.3.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.2.3.4.1-3: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Value | Comment |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | | **Test 1** | |
| NTN reference Serving satellite configuration | Config 1 | | SSC.1 | |
| | Config 2 | | SSC.2 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,2 | | FDD | |
| TDD Configuration | Config 1,2 | | Not Applicable | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 FDD | |
| SSB Configuration | Config 1,2 | | SSB.3 FR1 | |
| SMTC Configuration | Config 1,2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 15 KHz | |
| PRACH Configuration | Config 1,2 | | PRACH.4 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp- |

| | | | | |
|---|---|---|---|---|
| | | | | ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1,2 | | CSI-RS.1.2 FDD | |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.1.1 FDD | |
| TRS configuration | Config 1,2 | | TRS.1.1 FDD | |
| CSI-RS-Index assigned as RLM RS | Config 1,2 | | CSI-RS.1.2 FDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.14 | |
| T4 | | s | 0 | |
| T5 | | s | 0.08 | |
| D1 | | s | 0.04 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 14.4.2.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.2.3.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.3.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.3.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.3.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.4.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition "Short_DCI" with the following exceptions:

**Table 14.4.2.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.2.3.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.2.3.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 14.4.2.3.4.3-4: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 14.4.2.3.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 14.4.2.3.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

14.4.2.3.5 Test requirements

Tables 14.4.2.3.4.1-3 and 14.4.2.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

**Table 14.4.2.3.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1,2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | Config 1,2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1,2 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| $N_{oc}$ | Config 1,2 | dBm/15 KHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.2.3.4-1.
Note 9: Void.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access

### 14.4.2.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell which is served by satellite access node (SAN) and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 14.4.2.0.

### 14.4.2.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.2.4.

### 14.4.2.4.4 Test description

The test parameters are given in Tables 14.4.2.4.4.1-1, 14.4.2.4.4.1-3 and 14.4.2.4.5-1 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 14.4.2.4.4-1 shows the variation of the downlink SNR of the CSI-RS in set $q_0$ in the active cell to emulate CSI-RS based beam failure. Figure 14.4.2.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ of the candidate beam used for link recovery.

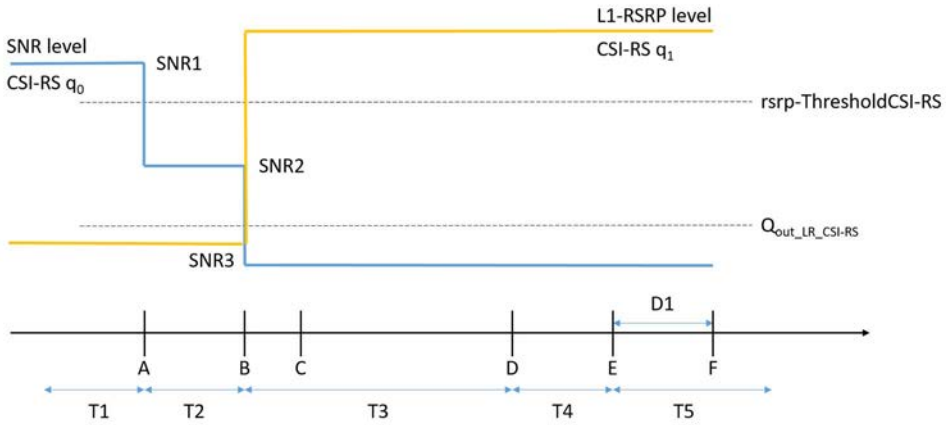



**Figure 14.4.2.4.4-1: SNR and L1-RSRP variation CSI-RS for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

#### 14.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.2.4.4.1-1.

**Table 14.4.2.4.4.1-1: Supported test configurations for FR1 Pcell**

| Configuration | Description |
|---|---|
| 14.4.2.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.2.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.2.4.4.1-2.

**Table 14.4.2.4.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.2.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.4.2.4.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.

3. The test parameters are given in Table 14.4.2.4.4.1-3.

4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.2.4.4.1-3: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| NTN reference Serving satellite configuration | Config 1 | | SSC.1 | |
| | Config 2 | | SSC.2 | |
| Active PSCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,2 | | FDD | |
| TDD Configuration | Config 1,2 | | Not Applicable | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | CCR.1.1 FDD | |
| SSB Configuration | Config 1,2 | | SSB.3 FR1 | |
| SMTC Configuration | Config 1,2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | 15 KHz | |
| PRACH Configuration | Config 1,2 | | PRACH.4 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the |

| | | | | |
|---|---|---|---|---|
| | | | | value 0. (Table 8.1.1-1 of TS 38.133 [6]). |
| rsrp-ThresholdSSB | Config 1, 2 | dBm/ SCS kHz | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| powerControlOffsetSS | | | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | n1 | see clause 5.17 of TS 38.321 [12] |
| beamFailureDetectionTimer | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1,2 | | CSI-RS.1.2 FDD | |
| CSI-RS configuration for CSI reporting | Config 1,2 | | CSI-RS.1.1 FDD | |
| TRS configuration | Config 1,2 | | TRS.1.1 FDD | |
| CSI-RS-Index assigned as RLM RS | Config 1,2 | | CSI-RS.1.2 FDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 8.37 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.93 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 14.4.2.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 14.4.2.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 14.4.2.4.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 14.4.2.4.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 14.4.2.4.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 14.4.2.4.5-1. T5 starts.

9. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

and

c) detects preamble on a beam associated with the candidate beam set $q_1$ before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.4.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 4.6 and 7.3.1 with condition "Short_DCI" with the following exceptions:

**Table 14.4.2.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX mode**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-8 with Condition CSI-RS BFD<br>Table H.3.1-10 with Condition CSI-RS<br>Table H.3.1-10A<br>Table H.3.5-4<br>Table H.3.7-1 with Condition DRX.7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.4.2.4.4.3-2: PDCCH *Search Space* for BFR**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| searchSpaceId | 4 | BFR | |
| controlResourceSetId | 2 | BFR | |
| monitoringSlotPeriodicityAndOffset CHOICE { | | | |
| sl1 | NULL | | |
| } | | | |
| monitoringSymbolsWithinSlot | 10000000000000 | Symbol 0 | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel1 | n0 | | |
| aggregationLevel2 | n0 | | |
| aggregationLevel4 | n0 | | |
| aggregationLevel8 | n1 | AL8 | |
| aggregationLevel16 | n0 | | |
| } | | | |
| searchSpaceType CHOICE { | | | |
| ue-Specific SEQUENCE { | | | USS |
| dci-Formats | formats0-0-And-1-0 | DCI Format 1_0 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

**Table 14.4.2.4.4.3-3: *RLF-TimersAndConstants***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| n310 | n2 | | |
| } | | | |

**Table 14.4.2.4.4.3-4: *NZP-CSI-RS-Resource***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-85 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| powerControlOffsetSS | db0 | | |
| } | | | |

**Table 14.4.2.4.4.3-5: *PDCCH-Config***

| Derivation Path: TS 38.501-1 [14],Table 4.6.3-95 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDCCH-Config ::= SEQUENCE { | | | |
| controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet { | 2 entries | | |
| ControlResourceSet[2] | ControlResourceSet | entry 2, BFR | |
| } | | | |
| controlResourceSetToReleaseList | Not present | | |
| searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace { | 2 entries | | |
| SearchSpace[2] | SearchSpace | entry 2, BFR | |
| } | | | |
| searchSpacesToReleaseList | Not present | | |
| downlinkPreemption | Not present | | |
| tpc-PUSCH | Not present | | |
| tpc-PUCCH | Not present | | |
| tpc-SRS | Not present | | |
| } | | | |

**Table 14.4.2.4.4.3-6: ControlResourceSet for BFR**

| Derivation Path: TS 38.501-1 [14],Table 7.3.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| controlResourceSetId | 2 | | |
| duration | 2 | | |
| cce-REG-MappingType CHOICE { | | | |
| interleaved ::= SEQUENCE { | | | |
| reg-BundleSize | n6 | | |
| interleaverSize | n2 | | |
| shiftIndex | 0 | | |
| } | | | |
| tci-StatesPDCCH-ToAddList | Not present | | |
| } | | | |

### 14.4.2.4.5 Test requirements

Tables 14.4.2.4.4.1-3 and 14.4.2.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX.

**Table 14.4.2.4.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | Config 1,2 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | Config 1,2 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1,2 | dBm/SCS kHz | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| $N_{oc}$ | Config 1,2 | dBm/15 KHz | -98 | | | | |
| Propagation condition | | | NTN-TDLC5-200 | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 14.4.2.3.4-1.
Note 9: Void.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.3 Active BWP Switch for SAN

### 14.4.3.1 DCI-based and Timer-based Active BWP Switch

#### 14.4.3.1.0 Minimum conformance requirements

##### 14.4.3.1.0.1 Minimum conformance requirements for DCI-based and timer-based active BWP switch

The requirements in this clause apply for a UE configured with only PCell, which is served by satellite access node (SAN). The requirements in this clause also apply for a UE configured with more than one BWP on PCell.

UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n. Where,

- Y=0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.
- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, $T_{BWPswitchDelay}$ + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 14.4.3.1.0.1-1.

**Table 14.4.3.1.0.1-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10C in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10C in the new BWP.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within the time duration of

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or
- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X + Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{BWPswitchDelay}$ is defined in Table 14.4.3.1.0.1-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of $T_{dormantBWPswitchDelay}$ which starts from the beginning of DL slot n.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6C.2.

### 14.4.3.1.1 NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Message contents may need to be updated
- Several test parameters and configuration are still FFS

#### 14.4.3.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 14.4.3.1.0.1.

#### 14.4.3.1.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and satellite access.

#### 14.4.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.3.1.1.

#### 14.4.3.1.1.4 Test description

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 14.4.3.1.0 and starts to report valid ACK/NACK for the Cell1 no later than the first UL slot that occurs after the beginning of slot ($i + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu_{K_{offset}}} K_{offset}$). The UE shall be continuously scheduled on Cell1's BWP-2 starting from the first DL slot that occurs after the beginning of slot ($i+T_{BWPswitchDelay}$).

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell1.

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of Cell1's slot ($j+T_{BWPswitchDelay}$) as defined in clause 14.4.3.1.0 and starts to report valid ACK/NACK for the Cell1 at latest on the first UL slot that occurs after the beginning of slot ($j + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu_{K_{offset}}} K_{offset}$). The UE shall be continuously scheduled on Cell1's BWP-1 starting from the first DL slot that occurs after the beginning of slot ($j+T_{BWPswitchDelay}$).

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

##### 14.4.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.3.1.1.4.1-1.

**Table 14.4.3.1.1.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.3.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.3.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.3.1.1.4.1-2.

**Table 14.4.3.1.1.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.4.3.1.1.4.1-3.

2. Message contents are defined in clause 14.4.3.1.1.4.3.

3. The test scenario comprises of one satellite access NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 4 of the test procedure:

   - UE is connected to Cell 1 on radio channel 1.

   - UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.

   - UE is configured with a *bwp-InactivityTimer* timer value for Cell 1.

**Table 14.4.3.1.1.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell 1 on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 14.4.3.1.1.4.2 Test procedure

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

The Cell 1 has constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 14.4.3.1.1.4.1-3 and 14.4.3.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 14.4.3.1.1.4.3-2. UE is configured with a bwp-InactivityTimer timer value for PCell.

4. The SS shall send a DCI format 1_1 command for Cell 1 DL BWP switch.

5. The UE shall receive the DCI format 1_1 command in slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   If the UE starts to report valid ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($i + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu_{K_{offset}}} K_{offset}$), the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

6. If the UE sends valid ACK/NACK for the Cell 1 on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on Cell 1.

7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1:

   If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($j + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu_{K_{offset}}} K_{offset}$), the number of successful tests is increased by one, otherwise, the number of failure tests is increased by one. The SS shall switch off and then on the UE.

8. Repeat steps 1-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

If all subtests pass, the test passes. If one subtest fails, the test fails.

#### 14.4.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.4.3.1.1.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 14.4.3.1.1.4.3-1A: *RRCReconfiguration* (Step 3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 14.4.3.1.1.4.3-1B | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-1B: *CellGroupConfig* (Table 14.4.3.1.1.4.3-1A) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 14.4.3.1.1.4.3-2 | |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-2: *ServingCellConfig* (Table 14.4.3.1.1.4.3-1B) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 14.4.3.1.1.4.3-3 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 14.4.3.1.1.4.3-3 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 14.4.3.1.1.4.3-4 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 14.4.3.1.1.4.3-4 | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-3: *BWP-Downlink* (Table 14.4.3.1.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |

| | | | |
|---|---|---|---|
| setup | PDSCH-ConfigCommon | Table 14.4.3.1.1.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-4: *BWP-Uplink* (Table 14.4.3.1.1.4.3-2) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-5: *PDSCH-TimeDomainResourceAllocationList* (Table 14.4.3.1.1.4.3-6) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S=2, L=6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 14.4.3.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |

| | | | |
|---|---|---|---|
| startSymbolAndLength | 53 | Start symbol(S)=2, Length(L)=12 | |
| } | | | |
| } | | | |

**Table 14.4.3.1.1.4.3-6: *PDSCH-ConfigCommon* (Table 14.4.3.1.1.4.3-3) for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 14.4.3.1.1.4.3-5 | |
| } | | | |

14.4.3.1.1.5 Test requirements

Tables 14.4.3.1.1.4.1-3 and 14.4.3.1.1.5-1 define the primary level settings including test tolerances for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access.

**Table 14.4.3.1.1.5-1: NR Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1, 2 | | FDD |
| $BW_{channel}$ | Config 1, 2 | | 10 MHz: $N_{PRB,c}$ = 52 |
| Serving Satellite Configuration | Config 1, 2 | | *[SSC.1] or [SSC.2]*<br>*[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1, 2 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | Config 1, 2 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | Config 1, 2 | | DLBWP.1.3 Note 4 |
| Initial UL BWP Configuration | Config 1, 2 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | Config 1, 2 | | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | Config 1, 2 | | N/A |
| PDSCH Reference measurement channel | Config 1, 2 | | SR.1.1 FDD |
| RMSI CORESET parameters | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET parameters | Config 1, 2 | | CCR.1.2 FDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1, 2 | | TRS.1.1 FDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1, 2 | dBm/SCS | -104 |

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | Config 1, 2 | dBm/SCS | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1, 2 | dBm/ 9.36 MHz | -58.96 |
| Propagation Condition | | | AWGN |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $(i + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu K_{offset}} K_{offset})$.

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $(j + T_{BWPswitchDelay} + k1 + 2^{\mu-\mu K_{offset}} K_{offset}$.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 14.4.3.1.0.1-1.

All of the above test requirements shall be fulfilled in order for the observed Cell 1 active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.3.2 RRC-based Active BWP Switch

### 14.4.3.2.0 Minimum conformance requirements

#### 14.4.3.2.0.1 Minimum conformance requirements for RRC-based Active BWP switch

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

- Active BWP switch or parameter change of its active BWPs for PCell

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay} + T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

$NR\ Slot\ length$ is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.6C.3.

### 14.4.3.2.1 NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Message contents may need to be updated
- Several test parameters and configuration are still FFS

#### 14.4.3.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 14.4.3.2.0.1.

#### 14.4.3.2.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting BWP adaptation of at least 2 BWPs and satellite access.

#### 14.4.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.3.2.1.

#### 14.4.3.2.1.4 Test description

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot (i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$) as defined in clause 14.4.3.2.0 and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot ($i$ + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1 + 2^{\mu-\mu_{K_{offset}}}K_{offset}$) on BWP-1 of final condition. The UE shall be continuously scheduled on PCell's BWP-1 of final condition starting from the first DL slot right after slot (i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$).

$T_{\text{RRCprocessingDelay}}$ and $T_{\text{BWPswitchDelayRRC}}$ are defined in clause 14.4.3.2.0.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a vaild ACK/NACK is received is received.

##### 14.4.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.3.2.1.4.1-1.

**Table 14.4.3.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.3.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.3.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.3.2.1.4.1-2.

**Table 14.4.3.2.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.4.3.2.1.4.1-3.

2. Message contents are defined in clause 14.4.3.2.1.4.3.

3. The test scenario comprises of one satellite access NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 4 of the test procedure:

   - UE is connected to Cell 1 on radio channel 1.

   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.

   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 1.

**Table 14.4.3.2.1.4.1-3: General test parameters for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

### 14.4.3.2.1.4.2 Test procedure

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Cell 1 has constant signal level throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 14.4.3.2.1.4.1-3 and 14.4.3.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 14.4.3.2.1.5-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 14.4.3.2.1.5-1. T1 starts.
6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.
7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i + X + k1+2^{\mu-\mu_{K_{offset}}}K_{offset}$ ), then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where:

   - X = 16 for both test configurations 14.4.3.2.1-1 and 14.4.3.2.1-2.

8. After the SS receives the ACK/NACK in step 7 or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.
9. The SS shall switch off and then on the UE.
10. Repeat steps 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The test equipment verifies the DL BWP switch time in Cell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

#### 14.4.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.4.3.2.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 14.4.3.2.1.4.3-1A: *RRCReconfiguration* (1, Step 3, Step 5) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 14.4.3.2.1.4.3-1B | |
| dedicatedNAS-MessageList | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.3.2.1.4.3-1B: *CellGroupConfig* (Table 14.4.3.2.1.4.3-1A) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 14.4.3.2.1.4.3-1C | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

**Table 14.4.3.2.1.4.3-1C: *ServingCellConfig* (Table 14.4.3.2.1.4.3-1B) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1<br>Table 14.4.3.2.1.4.3-1D | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 14.4.3.2.1.4.3-1E | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 14.4.3.2.1.4.3-1D: *BWP-Downlink* (Table 14.4.3.2.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |

| | | | |
|---|---|---|---|
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 14.4.3.2.1.4.3-1E: *BWP-Uplink* (Table 14.4.3.2.1.4.3-1C) for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

14.4.3.2.1.5 Test requirements

Tables 14.4.3.2.1.4.1-3 and 14.4.3.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access.

**Table 14.4.3.2.1.5-1: NR Cell specific test parameters for NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1, 2 | | FDD |
| $BW_{channel}$ | | Config 1, 2 | | 10 MHz: $N_{PRB,c}$ = 52 |
| Serving Satellite Configuration | | Config 1, 2 | | *[SSC.1] or [SSC.2]*<br>*[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1, 2 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2 | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1, 2 | | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | Config 1, 2 | | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | Config 1, 2 | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | Config 1, 2 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1, 2 | | SR.1.1 FDD |
| RMSI CORESET parameters | | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET parameters | | Config 1, 2 | | CCR.1.2 FDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1, 2 | | TRS.1.1 FDD |
| Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1, 2 | dBm/SCS | -104 |
| SS-RSRP Note 3 | Config 1, 2 | dBm/SCS | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1, 2 | dBm/ 9.36 MHz | -58.96 |
| NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot (i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$) and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i + \frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1 + 2^{\mu-\mu_{K_{offset}}} K_{offset}$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.4 UE specific CBW change for SAN

### 14.4.4.0 Minimum conformance requirements

#### 14.4.4.0.1 Minimum conformance requirements for UE specific CBW change for SAN

The requirements in this clause apply for a UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on an active DL BWP or transmit PUSCH on an active UL BWP of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [13], and

$T_{CBWchangeDelayRRC} = 6ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} >$

$T_{RRCprocessing Delay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.13C.

## 14.4.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

- Several test parameters and configuration are still FFS

### 14.4.4.1.1 Test purpose

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 14.4.4.0.1.

### 14.4.4.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting satellite access.

### 14.4.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.4.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.4.4.1.

### 14.4.4.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* containing *SCS-SpecificCarrier* with updated UE specific CBW, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated CBW-2 for the final condition.

The UE shall be able to receive PDSCH on PCell from the first DL slot that occurs after the beginning of DL slot $(i + \frac{T_{RRCprocessing Delay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length})$ as defined in clause 14.4.4.0 and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $(i + \frac{T_{RRCprocessing Delay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1 + 2^{\mu - \mu_{K_{offset}}} K_{offset})$ on the PCell's BWP-1 on CBW-2 for the final condition. The UE shall be continuously scheduled on the PCell's BWP-1 on CBW-2 for the final condition starting from the first DL slot right after slot $(i + \frac{T_{RRCprocessing Delay} + T_{CBWchangeDelayRRC}}{NR\ Slot\ length})$.

$T_{RRCprocessing Delay}$ and $T_{CBWchangeDelayRRC}$ are defined in clause 14.4.4.0.

The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the RRC Reconfiguration message including updated UE specific CBW configuration is sent until the moment a vaild ACK/NACK is received.

#### 14.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.4.1.4.1-1.

**Table 14.4.4.1.4.1-1: Supported test configurations for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| | |
|---|---|
| 14.4.4.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.4.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |

| Note: | The UE is only required to be tested in one of the supported test configurations |
|---|---|

Configure the test equipment and the DUT according to the parameters in Table 14.4.4.1.4.1-2.

**Table 14.4.4.1.4.1-2: Initial conditions for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.4.4.1.4.1-3.

2. Message contents are defined in clause 14.4.4.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the satellite access NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

4. The initial test environment conditions are setup according to section 14.0.5.

5. By step 3 of the test procedure:

   - UE is connected to Cell 1 (PCell) on radio channel 1.
   - UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
   - UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in PCell.
   - UE has been configured with UE specific CBW (CBW-1).
   - UE is indicated in *SCS-SpecificCarrier* [13] that the UE specific CBW is CBW-1 as the initial condition in Cell 1 (PCell).

**Table 14.4.4.1.4.1-3: General test parameters for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

### 14.4.4.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 14.4.4.1.4.1-3 and 14.4.4.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1 to ensure that the UE sends ACK/NACK during the test.

4. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

5. T1 starts from the beginning of slot i, where slot i is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 4. The SS shall continuously schedule the PCell's BWP-1 on CBW-2 starting from the first DL slot right after slot ($i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$).

6 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1 + 2^{\mu-\mu_{K_{offset}}}K_{offset}$), then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After the SS receives the ACK/NACK in step 6 or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. Then the SS shall switch off and then on the UE.

8. Repeat steps 1-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.4.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.4.4.1.4.3-1:*ServingCellConfigCommon* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon::= SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| genericParameters | Set according to DLBWP.0.2 | | |
| } | | | |
| uplinkConfigCommon SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters | Set according to ULBWP.0.2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 14.4.4.1.4.3-2: *ServingCellConfig* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-UL | Entry 1 Table 14.4.4.1.4.3-4 | |
| } | | | |
| } | | | |
| downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-DL | Entry 1 Table 14.4.4.1.4.3-3 | |
| } | | | |
| } | | | |

**Table 14.4.4.1.4.3-3: *SCS-SpecificCarrier-DL* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | The offset between point A and the lowest PRB index to guarantee the CBW including SSB and CORESET#0 | CBW-1 (DLCBW.1.1) | step 1 |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1[14] clause 4.3.1. | CBW-2 (DLCBW.1.2) | step 4 |
| } | | | |

**Table 14.4.4.1.4.3-4: *SCS-SpecificCarrier-UL* (step 1 and step 4) for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | Any offset within the CBW of test frequency given in TS 38.508-1[14] clause 4.3.1.and different with offsetToCarrier of ULCBW.1.2 | CBW-1 (ULCBW.1.1) | step 1 |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1[14] clause 4.3.1. | CBW-2 (ULCBW.1.2) | step 4 |
| } | | | |

14.4.4.1.5 Test requirement

Tables 14.4.4.1.4.1-3 and 14.4.4.1.5-1 define the primary level settings including test tolerances for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access.

**Table 14.4.4.1.5-1: NR Cell specific test parameters for NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access**

| **Parameter** | | | **Unit** | **Cell 1** |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1, 2 | | FDD |
| $BW_{channel}$ | | Config 1, 2 | | 10 MHz: $N_{PRB,c}$ = 52 |
| Serving Satellite Configuration | | Config 1, 2 | | *[SSC.1] or [SSC.2]*<br>*[NOTE: SSC.1 and SSC.2 are Serving Satellite Configurations for GSO and NGSO, respectively. The selection between the two is up to UE capability, and SSC.2 is selected if DUT supports both]* |
| Active DL BWP ID | | Config 1, 2 | | 1 |
| Initial DL BWP Configuration (BWP-1) | | Config 1, 2 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2 | | ULBWP.0.2 |
| Initial Condition | Active DLCBW-1 Configureation | Config 1, 2 | | DLCBW.1.1 |
| | Active UL CBW-1 Configuration | Config 1, 2 | | ULCBW.1.1 |
| Final Condition | Active DLCBW-1 Configureation | Config 1, 2 | | DLCBW.1.2 |

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| | Active UL CBW-1 Configuration | Config 1, 2 | | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1, 2 | | SR.1.1 FDD |
| RMSI CORESET parameters | | Config 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET parameters | | Config 1, 2 | | CCR.1.1 FDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1, 2 | | TRS.1.1 FDD |
| Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1, 2 | dBm/SCS | -104 |
| SS-RSRP Note 3 | | Config 1, 2 | dBm/SCS | -87 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |
| Io Note3 | | Config 1, 2 | dBm/ 9.36 MHz | -58.96 |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the begining of slot ($i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$) and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1 + 2^{\mu-\mu_{K_{offset}}}K_{offset}$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 14.4.5 Pathloss reference signal switching delay for SAN

### 14.4.5.0 Minimum conformance requirements

#### 14.4.5.0.1 Minimum conformance requirements for Pathloss reference signal switching delay for SAN

The requirements in this clause apply for pathloss reference signal activated or updated on PCell in clause 7.1.1 in TS 38.213 [8] and the UE is configured with only PCell, which is served by satellite access node (SAN).

UE shall complete the switch of pathloss reference signal within the delay defined in this clause.

The pathloss reference signal is known if the following conditions are met during the period between the last transmission of the RS resource used for L1-RSRP measurement reporting and the completion of pathloss reference signal switch, where the RS resource is the target pathloss reference signal or QCLed (with Type D) to the target pathloss reference signal.

- Pathloss reference signal switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
- The UE has sent at least 1 L1-RSRP report for the target pathloss reference signal before the pathloss reference signal switch command
- The target pathloss reference signal remains detectable during the pathloss reference signal switching period
  - SNR of the target pathloss reference signal ≥ -3 dB
- The associated SSBs with the target pathloss reference signal remain detectable during the pathloss reference signal switching period
  - SNR of the associated SSB ≥ -3 dB

Otherwise, the pathloss reference signal is unknown.

The requirements in this clause apply for a UE to update a pathloss reference signal by MAC-CE for PUCCH, PUSCH, semi-persistent SRS and aperiodic SRS.

If the target pathloss reference signal is known, upon receiving PDSCH carrying MAC-CE activation in slot n, UE shall be able to apply the target pathloss reference signal of the serving cell on which pathloss reference signal switch occurs no later than the slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu} + NM * \left\lceil \frac{5 * T_{target_PL-RS} + 2\ ms}{NR\ slot\ length} \right\rceil$. The UE shall be able to apply old pathloss reference signals until the slot $n + T_{HARQ} + 3N_{slot}^{subframe,\mu}$. Where:

- $T_{HARQ}$ is the timing between pathloss reference MAC-CE activation command and acknowledgement as specified in TS 38.321 [12].
- NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise.
- $T_{target_PL-RS}$ is the periodicity of the target pathloss reference signal which would be SSB or NZP CSI-RS.

NOTE: longer application time is expected if measurement sample is not available due to measurement gap, DRX or other UE activities.

NOTE: longer application time is expected if the pathloss reference signal is unknown.

The normative reference for this requirement is TS 38.133 [6] clauses 8.14C.

### 14.4.5.1 NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access

Editor's Note: This test is incomplete in the following aspects:

MU and TT analysis is incomplete

#### 14.4.5.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 14.4.5.0.1.

#### 14.4.5.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting satellite access.

#### 14.4.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.4.5.0.

The normative reference for this requirement is TS 38.133 [6] clause A. 14.4.3.1.1.

14.4.5.1.4 Test description

14.4.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.4.5.1.4.1-1.

**Table 14.4.5.1.4.1-1: Supported test configurations for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Configuration | Description |
|---|---|
| 14.4.5.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.4.5.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.4.3.1.1.4.1-2.

**Table 14.4.5.1.4.1-2: Initial conditions for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.4.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.4.5.1.4.1-3.
2. Message contents are defined in clause 14.4.5.1.4.3.
3. The test scenario comprises of one satellite access NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.4.5.1.4.1-3: General test parameters for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1, 2 | | FDD | |
| DL initial BWP configuration | Config 1, 2 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, | | ULBWP.1.1 | |
| CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD | |
| SSB Configuration | Config 1, 2 | | SSB.1 FR1 | |

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| SSB index assigned as pathloss RS | | | 0 in T1, 0 in T2, 1 in T3 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| *phr-ProhibitTimer* | | sub frame | 0 | |
| *phr-Tx-PowerFactorChange* | | dB | 5 | |
| *phr-PeriodicTimer* | | sub frame | infinity | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| T1 | | s | 2 | |
| T2 | | s | 2 | |
| T3 | | s | 0.2 | |

#### 14.4.5.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

The test equipment verifies the pathloss RS switch time by counting the slots from the time when the pathloss RS switch command is transmitted till a PHR is received during T3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 14.4.5.1.4.1-3 and 14.4.5.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2. T1 starts

3. During T1 both SSB0 and SSB1 are transmitting. The UE shall be able to detect SSB1 such that it becomes a known candidate pathloss reference signal to the UE. The UE starts transmitting CSI reports containing L1-RSRP measurements for both SSB0 and SSB1.

4. The SS shall transmit an *RRCReconfiguration* message on Cell1 configuring the UE with power headroom reporting functionality as specified in 14.4.5.1.4.3.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T2 starts.

6. During T2, UE shall transmit PHR. If UE does not send any PHR during T2, proceed with step 8.

7. The SS shall transmit a PDSCH carrying MAC-CE activation for pathloss reference signal switch for the UE to swicth the pathloss reference signal from SSB0 to SSB1. The last TTI slot in which this command is received at the UE side in Cell 1 is denoted as slot *i*. T3 starts at slot *i*.

8. The UE shall switch its pathloss reference signal from SSB0 to SSB1 and send PHR:

   - The UE shall start to send the PHR for PCell no earlier than the slot $i + T_{HARQ} + 3\mathrm{N}_{\mathrm{slot}}^{\mathrm{subframe},\mu}$.

   - The UE shall start to send the PHR for PCell no later than the slot $i + T_{HARQ} + \left\lceil \frac{3\ \mathrm{ms} + 5 * T_{target_PL-RS} + 2\ \mathrm{ms}}{NR\ slot\ length} \right\rceil$

   In addition, the UE shall continue transmitting L1-RSRP measurements for both SSB0 and SSB1.

   If the above requirements are fulfilled, the number of successful tests is increased by one. Otherwise, count a fail for the test.

8. Switch off and then on the UE. Then proceed with step 9.

9. Repeat steps 1-7 until the confidence level according to Annex G clause G.2.3 is achieved.

#### 14.4.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.4.5.1.4.3-1: Common Exception messages for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)<br>Table H.3.1-4 with A3-offset = 0dB<br>Table H.3.1-6 with conditions gapUE and RLM<br>Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with condition SSB<br>Table H.3.6-10 |
| MAC-CE activation for pathloss reference signal switch | As specified in TS 38.321 [12] clause 6.1.3.28 |

**Table 14.4.5.1.4.3-2: *PHR-Config* for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-104 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHR-Config ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| phr-PeriodicTimer | infinity | | |
| phr-ProhibitTimer | sf0 | | |
| phr-Tx-PowerFactorChange | dB5 | | |
| } | | | |
| } | | | |

#### 14.4.5.1.5 Test requirements

Tables 14.4.5.1.4.1-3 and 14.4.5.1.5-1 define the primary level settings including test tolerances for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access.

**Table 14.4.5.1.5-1: NR Cell specific test parameters for NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access**

| Parameter | | | Unit | Test 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB | | | |
| EPRE ratio of PSS to SSS | | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | dB | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | [7] | | |
| | $N_{oc}$ | Config 1, 2 | dBm/15 kHz | [-101] | | |
| | $\hat{E}_s / N_{oc}$ | | dB | [7] | | |
| | SS-RSRP Note 4 | Config 1 | dBm/ SCS | [-94] | | |
| | | Config 2 | | [-94] | | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | [-3] | | |

| Parameter | | | Unit | Test 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| | $N_{oc}$ | Config 1, 2 | dBm/15 kHz | [-101] | | |
| | $\hat{E}_s / N_{oc}$ | | dB | [-3] | | |
| | SS-RSRP Note 4 | Config 1 | dBm/ SCS | [-104] | | |
| | | Config 2 | | [-104] | | |
| Io Note 5 | Config 1 | | dBm | -65.3/9.36MHz | | |
| | Config 2 | | | -65.3/9.36MHz | | |
| Propagation condition | | | | AWGN | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 5: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

During T3, the UE shall start to send the PHR for PCell no later than the slot $i + T_{HARQ} + \left\lceil \frac{3\text{ ms} + 5 * T_{target_PL-RS} + 2\text{ ms}}{NR\ slot\ length} \right\rceil$.

During T3, the UE shall start to send the PHR for PCell no earlier than the slot $i + T_{HARQ} + 3\text{N}_{\text{slot}}^{\text{subframe},\mu}$.

Where, $T_{HARQ}$ is the timing between pathloss reference MAC-CE activation command and acknowledgement as specified in [12], $T_{target_PL-RS}$ is the periodicity of the target pathloss reference signal which is SSB in this test.

During T3, UE shall send L1-RSRP report with measurement results for both SSB0 and SSB1.

All of the above test requirements shall be fulfilled in order for the observed pathloss RS switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90 %.

NOTE: The UE shall be given proper uplink transmission grant during T2 and T3.

# 14.5 Measurement procedure

## 14.5.1 Intra-frequency Measurements for SAN

### 14.5.1.0 Minimum conformance requirements

#### 14.5.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

##### 14.5.1.0.1.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index}$.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ \text{ms}$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})\ \text{ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 14.5.1.0.1.1-1

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 14.5.1.0.1.1-2

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 14.5.1.0.1.2-1

$K_{multi_SMTC}$ is the scaling factor for measurement of multiple SMTCs or multiple satellites, and

if SMTCs do not overlap with each other,

- $K_{multi_SMTC} = 1$, if GEO satellites are measured on the carrier;
- $K_{multi_SMTC} = \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if LEO satellites are measured on the carrier;

if SMTCs partially overlap with each other,

- $K_{multi_SMTC} = N_{SMTC,overlap}$, if only GEO satellites are measured on the carrier;
- $K_{multi_SMTC} = \sum_{i=1}^{N_{SMTC,overlap}} \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if only LEO satellites are measured on the carrier;

where

- $N_{LEO,i}$ is the number of LEO satellites to be measured within i-th SMTC,
- $N_{LEO,simul}$ is the number of LEO satellites that UE can measure in parallel within an SMTC,
- $N_{SMTC,overlap}$ is the number of SMTCs that partially overlap with each other.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$K_p$ is the scaling factor for an SSB frequency layer to be measured without measurement gaps. $K_p = N_{total_SAN} / N_{available_SAN}$, where $N_{available_SAN}$ and $N_{total_SAN}$ are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where
  - If UE supports *parallelMeasurementGap-r17* and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap. Otherwise, MGRP max is the MGRP of configured measurement gap.
  - Starting from the beginning of any SMTC occasion:
    - $N_{total_SAN}$ is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and
    - $N_{available_SAN}$ is the number of SMTC occasions within the window W that don't collide with any non-dropped MG occasion within or outside the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] clause 9.1C.8.3. The collision rule between SMTC occasion and measurement gap occasion is defined in TS 38.133 [6] clause 9.1C.9.1

$K_p$ = [1] when $N_{available_SAN} = 0$ and measurement gap sharing in TS 38.133 [6] clause 9.1.2.1a shall apply.

$K_p = 1$ when intra-frequency SMTC is fully non overlapping with measurement gaps.

For calculation of Kp, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

$K_{layer1_measurement}$: it is scaling factor for sharing between L3 and L1 measurement, and $K_{layer1_measurement}$ =1, if GEO satellites are measured on the carrier, or if LEO satellites are measured on the carrier and UE supports *parallelMeasurementWithoutRestriction-r17*, otherwise

$K_{layer1_measurement}$ =1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$ =1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

**Table 14.5.1.0.1.1-1: Time period for PSS/SSS detection, (Frequency range FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x SMTC period )$^{Note\ 1}$ x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5 x 5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil(5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

**Table 14.5.1.0.1.1-2: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

The requirements in clause 14.5.1.0.1.1 and 14.5.1.0.1.2 are not applicable when the overall overhead ratio due to scheduling restriction caused by all configured SMTCs (i.e. scheduling restriction overhead of all SMTCs in one SMTC periodicity), is larger than 75%.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.1.

### 14.5.1.0.1.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 14.5.1.0.1.2-1.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$.

**Table 14.5.1.0.1.2-1: Measurement period for intra-frequency measurements without gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x SMTC period)[Note 1] x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x max(SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | ceil( 5 x $K_p$ x $K_{layer1_measurement}$) x $K_{multi_SMTC}$ x DRX cycle x $CSSF_{intra}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.2.

#### 14.5.1.0.1.3 Scheduling availability of UE during intra-frequency measurements

When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged (in TS 38.331 [13]), if it is configured; otherwise, all *L* SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [8] are included.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.

##### 14.5.1.0.1.3.1 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement:

- If *deriveSSB-IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2* is configured (in TS 38.331 [13]), the SMTC periodicity follows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1*.

- If *deriveSSB-IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1*.

The UE shall be able to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured., if the following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.1.

##### 14.5.1.0.1.3.2 Scheduling availability of UE performing measurements on a neighbor cell served by a different satellite in LEO

For UE which do not support capability *parallelMeasurementWithoutRestriction-r17* the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement on a neighbor cell served by a different satellite in LEO.

- If *deriveSSB-IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2* is configured (in TS 38.331 [13]), the SMTC periodicity follows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1*.

- If *deriveSSB-IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*; Otherwise, the SMTC periodicity follows *smtc1*.

- If the following conditions are met:

  - The UE has been notified about system information update through paging,

  - The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

- The UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured.

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.5.3.2.

#### 14.5.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

##### 14.5.1.0.2.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, the UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index}$

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \text{ ms}$$

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra}$: it is the time period used in PSS/SSS detection given in table 14.5.1.0.2.1-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 14.5.1.0.2.1-2.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 14.5.1.0.2.2-1.

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps. When the UE is configured with concurrent measurement gaps and the two measurement gaps are fully overlapping with MGRP=160ms, $K_{gap}$ = 2. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, and starting from the beginning of any SMTC occasion:

- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] clause 9.1.8.3.

$K_{gap}$ is only applicable for UE supporting *parallelMeasurementGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0, or if one SMTC overlaps more than one MGs associated to the frequency layer.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$K_{multi_SMTC}$ is the scaling factor for measurement of multiple SMTCs or multiple satellites, and

if SMTCs within a measurement gap do not overlap with each other,

- $K_{multi_SMTC} = 1$, if GEO satellites are measured on the carrier;
- $K_{multi_SMTC} = \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if LEO satellites are measured on the carrier;

if SMTCs within a measurement gap partially overlap with each other,

- $K_{multi_SMTC} = N_{SMTC,overlap}$, if only GEO satellites are measured on the carrier;
- $K_{multi_SMTC} = \sum_{i=1}^{N_{SMTC,overlap}} \left\lceil \frac{N_{LEO,i}}{N_{LEO,simul}} \right\rceil$, if only LEO satellites are measured on the carrier;

where

- $N_{LEO,i}$ is the number of LEO satellites to be measured within i-th SMTC,
- $N_{LEO,simul}$ is the number of LEO satellites that UE can measure in parallel within an SMTC,
- $N_{SMTC,overlap}$ is the number of SMTCs that partially overlap with each other.

If the higher layer signaling in TS 38.331 [13] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

**Table 14.5.1.0.2.1-1: Time period for PSS/SSS detection (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_intra}$ |
|---|---|
| No DRX | max(600ms, 5 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x 5) x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

**Table 14.5.1.0.2.1-2: Time period for time index detection (Frequency range FR1)**

| DRX cycle | $T_{SSB_time_index_intra}$ |
|---|---|
| No DRX | max(120ms, 3 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(120ms, ceil(1.5 x 3) x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$) |
| DRX cycle>320ms | 3 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.6.1 and 9.2C.6.2.

### 14.5.1.0.2.2 Intra-frequency measurement period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 14.5.1.0.2.2-1.

**Table 14.5.1.0.2.2-1: Measurement period for intra-frequency measurements with gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_intra}$ |
|---|---|
| No DRX | max(200ms, 5 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$ |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5) x $K_{multi_SMTC}$ x $K_{gap}$ x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$ |
| DRX cycle>320ms | 5 x $K_{gap}$ x $K_{multi_SMTC}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$ |

The normative reference for this requirement is TS 38.133 [6] clause 9.2C.6.3.

## 14.5.1.1 NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access

### 14.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

### 14.5.1.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.1.

### 14.5.1.1.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table 14.5.1.1.4.1-1,14.5.1.1.4.1-3 and 14.5.1.1.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The UE shall be provided with the valid information about the SAN serving each cell in the test before the start of the test.

UE is configured with 2 non-overlapping SMTCs for the intra-frequency measurement. The SMTC periodicity is 20ms, and SMTC1 is associated with Cell 1 with offset 0, and SMTC2 is associated with Cell 2 with offset 10ms.

#### 14.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.1.4.1-1.

**Table 14.5.1.1.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.1.4.1-2.

**Table 14.5.1.1.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 14.5.1.1.4.1-3.
2. Message contents are defined in clause 14.5.1.1.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.1.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | Cell 1 and Cell 2 |
| SMTC1 configuration | | 1 | SMTC.1 | Period: 20ms, offset: 0 |
| SMTC2 configuration | | 2 | SMTC.4 | Period: 20ms, offset: 10ms |
| A3-Offset | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between serving and neighbour cells | ms | 1, 2 | 10 | Asynchronous cells.<br>The timing of Cell 2 is 10ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 14.5.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.1.4.1-3.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.1.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 802 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.1.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 (for config 1) or SMTC pattern 4 (for config 2), and Asynchronous cells<br>Table H.3.1-4 with A3-offset = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

### 14.5.1.1.5 Test requirements

Tables 14.5.1.1.4.1-3 and 14.5.1.1.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access.

**Table 14.5.1.1.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting tests without gap under non-DRX for NR satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |

| | | | |
|---|---|---|---|
| Propagation Condition | | 1, 2 | AWGN |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.1.2 NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access

### 14.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

### 14.5.1.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX cycle.

### 14.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.2.

### 14.5.1.2.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table 14.5.1.2.4.1-1,14.5.1.2.4.1-3 and 14.5.1.2.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The UE shall be provided with the valid information about the SAN serving for each cell in the test before the start of the test.

UE is configured with 1 SMTC for the intra-frequency measurement. Both Cell 1 and Cell 2 are associated with the configured SMTC.

#### 14.5.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.2.4.1-1.

**Table 14.5.1.2.4.1-1: Supported test configurations for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |

| | |
|---|---|
| 14.5.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: | If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.2.4.1-2.

**Table 14.5.1.2.4.1-2: Initial conditions for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.1.2.4.1-3.
2. Message contents are defined in clause 14.5.1.2.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.2.4.1-3: General test parameters for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2 | Cell 1 | | |
| Neighbour cell | | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | | Cell 1 and Cell 2 |
| SMTC configuration | | 1, 2 | SMTC.2 | | |
| A3-Offset | dB | 1, 2 | -4.5 | | |
| CP length | | 1, 2 | Normal | | |
| Hysteresis | dB | 1, 2 | 0 | | |
| Time To Trigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.1 | DRX. 7 | |
| Time offset between serving and neighbour cells | µs | 1, 2 | 3 | | Synchronous cells |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 5 | 10 | |

### 14.5.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.2.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.2.4.1-3.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.2.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delay measured from the beginning of time period T2 is less than X ms for Test 1, or Y ms for Test 2 then the number of successful tests is increased by one. Where X and Y are defined as:

   - For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

     - X = 1282ms

     - Y = 12802ms

   - Otherwise:

     - X = 922ms

     - Y = 6402ms

   If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.
11. Repeat step 1-10 for each sub-test in Table 14.5.1.2.4.1-3 as appropriate.

### 14.5.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.2.4.3-1: Common Exception messages for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2, and Synchronous cells<br>Table H.3.1-4 with A3-offset = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |

14.5.1.2.5 Test requirements

Tables 14.5.1.2.4.1-3 and 14.5.1.2.5-1 define the primary level settings including test tolerances for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access.

**Table 14.5.1.2.5-1: Cell specific test parameters for NR SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. X=1280 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than Y ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. Y=12800 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.1.3 NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access

### 14.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clauses 14.5.1.0.1.1 and 14.5.1.0.1.2.

### 14.5.1.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.5.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.3.

### 14.5.1.3.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table 14.5.1.3.4.1-1 and 14.5.1.3.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The UE shall be provided with the valid information about the SAN serving each cell in the test before the start of the test.

UE is configured with 2 overlapping SMTC for the intra-frequency measurement. The SMTC periodicity is 20ms, and SMTC1 is associated with Cell 1 with offset 0, and SMTC2 is associated with Cell 2 with offset 17ms.

#### 14.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.3.4.1-1.

**Table 14.5.1.3.4.1-1: Supported test configurations for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.3.4.1-2.

**Table 14.5.1.3.4.1-2: Initial conditions for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to Table 14.5.1.3.4.1-3.
2. Message contents are defined in clause 14.5.1.3.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.3.4.1-3: General test parameters for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | Cell 1 and Cell 2 |
| SSB configuration | | 1, 2 | SSB.1 FR1 | |
| SMTC1 configuration | | 1, 2 | SMTC.2 | |
| SMTC2 configuration | | 1, 2 | SMTC.6 | |
| A3-Offset | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF | |
| Time offset between serving and neighbour cells | ms | 1, 2 | 3 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 14.5.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.3.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, and SMTC configuration according to Table 14.5.1.3.4.1-3.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.3.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than X ms, then the number of successful tests is increased by one. Where X is defined as:

   - For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

     - X = 922ms

   - Otherwise:

- X = 802ms

If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.3.4.3-1: Common Exception messages for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2 (for config 1) or SMTC pattern 6 (for config 2), and Asynchronous cells<br>Table H.3.1-4 with A3-offset = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index |

#### 14.5.1.3.5 Test requirements

Tables 14.5.1.3.4.1-3 and 14.5.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access.

**Table 14.5.1.3.5-1: Cell specific test parameters for NR SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0,1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test. X=920 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=800.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 14.5.1.4 NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

#### 14.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

#### 14.5.1.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and CSI-RS based RLM.

#### 14.5.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.4.

#### 14.5.1.4.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) and a NR FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Tables 14.5.1.4.4.1-1, 14.5.1.4.4.1-3 and 14.5.1.4.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

#### 14.5.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.4.4.1-1.

**Table 14.5.1.4.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.4.4.1-2.

**Table 14.5.1.4.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.1.4.4.1-3.
2. Message contents are defined in clause 14.5.1.4.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.4.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | Cell 1 and Cell 2 |
| Measurement gap type | | 1, 2 | Per-UE gaps | |
| Gap Pattern ID | | 1, 2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | |
| Measurement gap length | ms | 1, 2 | 6 | |
| Measurement gap offset | ms | 1, 2 | 39 | |
| A3-Offset | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF | |

| | | | | |
|---|---|---|---|---|
| Time offset between serving and neighbour cells | ms | 1,2 | 3 | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

#### 14.5.1.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP0 which contains the cell defining SSB, and BWP1 which does not contain any SSB of Cell 1. During the whole test, BWP1 is always scheduled as the active BWP for the UE.

UE is configured with 1 SMTC for the intra-frequency measurement. Both Cell 1 and Cell 2 are associated with the configured SMTC.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.4.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.1.4.4.1-3 and 14.5.1.4.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.4.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than X ms, then the number of successful tests is increased by one. Where X is defined as:

   - For configuration 2, if the UE reports *maxNumber-NGSO-SatellitesWithinOneSMTC* as ‘n1’:

     - X = 1602ms

   - Otherwise:

     - X = 1002ms

   If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.4.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 2, and Asynchronous cells<br>Table H.3.1-4 with A3-offset = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 39<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index |

14.5.1.4.5 Test requirements

Tables 14.5.1.4.4.1-3 and 14.5.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access.

**Table 14.5.1.4.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | 1, 2 | SMTC.2 | | SMTC.2 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition | | 1, 2 | AWGN | | | |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. X=1600 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=1000.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.1.5 NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access

### 14.5.1.5.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

### 14.5.1.5.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]), CSI-RS based RLM and long DRX cycle.

### 14.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.5.

### 14.5.1.5.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Tables 14.5.1.5.4.1-1, 14.5.1.5.4.1-3 and 14.5.1.5.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The UE is configured with 2 concurrent and fully non-overlapping (FNO) measurement gaps for the intra-frequency measurement. Serving Cell 1 is expected to be measured within MeasGapId #0 and Neighbour Cell 2 is expected to be measured within MeasGapId #1.

#### 14.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.5.4.1-1.

**Table 14.5.1.5.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.5-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |

| | |
|---|---|
| 14.5.1.5-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: | If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.5.4.1-2.

**Table 14.5.1.5.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.1.5.4.1-3.
2. Message contents are defined in clause 14.5.1.5.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.5.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2 | Cell 1 | | |
| Neighbour cell | | 1, 2 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | | Cell 1 and Cell 2 |
| Measurement gap type | | 1, 2 | Per-UE gap | | |
| Gap Pattern ID | | 1 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | | |
| Measurement gap length | ms | 1, 2 | 6 | | |
| Measurement gap offset | ms | 1, 2 | 19 for MeasGapId #0<br>4 for MeasGapId #1 | | |
| A3-Offset | dB | 1, 2 | -4.5 | | |
| CP length | | 1, 2 | Normal | | |
| Hysteresis | dB | 1, 2 | 0 | | |
| Time To Trigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.1 | DRX. 7 | |
| Time offset between serving and neighbour cells | ms | 1, 2 | 3 | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 5 | 10 | |

#### 14.5.1.5.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP0, which contains the cell defining SSB, and BWP1, which does not contain any SSB of Cell 1. During the whole test, BWP1 is always scheduled as the active BWP for the UE.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.5.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, two parallel gap configurations, and SMTC configuration according to Tables 14.5.1.5.4.1-3 and 14.5.1.5.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.5.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms for Test 1 or 6402 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.
11. Repeat step 1-10 for each sub-test in Table 14.5.1.5.4.1-3 as appropriate.

#### 14.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.5.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.7 FR1, SMTC pattern 12, and Asynchronous cells<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 |

**Table 14.5.1.5.4.3-2: *MeasGapConfig* for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP_ADD | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | MeasGapId #1 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 19 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | | |
| measGapId-r17 | 2 | MeasGapId #2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 4 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

14.5.1.5.5 Test requirements

Tables 14.5.1.5.4.1-3 and 14.5.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access.

**Table 14.5.1.5.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting without SSB time index detection when DRX is used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.7 FR1 | |
| SMTC configuration | | 1, 2 | SMTC.2 | | SMTC.12 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.1.6 NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

### 14.5.1.6.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA intra-frequency NR cell search requirements in clause 14.5.1.0.2.

### 14.5.1.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access, 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]) and CSI-RS based RLM.

### 14.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.1.6.

### 14.5.1.6.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Tables 14.5.1.6.4.1-1, 14.5.1.6.4.1-3 and 14.5.1.6.5-1 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The UE is configured with 2 PPO concurrent measurement gaps for the intra-frequency measurement. Serving Cell 1 is expected to be measured within MeasGapId #0 and Neighbour Cell 2 is expected to be measured within MeasGapId #1. The priority for MeasGapId #1 is higher than the priority for MeasGapId #0.

#### 14.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.1.6.4.1-1.

**Table 14.5.1.6.4.1-1: Supported test configurations for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Configuration | Description |
|---|---|
| 14.5.1.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.1.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.1.6.4.1-2.

**Table 14.5.1.6.4.1-2: Initial conditions for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.1.6.4.1-3.
2. Message contents are defined in clause 14.5.1.6.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.1.6.4.1-3: General test parameters for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1 | Cell 1 and Cell 2 |
| Measurement gap type | | 1, 2 | Per-UE gap | |
| Gap Pattern ID | | 1, 2 | 0 for MeasGapId #1<br>1 for MeasGapId #2 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap repetition periodicity | ms | 1, 2 | 40ms for MeasGapId #1<br>80ms for MeasGapId #2 | |
| Measurement gap length | ms | 1, 2 | 6 | |

| | | | | |
|---|---|---|---|---|
| Measurement gap offset | ms | 1, 2 | 39 for MeasGapId #0<br>4 for MeasGapId #1 | |
| A3-Offset | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 | OFF | |
| Time offset between serving and neighbour cells | ms | 1, 2 | 5 | Asynchronous cells.<br>The timing of Cell 2 is 5ms later than the timing of serving Cell 1. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

#### 14.5.1.6.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP0, which contains the cell defining SSB, and BWP1, which does not contain any SSB of Cell 1. During the whole test, BWP1 is always scheduled as the active BWP for the UE.

The UE is required to report the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.1.6.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an intra-frequency measurement object, event A3, two parallel gap configurations, and SMTC configuration according to Tables 14.5.1.6.4.1-3 and 14.5.1.6.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.1.6.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1242 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shallswitch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.1.6.4.3-1: Common Exception messages for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Default Message Contents |
|---|

| | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 12, and Asynchronous cells<br>Table H.3.1-4 with A3-offset = -4.5dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ |

**Table 14.5.1.6.4.3-2: *MeasGapConfig* for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP_ADD | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | MeasGapId #1 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | | |
| measGapId-r17 | 2 | MeasGapId #2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 4 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms80 | Gap pattern 1 | |
| mgta-r17 | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

### 14.5.1.6.5 Test requirements

Tables 14.5.1.6.4.1-3 and 14.5.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access.

**Table 14.5.1.6.5-1: Cell specific test parameters for NR SA FR1 Event-triggered reporting with SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | 1, 2 | SMTC.2 | | SMTC.12 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.1.2 FDD resource #0 | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.59 | -62.25 | -64.59 | -62.25 |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1240 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2 Inter-frequency Measurements for SAN

### 14.5.2.0 Minimum conformance requirements

#### 14.5.2.0.1 Minimum conformance requirements for inter-frequency measurements with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})\ ms$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})\ ms$$

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 14.5.2.0.1-1.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 14.5.2.0.1-2.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 14.5.2.0.1-3.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1D.5.2 for measurement conducted within measurement gaps.

$K_{gap}$ is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap}$ = 1 when the UE is not configured with concurrent measurement gaps. When the UE is configured with concurrent measurement gaps and the two measurement gaps are fully overlapping with MGRP=160ms, $K_{gap}$ = 2. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and $N_{total}$ are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, and starting from the beginning of any SMTC occasion:

- $N_{total}$ is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and
- $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

$K_{gap}$ is only applicable for UE supporting *parallelMeasurementGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0, or if one SMTC overlaps more than one MGs associated to the frequency layer.

K_satellite: it is a statellite specific scaling factor.

If SMTCs within a measurement gap do not overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within SMTC

K_satellite = 1, if GSO satellites are measured on the carrier

$K_satellite = \left\lceil \frac{Num\ of\ LEO\ satellites\ to\ be\ measured\ in\ the\ SMTC}{number\ of\ LEO\ satellites\ UE\ is\ capable\ to\ measure\ in\ one\ SMTC} \right\rceil$, if LEO satellites are measured on the carrier.

If SMTCs within a measurement gap partially overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within overlapped SMTCs

$K_satellite = number\ of\ overlapped\ SMTCs$, if only GEO satellites are measured on the carrier

$K_satellite = \sum_i \left\lceil \frac{Num\ of\ LEO\ satellites\ to\ be\ measured\ in\ the\ SMTC\ i}{number\ of\ LEO\ satellites\ UE\ is\ capable\ to\ measure\ in\ one\ SMTC} \right\rceil$, if only LEO satellites are measured on the carrier.

**Table 14.5.2.0.1-1: Time period for PSS/SSS detection (Frequency range FR1)**

| Condition NOTE1 | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | Max(600ms, Ceil(8 x $K_{gap}$) × Max(MGRP, SMTC period NOTE2)) × $CSSF_{inter}$ × K_satellite |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8*1.5 x $K_{gap}$) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ × K_satellite |
| DRX cycle > 320ms | Ceil(8 x $K_{gap}$) × DRX cycle × $CSSF_{inter}$ × K_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

**Table 14.5.2.0.1-2: Time period for time index detection (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | Max(120ms, Ceil(3 x $K_{gap}$) × Max(MGRP, SMTC period NOTE2)) × $CSSF_{inter}$ × K_satellite |

| | |
|---|---|
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5 x $K_{gap}$) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ × K_satellite |
| DRX cycle > 320ms | Ceil(3 x $K_{gap}$) × DRX cycle × $CSSF_{inter}$ × K_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

When measurement gaps are provided for inter-frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1C.4, 10.1C.5, 10.1C.9, 10.1C.10, 10.1C.14 and 10.1C.15, respectively, as shown in table 14.5.2.0.1-3.

**Table 14.5.2.0.1-3: Measurement period for inter-frequency measurements with gaps (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | Max(200ms, Ceil(8 x $K_{gap}$) × Max(MGRP, SMTC period NOTE2)) × $CSSF_{inter}$ × K_satellite |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5 x $K_{gap}$) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$ × K_satellite |
| DRX cycle > 320ms | Ceil(8 x $K_{gap}$) × DRX cycle × $CSSF_{inter}$ × K_satellite |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 38.133 [6] clause 3.6.1<br>NOTE 2: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.3C.4 and 9.3C.5.

### 14.5.2.0.2 Minimum conformance requirements for inter-frequency measurements without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})$ ms

$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})$ ms

Where:

$T_{PSS/SSS_sync_inter}$: it is the time period used in PSS/SSS detection given in table 14.5.2.0.2-1.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 14.5.2.0.2-2.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 14.5.2.0.2-3.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1D.5.1 for measurement conducted outside measurement gaps, i.e. when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] clause 9.1D.5.2 for measurement conducted within measurement gaps, i.e. when inter-frequency SMTC is fully overlapping with measurement gaps.

$K_p$ is the scaling factor for a SSB frequency layer to be measured without measurement gaps. $K_p = N_{total_SAN} / N_{available_SAN}$, where $N_{available_SAN}$ and $N_{total_SAN}$ are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where

- If UE supports *parallelMeasurementGap-r17* and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap. Otherwise, MGRP max is the MGRP of configured measurement gap.
- Starting from the beginning of any SMTC occasion:
  - $N_{total_SAN}$ is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and
  - $N_{available_SAN}$ is the number of SMTC occasions within the window W that don't collide with any non-dropped MG occasion within or outside the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1C.8.3. The collision rule between SMTC occasion and measurement gap occasion is defined in TS 38.133 [6] section 9.1C.9.1

$K_p$ = [1] when $N_{available_SAN}$ = 0 and measurement gap sharing in TS 38.133 [6] clause 9.1.2.1a shall apply.

$K_p$ = 1 when inter-frequency SMTC is fully non overlapping with measurement gaps.

$K_{satellite}$: it is a satellite specific scaling factor.

- If SMTCs do not overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within SMTC
  - $K_{satellite}$ = 1, if GSO satellite(s) is/are measured on the carrier
  - $K_{satellite} = \left\lceil \frac{Num\ of\ LEO\ satellites\ to\ be\ measured\ in\ the\ SMTC}{number\ of\ LEO\ satellites\ UE\ is\ capable\ to\ measure\ in\ one\ SMTC} \right\rceil$, if LEO satellite(s) is/are measured on the carrier.
- If SMTCs partially overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within overlapped SMTCs
  - $K_{satellite} = number\ of\ overlapped\ SMTCs$, if only GEO satellite(s) is/are measured on the carrier
  - $K_{satellite} = \sum_i \left\lceil \frac{Num\ of\ LEO\ satellites\ to\ be\ measured\ in\ the\ SMTC\ i}{number\ of\ LEO\ satellites\ UE\ is\ capable\ to\ measure\ in\ one\ SMTC} \right\rceil$, if only LEO satellite(s) is/are measured on the carrier.

**Table 14.5.2.0.2-1: Time period for PSS/SSS detection, (FR1)**

| DRX cycle | $T_{PSS/SSS_sync_inter}$ |
|---|---|
| No DRX | max( 600ms, ceil( 5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter} \times K_{satellite}$ |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter} \times K_{satellite}$ |
| DRX cycle>320ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{inter} \times K_{satellite}$ |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

**Table 14.5.2.0.2-2: Time period for time index detection (FR1)**

| DRX cycle | $T_{SSB_time_index_inter}$ |
|---|---|
| No DRX | max(120ms, ceil( 3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter} \times K_{satellite}$ |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter} \times K_{satellite}$ |
| DRX cycle>320ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{inter} \times K_{satellite}$ |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1C.4, 10.1C.5, 10.1C.9, 10.1C.10, 10.1C.14 and

10.1C.15, respectively, as shown in table 14.5.2.0.2-3, if UE supports inter-frequency measurement without measurement gaps:

**Table 14.5.2.0.2-3: Measurement period for inter-frequency measurements without gaps (FR1)**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{inter}$ × K_satellite |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$ × K_satellite |
| DRX cycle>320ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{inter}$ × K_satellite |
| NOTE 1: SMTC period is the SMTC period in SMTC configuration which is associated with the target cell to be measured configured in *SSB-MTC4List-r17*. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.3C.7.1 and 9.3C.7.2.

## 14.5.2.1 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access

### 14.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

### 14.5.2.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.1.

### 14.5.2.1.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.1.4.1-1, 14.5.2.1.4.1-3 and 14.5.2.1.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

#### 14.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.1.4.1-1.

**Table 14.5.2.1.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Configuration | Description |
|---|---|
| 14.5.2.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.1.4.1-2.

**Table 14.5.2.1.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.2.1.4.1-3.
2. Message contents are defined in clause 14.5.2.1.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.1.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR Cell2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 1 | |

### 14.5.2.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.1.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.2.1.4.1-3 and 14.5.2.1.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.1.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 14.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

### 14.5.2.1.5 Test requirements

Tables 14.5.2.1.4.1-3 and 14.5.2.1.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access.

**Table 14.5.2.1.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Satellite information | | Config 1 | SSC.1 | | NSC.1 | |
| | | Config 2 | SSC.2 | | NSC.2 | |
| Duplex mode | | Config 1,2 | FDD | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | Config 1 | Config 1,2 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.1 FDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 FDD | | | |
| RMSI CORESET Reference Channel | | | Config 1,2 | CR.1.1 FDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1,2 | CCR.1.1 FDD | | | |
| SSB parameters | | | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | | | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| Propagation Condition | | | Config 1,2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2.2 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access

### 14.5.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

### 14.5.2.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and long DRX cycle.

### 14.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.2.

### 14.5.2.2.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.2.4.1-1, 14.5.2.2.4.1-3, 14.5.2.2.5-1, 14.5.2.2.5-2 and 14.5.2.2.5-3 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

#### 14.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.2.4.1-1.

**Table 14.5.2.2.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Configuration | Description |
|---|---|
| 14.5.2.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.2.4.1-2.

**Table 14.5.2.2.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.2.2.4.1-3.
2. Message contents are defined in clause 14.5.2.2.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.2.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR Cell2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | | As specified in 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | | |
| A3-Offset | dB | Config 1,2 | -6 | | |
| Hysteresis | dB | Config 1,2 | 0 | | |
| CP length | | Config 1,2 | Normal | | |
| TimeToTrigger | s | Config 1,2 | 0 | | |
| Filter coefficient | | Config 1,2 | 0 | | L3 filtering is not used |
| DRX | | Config 1,2 | DRX.1 | DRX. 7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1,2 | 3ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 1.1 | 11 | |

### 14.5.2.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.2.2.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, DRX configuration, and SMTC configuration according to Tables 14.5.2.2.4.1-3 and 14.5.2.2.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1082 ms for Test 1 or less than 10242 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE.

10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 14.5.2.2.4.1-3 as appropriate.

#### 14.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.2.2.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1<br>Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

#### 14.5.2.2.5 Test requirements

Tables 14.5.2.2.4.1-3, 14.5.2.2.5-1, 14.5.2.2.5-2 and 14.5.2.2.5-3 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access.

**Table 14.5.2.2.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | |
| Satellite information | | | Config 1 | SSC.1 | | NSC.1 | |
| | | | Config 2 | SSC.2 | | NSC.2 | |
| Duplex mode | | | Config 1,2 | FDD | | | |
| $BW_{channel}$ | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| BWP BW | | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| BWP configuration | Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.1 FDD | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| OCNG Patterns | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.1.1 FDD | | | |
| RMSI CORESET Reference Channel | | Config 1,2 | CR.1.1 FDD | | | |
| Dedicated CORESET Reference Channel | | Config 1,2 | CCR.1.1 FDD | | | |
| SSB parameters | | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 14.5.2.2.5-2: DRX-Configuration for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Field | Test1 | Test2 | Comment |
|---|---|---|---|
| | Value | Value | |
| drx-onDurationTimer | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| drx-InactivityTimer | ms1 | ms1 | |
| drx-RetransmissionTimerDL | sl1 | sl1 | |
| drx-RetransmissionTimerUL | sl1 | sl1 | |
| drx-LongCycleStartOffset | ms40 | ms640 | |
| shortDRX | disable | disable | |

**Table 14.5.2.2.5-3: *TimeAlignmentTimer* configuration for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access**

| Field | Value | Comment |
|---|---|---|
| TimeAlignmentTimer | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2.3 NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access

### 14.5.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

### 14.5.2.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.3.

### 14.5.2.3.4 Test description

Two cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1 and NR FR1 neighbour cell (Cell 2) on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.3.4.1-1, 14.5.2.3.4.1-3 and 14.5.2.3.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Measurement gap pattern configuration # 0 is provided to the UE.

#### 14.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.3.4.1-1.

**Table 14.5.2.3.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

| Configuration | Description |
|---|---|
| 14.5.2.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.3.4.1-2.

**Table 14.5.2.3.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.2.3.4.1-3.
2. Message contents are defined in clause 14.5.2.3.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.3.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR Cell2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1,2 | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 1.1 | |

### 14.5.2.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is required to report the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.2.3.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, gap configuration, and SMTC configuration according to Tables 14.5.2.3.4.1-3 and 14.5.2.3.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.3.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1042 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE.
10. Repeat step 1-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 14.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.2.3.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9<br>Table H.3.1-7 with Condition INTER-FREQ and SSB Index<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

### 14.5.2.3.5 Test requirements

Tables 14.5.2.3.4.1-3 and 14.5.2.3.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access.

**Table 14.5.2.3.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Satellite information | | Config 1 | SSC.1 | | NSC.1 | |
| | | Config 2 | SSC.2 | | NSC.2 | |
| Duplex mode | | Config 1,2 | FDD | | | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 52 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | Config 1 | Config 1,2 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.1 FDD | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 FDD | | | |
| RMSI CORESET Reference Channel | | | Config 1,2 | CR.1.1 FDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1,2 | CCR.1.1 FDD | | | |
| SSB parameters | | | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | |
| SMTC configuration | | | Config 1,2 | SMTC.2 | | SMTC.5 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | Config 1,2 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1,2 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.2 |
| Propagation Condition | | | Config 1,2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2.4 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access

### 14.5.2.4.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

### 14.5.2.4.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]).

### 14.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.4.

### 14.5.2.4.4 Test description

Three cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1, NR FR1 neighbour cell (Cell 2) on NR RF channel 2, and NR FR1 neighbour cell (Cell 3) also on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.4.4.1-1, 14.5.2.4.4.1-3 and 14.5.2.4.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Two parallel non-overlapping measurement gap pattern configurations are provided to the UE.

#### 14.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.4.4.1-1.

**Table 14.5.2.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Configuration | Description |
|---|---|
| 14.5.2.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.4.4.1-2.

**Table 14.5.2.4.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.4.4.1-1. | |
| Propagation conditions | AWGN | As specified in clause C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.2.4.4.1-3.
2. Message contents are defined in clause 14.5.2.4.4.3.
3. Cell 1, Cell 2 and Cell 3 are NR cells (PCell and two neighbor cells, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1, Cell 2 and Cell 3 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.4.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR Cell 2 and NR Cell 3 | NR Cell 2 and NR Cell 3 are on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 for MeasGapId #1<br>0 for MeasGapId #2 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 9 for MeasGapId #1<br>19 for MeasGapId #2 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cell 2,3 | | Config 1,2 | 3ms | Asynchronous cells.<br>The timing of Cell 2 and Cell 3 is 3ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 1 | |

### 14.5.2.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.2.4.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, two parallel gap configurations, and two SMTC configurations, respectively, according to Tables 14.5.2.4.4.1-3 and 14.5.2.4.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS shall switch OFF and then ON the UE and proceed with step 1.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.2.4.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

**Table 14.5.2.4.4.3-2: *MeasGapConfig* for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP_ADD | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | MeasGapId #1 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 9 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | | |
| measGapId-r17 | 2 | MeasGapId #2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 19 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

14.5.2.4.5 Test requirements

Tables 14.5.2.4.4.1-3 and 14.5.2.4.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access.

**Table 14.5.2.4.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | | 2 | |
| Satellite information | | | Config 1 | SSC.1 | | NSC.1 | | | |
| | | | Config 2 | SSC.2 | | NSC.2 | | | |
| Duplex mode | | | Config 1,2 | FDD | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | |
| BWP configuration | Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | | NA | |
| TRS configuration | | | Config 1,2 | TRS.1.1 FDD | | NA | | NA | |
| OCNG Patterns | | | Config 1,2 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1,2 | SR.1.1 FDD | | | | | |
| RMSI CORESET Reference Channel | | | Config 1,2 | CR.1.1 FDD | | | | | |
| Dedicated CORESET Reference Channel | | | Config 1,2 | CCR.1.1 FDD | | | | | |
| SSB parameters | | | Config 1,2 | SSB.1 FR1 | | SSB.5 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | | Config 1,2 | SMTC.2 | | SMTC.5 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | | | |
| EPRE ratio of PSS to SSS | | | Config 1,2 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1,2 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | -91 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | -62.26 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [920] ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2.5 Void

## 14.5.2.6 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access

### 14.5.2.6.1 Test purpose

The purpose of this test is to verify that the multiple gaps capable UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 14.5.2.0.1.

### 14.5.2.6.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and 2 parallel measurement gaps (*parallelMeasurementGap-r17*, TS 38.306 [11]).

### 14.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.6.

### 14.5.2.6.4 Test description

Three cells are deployed in the test, which are NR FR1 PCell (Cell 1) on NR RF channel 1, NR FR1 neighbour cell (Cell 2) on NR RF channel 2, and NR FR1 neighbour cell (Cell 3) also on NR RF channel 2. The test parameters for PCell and neighbour cell are given in Tables 14.5.2.6.4.1-1, 14.5.2.6.4.1-3 and 14.5.2.6.5-1 below. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Two parallel partially overlapping measurement gap pattern configurations are provided to the UE. MeasGapId #2 is configured with a higher priority than MeasGapId #1.

#### 14.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.6.4.1-1.

**Table 14.5.2.6.4.1-1: Supported test configurations for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Configuration | Description |
|---|---|
| 14.5.2.6-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.6-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note 1: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2.<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.6.4.1-2.

**Table 14.5.2.6.4.1-2: Initial conditions for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 14.5.2.6.4.1-3.
2. Message contents are defined in clause 14.5.2.6.4.3.
3. Cell 1, Cell 2 and Cell 3 are NR cells (PCell and two neighbor cells, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1, Cell 2 and Cell 3 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.6.4.1-3: General test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1,2 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1,2 | NR Cell 2 and NR Cell 3 | NR Cell 2 and NR Cell 3 are on NR RF channel number 2. |
| Gap Pattern Id | | Config 1,2 | 0 for MeasGapId #1<br>1 for MeasGapId #2 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 79 for MeasGapId #1<br>4 for MeasGapId #2 | |
| A3-Offset | dB | Config 1,2 | -6 | |
| Hysteresis | dB | Config 1,2 | 0 | |

| | | | | |
|---|---|---|---|---|
| CP length | | Config 1,2 | Normal | |
| TimeToTrigger | s | Config 1,2 | 0 | |
| Filter coefficient | | Config 1,2 | 0 | L3 filtering is not used |
| DRX | | Config 1,2 | OFF | DRX is not used |
| Time offset between serving and neighbour cell 1 | | Config 1,2 | 3μs | Cell 1 and Cell 2 are synchronous. |
| Time offset between serving and neighbour cell 2 | | Config 1,2 | 5ms | Cell 1 and Cell 3 are asynchronous. The timing of Cell 3 is 5ms later than the timing of Cell 1. |
| T1 | s | Config 1,2 | 5 | |
| T2 | s | Config 1,2 | 1.5 | |

#### 14.5.2.6.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.2.6.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, two parallel gap configurations, and two SMTC configurations, respectively, according to Tables 14.5.2.6.4.1-3 and 14.5.2.6.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.6.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 1282 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for next iteration of the test procedure loop.
9. Once the connection is released, the SS shall switch OFF and then ON the UE and proceed with step 1.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 14.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.2.6.4.3-1: Common Exception messages for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ<br>Table H.3.1-3 with Conditions INTER-FREQ MO<br>Table H.3.1-4 with A3-offset = -6dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTER-FREQ<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5 |

**Table 14.5.2.6.4.3-2: *MeasGapConfig* for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 with Condition GAP_ADD | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 { | 2 entries | | |
| GapConfig-r17[1] SEQUENCE { | | | |
| measGapId-r17 | 1 | MeasGapId #1 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 79 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms40 | Gap pattern 0 | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 2 | Lower priority | |
| } | | | |
| GapConfig-r17[2] SEQUENCE { | | | |
| measGapId-r17 | 2 | MeasGapId #2 | |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 4 | | |
| mgl-r17 | ms6 | | |
| mgrp-r17 | ms80 | Gap pattern1 | |
| mgta-r17 | ms0 | | |
| gapPriority-r17 | 1 | Higher priority | |
| } | | | |
| } | | | |
| } | | | |

14.5.2.6.5 Test requirements

Tables 14.5.2.6.4.1-3 and 14.5.2.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access.

**Table 14.5.2.6.5-1: Cell specific test parameters for NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access**

| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | | **Cell 3** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **T1** | **T2** | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | | | Config 1,2 | 1 | | 2 | | 2 | |
| Satellite information | | | Config 1 | SSC.1 | | NSC.1 | | | |
| | | | Config 2 | SSC.2 | | NSC.2 | | | |
| Duplex mode | | | Config 1,2 | FDD | | | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | | | |
| BWP configuration | Initial DL BWP | | Config 1,2 | DLBWP.0.1 | | NA | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | | NA | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TRS configuration | | Config 1,2 | TRS.1.1 FDD | | NA | | NA | |
| OCNG Patterns | | Config 1,2 | OP.1 | | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.1.1 FDD | | | | | |
| RMSI CORESET Reference Channel | | Config 1,2 | CR.1.1 FDD | | | | | |
| Dedicated CORESET Reference Channel | | Config 1,2 | CCR.1.1 FDD | | | | | |
| SSB parameters | | Config 1,2 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 | |
| SMTC configuration | | Config 1,2 | SMTC.2 | | SMTC.2 | | SMTC.12 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 15 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | 0 | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1,2 | -98 | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1,2 | -98 | | -98 | | -98 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 | -Infinity | -91 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 4 | 4 | -Infinity | 7 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 | -70.05 | -62.26 |
| Propagation Condition | | Config 1,2 | AWGN | | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 14.5.2.7 NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete

- Message contents are FFS
- Call setup and test procedure needs to be updated
- Applicability needs to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets
- Neighbor cell ephemeris needs further analysis

#### 14.5.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in clauses 14.5.2.0.2

#### 14.5.2.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

#### 14.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.7.

#### 14.5.2.7.4 Test description

Supported test configurations are shown in table 14.5.2.7.4.1-1. Two cells are deployed in the test, which are FR1 PCell (Cell 1) on NR RF channel 1 and a FR1 neighbour cell (Cell 2) on NR RF channel 2. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

##### 14.5.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.7.4.1-1.

**Table 14.5.2.7.4.1-1: NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access**

| Configuration | Description |
|---|---|
| 14.5.2.7-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.7-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.7.4.1-2.

**Table 14.5.2.7.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.5.2.7.4.1-3.
2. Message contents are defined in clause 14.5.2.7.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.7.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | |
| SMTC1 configuration | | 1 | SMTC.1 | Period: 20ms, offset: 0 |
| SMTC2 configuration | | 2 | SMTC.4 | Period: 20ms, offset: 10ms |
| A3-Offset | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| Hysteresis | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | | OFF |
| Time offset between serving and neighbour cells | | 1, 2 | 20 ms | Asynchronous cells.<br>The timing of Cell 2 is 20ms later than the timing of Cell 1. |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 14.5.2.7.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE is not required to read the neighbour cell SSB index in this test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 14.5.2.7.5-1.
3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, with 2 non-overlapping SMTCs for the inter-frequency measurement according to Tables 14.5.2.7.4.1-3 and 14.5.2.7.5-1.
4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.7.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than 800 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS [shall reset the satellite access channel model and then] switch OFF and then ON the UE and proceed with step 1.

10. Repeat step 2-9 until the confidence level [according to Tables G.2.3-1 in Annex G clause G.2 is achieved].

#### 14.5.2.7.4.3 Message contents

FFS

### 14.5.2.7.5 Test requirements

Table 14.5.2.7.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access.

**Table 14.5.2.7.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Satellite information | | Config 1 | SSC.1 | | NSC.1 | |
| | | Config 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | Config 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration | | Config 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | Config 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | Config 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | Config 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration | | Config 1, 2 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration | | Config 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | Config 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | Config 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | Config 1, 2 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | Config 1, 2 | -98+TT | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | Config 1, 2 | -98+TT | | | |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2 | 4+TT | -1.46+TT | -Infinity | -1.46+TT |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2 | 4+TT | 4+TT | -Infinity | 4+TT |
| SS-RSRP Note 3 | dBm/SCS kHz | Config 1, 2 | -94+TT | -94+TT | -Infinity | -94+TT |
| Io | dBm/9.36 MHz | Config 1, 2 | -64.60+TT | -62.25+TT | --64.60+TT | -62.25+TT |
| Propagation Condition | | Config 1, 2 | AWGN | | | |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.2.8 NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access

Editor's Note:

- MU and TT analysis is incomplete
- Message contents are FFS
- Call setup and test procedure needs to be updated
- Applicability needs to be updated
- Several sections are in brackets
- Several test parameters and configuration are still in brackets

### 14.5.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in clauses 14.5.2.0.2

### 14.5.2.8.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access.

### 14.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.2.8.

### 14.5.2.8.4 Test description

Supported test configurations are shown in table 14.5.2.8.4.1-1. Two cells are deployed in the test, which are FR1 PCell (Cell 1) on NR RF channel 1 and a FR1 neighbour cell (Cell 2) on NR RF channel 2. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

#### 14.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.2.8.4.1-1.

**Table 14.5.2.8.4.1-1: NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access**

| Configuration | Description |
|---|---|
| 14.5.2.8-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.2.8-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.2.8.4.1-2.

**Table 14.5.2.8.4.1-2: Initial conditions for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.12-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | [For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part] | | [4Rx support is FFS, exceptions may need to be removed] |

1. The general test parameter settings are set up according to Table 14.5.2.8.4.1-3.
2. Message contents are defined in clause 14.5.2.8.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbor cell, respectively) with the power level set according to Annex C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.2.8.4.1-3: General test parameters for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2 | Cell 1 | | |
| Neighbour cell | | 1, 2 | Cell 2 | | Cell to be identified. |
| NTN reference configuration | | 1 | SSC.1, NSC.1 | | For GSO |
| | | 2 | SSC.2, NSC.2 | | For NGSO |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | | |
| SMTC configuration | | 1, 2 | SMTC.2 | | |
| A3-Offset | dB | 1, 2 | -4.5 | | |
| CP length | | 1, 2 | Normal | | |
| Hysteresis | dB | 1, 2 | 0 | | |
| Time To Trigger | s | 1, 2 | 0 | | |
| Filter coefficient | | 1, 2 | 0 | | L3 filtering is not used |
| DRX | | 1, 2 | DRX.1 | DRX. 7 | |
| Time offset between serving and neighbour cells | | 1, 2 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2 | 5 | | |
| T2 | s | 1, 2 | 5 | 10 | |

#### 14.5.2.8.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle

The UE is not required to read the neighbour cell SSB index in this test.

2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 14.5.2.8.5-1.

3. SS shall transmit an *RRCReconfiguration* message configuring a *MeasId* consisting in an inter-frequency measurement object, event A3, with 1 SMTC for the inter-frequency measurement according to Table 14.5.2.8.4.1-3.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 14.5.2.8.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by event A3. If the overall delay measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one. Where X and Y are

   - X=1280 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

   - Y=12800 for test configuration 2 and if UE indicates ‘n1’ for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Once the connection is released, the SS [shall reset the satellite access channel model and then] switch OFF and then ON the UE and proceed with step 1.

10. Repeat step 2-9 until the confidence level [according to Tables G.2.3-1 in Annex G clause G.2 is achieved].

11. Repeat step 1-10 for each sub-test in Table 14.5.2.8.4.1-3 as appropriate.

#### 14.5.2.8.4.3 Message contents

FFS

### 14.5.2.8.5 Test requirements

Table 14.5.2.8.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access.

**Table 14.5.2.8.5-1: Cell specific test parameters for NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Satellite information | | 1 | SSC.1 | | NSC.1 | |
| | | 2 | SSC.2 | | NSC.2 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| IInitial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98+TT | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98+TT | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2 | 4+TT | -1.46+TT | -Infinity | -1.46+TT |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 4+TT | 4+TT | -Infinity | 4+TT |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94+TT | -94+TT | -Infinity | -94+TT |
| Io | dBm/9.36 MHz | 1, 2 | -64.60+TT | -62.25+TT | -64.60+TT | -62.25+TT |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. X=1280 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise X=920.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than Y ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test. Y=12800 for test configuration 2 and if UE indicates 'n1' for *maxNumber-NGSO-SatellitesWithinOneSMTC*, otherwise Y=6400.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.3 L1-RSRP measurement for beam reporting for SAN

### 14.5.3.0 Minimum conformance requirements

#### 14.5.3.0.1 Minimum conformance requirements for SSB based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ is defined in Table 14.5.3.0.1-1 for FR1, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- P value for SSB resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
  - $N_{total} / N_{available}$ with $N_{available} > 0$
- For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any SSB resource occasion:
  - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
  - $N_{available}$ is
    - the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and
    - same as $N_{outside_MG}$, otherwise
  - $T_{L1}$ is periodicity of the target SSB.
  - $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet previous conditions.

**Table 14.5.3.0.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to TS 38.133 [6] clause 10.1.19C for FR1 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1.19C for FR1. The differential L1-RSRP is quantized to a 4-bit value with 2dB step

size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] clause 10.1.6.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.19C.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [9].

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5C.3.1, 9.5C.4.1 and 9.5C.5.1.

#### 14.5.3.0.2 Minimum conformance requirements for CSI-RS based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 14.5.3.0.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- P value for a CSI-RS resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
  - $N_{total} / N_{available}$ with $N_{available} > 0$
- For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CSI-RS resource occasion:
  - $N_{total}$ is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{outside_MG}$ is the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
  - $N_{available}$ is
    - the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support

*parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as $N_{outside_MG}$, otherwise

- $T_{L1}$ is periodicity of the target CSI-RS.

- $P_{sharing\ factor} = 3$.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet previous conditions.

**Table 14.5.3.0.2-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to TS 38.133 [6] clause 10.1.19C for FR1 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1.19C for FR1. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] clause 10.1.6.

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in TS 38.133 [6] clauses 10.1.19C.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [9].

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5C.3.3, 9.5C.4.2 and 9.5C.5.2.

## 14.5.3.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure are FFS
- Test requirements contain parameters in square brackets.

### 14.5.3.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in 14.5.3.0.1.

### 14.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

### 14.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.1.

### 14.5.3.1.4 Test description

Supported test configurations are shown in table 14.5.3.1.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

#### 14.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.1.4.1-1.

**Table 14.5.3.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Configuration | Description |
|---|---|
| 14.5.3.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.3.1.4-2.

**Table 14.5.3.1.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.1.4-1 | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.5.3.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.5.3.1.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.3.1.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | FDD |
| TDD Configuration | 1, 2 | | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| PDSCH Reference measurement channel | 1, 2 | | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 | | CCR.1.1 FDD |
| SSB configuration | 1, 2 | | SSB.3 FR1 |
| OCNG Patterns | 1, 2 | | OP.1 |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1, 2 | | SMTC.1 |
| TRS Configuration | 1, 2 | | TRS.1.1 FDD |
| DRX configuration | 1, 2 | | Off |
| reportConfigType | 1, 2 | | periodic |
| reportQuantity | 1, 2 | | ssb-Index-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| L1-RSRP reporting period | 1, 2 | slot | 80 |
| T1 | 1, 2 | s | 5 |
| T2 | 1, 2 | s | 1 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1, 2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

#### 14.5.3.1.4.2 Test procedure

FFS

#### 14.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.3.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table H.3.6-10 |

**Table 14.5.3.1.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.5.3.1.5 Test requirement

Table 14.5.3.1.5-1 defines the primary level settings including test tolerances for all tests.

**Table 14.5.3.1.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1, 2 | dBm/15kHz | -94.65+TT | | | |
| $N_{oc}$ Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | | | |
| $\hat{E}_s / I_{ot}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -Infinity | -91.65+TT |
| Io Note3 | 1, 2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| $\hat{E}_s / N_{oc}$ | 1, 2 | dB | 0+TT | 0+TT | -Infinity | 3+TT |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 14.5.3.1.5-2 and the corresponding relative accuracy requirements in Table 14.5.3.1.5-3.

**Table 14.5.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | [FFS] | [FFS] |
| Highest reported value (SSB#1) | [FFS] | [FFS] |

**Table 14.5.3.1.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |
| Highest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |

For the test to pass, the ratio of successful reported values for each requirement (RX to RY) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.3.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure are FFS
- Test requirements contain parameters in square brackets.

### 14.5.3.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in 14.5.3.0.1.

### 14.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access and long DRX cycle.

### 14.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.2.

### 14.5.3.2.4 Test description

Supported test configurations are shown in table 14.5.3.2.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

#### 14.5.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.2.4.1-1.

**Table 14.5.3.2.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Configuration | Description |
|---|---|
| 14.5.3.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.3.2.4-2.

**Table 14.5.3.2.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.2.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.5.3.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.5.3.2.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.3.2.4.1-3: General test parameters for NR SA FR1 SSB based L1-RSRP test for satellite access**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | FDD |
| TDD Configuration | 1, 2 | | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| PDSCH Reference measurement channel | 1, 2 | | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 | | CCR.1.1 FDD |
| SSB configuration | 1, 2 | | SSB.3 FR1 |
| OCNG Patterns | 1, 2 | | OP.1 |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1, 2 | | SMTC.1 |
| TRS Configuration | 1, 2 | | TRS.1.1 FDD |
| DRX configuration | 1, 2 | | DRX.3 |
| reportConfigType | 1, 2 | | periodic |
| reportQuantity | 1, 2 | | ssb-Index-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| L1-RSRP reporting period | 1, 2 | slot | 80 |

| | | | |
|---|---|---|---|
| T1 | 1, 2 | s | 5 |
| T2 | 1, 2 | s | 1 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1, 2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

14.5.3.2.4.2 Test procedure

FFS

14.5.3.2.4.3 Message contents

Same message content as in subclause 14.5.3.2.4.3 with the following exception:

**Table 14.5.3.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

14.5.3.2.5 Test requirement

Table 14.5.3.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 14.5.3.2.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1, 2 | dBm/15kHz | -94.65+TT | | | |
| $N_{oc}$ Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | | | |
| $\hat{E}_s / I_{ot}$ | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -94.65+TT | -94.65+TT | -Infinity | -91.65+TT |
| Io Note3 | 1, 2 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| $\hat{E}_s / N_{oc}$ | 1, 2 | dB | 0+TT | 0+TT | -Infinity | 3+TT |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 14.5.3.2.5-2 and the corresponding relative accuracy requirements in Table 14.5.3.2.5-3.

**Table 14.5.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest reported value (SSB#1) | [FFS] | [FFS] |
| Highest reported value (SSB#1) | [FFS] | [FFS] |

**Table 14.5.3.2.5-3: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| Normal Conditions | T1 | T2 |
|---|---|---|
| Lowest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |
| Highest DIFF RSRP reported (SSB#0) | [FFS] | [FFS] |

For the test to pass, the ratio of successful reported values for each requirement (XX to YY) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 14.5.3.3 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure are FFS
- Applicability needs to be updated.
- Test requirements contain parameters in square brackets.

### 14.5.3.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in 14.5.3.0.2.

### 14.5.3.3.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

### 14.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.3.

#### 14.5.3.3.4 Test description

Supported test configurations are shown in table 14.5.3.3.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

##### 14.5.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.3.4.1-1.

**Table 14.5.3.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Configuration | Description |
|---|---|
| 14.5.3.3-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.3-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.3.3.4-2.

**Table 14.5.3.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.3.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.5.3.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.5.3.3.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.3.3.4.1-3: General test parameters for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | FDD |
| TDD Configuration | 1, 2 | | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| PDSCH Reference measurement channel | 1, 2 | | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 | | CCR.1.1 FDD |
| SSB configuration | 1, 2 | | SSB.3 FR1 |
| CSI-RS configuration | 1, 2 | | CSI-RS 1.3 FDD |
| OCNG Patterns | 1, 2 | | OP.1 |
| TRS Configuration | 1, 2 | | TRS.1.1 FDD |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.1<br>ULBWP.1.1 |

| | | | |
|---|---|---|---|
| SMTC configuration | 1, 2 | | SMTC.1 |
| DRX configuration | 1, 2 | | Off |
| reportConfigType | 1, 2 | | aperiodic |
| reportQuantity | 1, 2 | | cri-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| qcl-Info | 1, 2 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| reportSlotOffsetList | 1, 2 | slots | 8 |
| T1 | 1, 2 | s | 5 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1, 2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

#### 14.5.3.3.4.2 Test procedure

FFS

#### 14.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.5.3.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions APERIODIC and CSI-RSRP<br>Table H.3.6-3 with condition CSI-RS<br>TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC |

**Table 14.5.3.3.4.3-2: RadioLinkMonitoringConfig**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.5.3.3.5 Test requirement

Table 14.5.3.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 14.5.3.3.5-1: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1, 2 | dBm/15kHz | -94.65+TT | |
| $N_{oc}$ Note1 | 1, 2 | dBm/SSB SCS | -94.65+TT | |
| $\hat{E}_s/I_{ot}$ | 1, 2 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | -91.65+TT |
| Io Note2 | 1, 2 | dBm/9.36 MHz | -63.69+TT | -61.93+TT |
| $\hat{E}_s/N_{oc}$ | 1, 2 | dB | 0+TT | 3+TT |
| Note 1:<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.1 and relative accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 14.5.3.4 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure are FFS
- Applicability needs to be updated.
- Test requirements contain parameters in square brackets.

#### 14.5.3.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in 14.5.3.0.2.

#### 14.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite and long DRX cycle.

#### 14.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.5.3.4.

#### 14.5.3.4.4 Test description

Supported test configurations are shown in table 14.5.3.4.4.1-1. There is one cells in the test, the FR1 PCell (Cell 1) which is served by satellite access node (SAN).

##### 14.5.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.5.3.4.4.1-1.

**Table 14.5.3.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Configuration | Description |
|---|---|
| 14.5.3.4-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.5.3.4-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.5.3.4.4-2.

**Table 14.5.3.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.5.3.4.4-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 14.5.3.4.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 1 is a satellite access cell.
3. The test parameters are given in Table 14.5.3.4.4.1-3.
4. The initial test environment conditions are setup according to section 14.0.5.

**Table 14.5.3.4.4.1-3: General test parameters for NR SA FR1 CSI-RS based L1-RSRP test for Satellite Access**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | FDD |
| TDD Configuration | 1, 2 | | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 |
| PDSCH Reference measurement channel | 1, 2 | | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 | | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 | | CCR.1.1 FDD |
| SSB configuration | 1, 2 | | SSB.3 FR1 |
| CSI-RS configuration | 1, 2 | | CSI-RS 1.3 FDD |

| | | | |
|---|---|---|---|
| OCNG Patterns | 1, 2 | | OP.1 |
| TRS Configuration | 1, 2 | | TRS.1.1 FDD |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1, 2 | | SMTC.1 |
| DRX configuration | 1, 2 | | DRX.3 |
| reportConfigType | 1, 2 | | aperiodic |
| reportQuantity | 1, 2 | | cri-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| qcl-Info | 1, 2 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1, 2 | slots | 8 |
| T1 | 1, 2 | s | 5 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1, 2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

#### 14.5.3.4.4.2 Test procedure

FFS

#### 14.5.3.4.4.3 Message contents

Same message content as in subclause 14.5.3.3.4.3 with the following exception:

**Table 14.5.3.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.7-1 with condition DRX.3 |

### 14.5.3.4.5 Test requirement

Table 14.5.3.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 14.5.3.4.5-1: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1, 2 | dBm/15kHz | -94.65+TT | |
| $N_{oc}$ Note1 | 1, 2 | dBm/SSB SCS | -94.65+TT | |
| $\hat{E}_s / I_{ot}$ | 1, 2 | dB | 0+TT | 3+TT |

| | | | | |
|---|---|---|---|---|
| CSI-RS RSRP Note2 | 1, 2 | dBm/SSB SCS | -94.65+TT | -91.65+TT |
| Io Note2 | 1, 2 | dBm/9.36 MHz | -63.69+TT | -61.93+TT |
| $\hat{E}_s / N_{oc}$ | 1, 2 | dB | 0+TT | 3+TT |
| Note 1: | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.1 and relative accuracy requirement in TS 38.133 [6] clause 10.1.19C.2.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# 14.6 Measurement Performance Requirements

## 14.6.1 SS-RSRP for SAN

### 14.6.1.0 Minimum conformance requirements

#### 14.6.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements for FR1 SAN

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 14.6.1.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.1.0.1-1: SS-RSRP Intra-frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io Note 1 range** | | | | |
| | | | **NR operating band groups Note 2** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±4.5 | ±9 | ≥-6 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_FDD_SAB_FR1_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth. | | | | | | | |
| NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1A | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.2C.1.1.

### 14.6.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 14.6.1.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.1.0.2-1: SS-RSRP Intra-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±2 | ±3 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.2C.1.2.

### 14.6.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements for FR1 SAN

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.1.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.1.0.3-1: SS-RSRP Inter-frequency Absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range |

| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±9 | ≥-6 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR_FDD_SAB_FR1_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: Void<br>NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.4C.1.1.

#### 14.6.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRP in inter-frequency case is defined as the RSRP measured from one cell on a frequency in FR1compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.1.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.1.0.4-1: SS-RSRP Inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.5 | ±6 | ≥-6 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB $\hat{E}s/Iot$ is the minimum SSB $\hat{E}s/Iot$ of the pair of cells to which the requirement applies.<br>NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.4C.1.2.

### 14.6.1.1 NR SA FR1 SS-RSRP measurement accuracy for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure may need to be updated.
- Test requirements contain parameters in square brackets.

#### 14.6.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 14.6.1.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

#### 14.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.1.0.1 and 14.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.1.1.

#### 14.6.1.1.4 Test description

Supported test configurations are shown in table 14.6.1.1.4.1-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in 14.6.1.1.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

##### 14.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.1.1.4.1-1.

**Table 14.6.1.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.1.1-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.6.1.1-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.1.1.4.1-2.

**Table 14.6.1.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [E.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A.<br><br>[4Rx support is FFS, diagram may need to be removed] |
| | [TE Part 4Rx] | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | [DUT Part 4Rx] | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. The general test parameter settings are set up according to Table 14.6.1.1.5-1

2. Message contents are defined in clause 14.6.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

#### 14.6.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 14.6.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 14.6.1.1.4.3.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Tables 14.6.1.1.5-2 and 14.6.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 14.6.1.1.5-1 as appropriate and repeat steps 5-7.

#### 14.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.1.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition SSB.1 FR1<br>Table H.3.1-5<br>Table H.3.1-7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

14.6.1.1.5 Test requirement

Table 14.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 14.6.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.1.1.5-2 and the relative accuracy requirements in Table 14.6.1.1.5-3, correspondingly.

**Table 14.6.1.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRP measurement accuracy for Satellite Access**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | | freq1 | | freq1 | | freq1 | |
| $BW_{channel}$ | Config 1,2 | | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| BWP BW | Config 1,2 | | | 10: $N_{RB,c}$ = 52 | | | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1,2 | | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| DRX Cycle | Config 1,2 | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,2 | | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | Config 1,2 | | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| Control channel RMC | Config 1,2 | | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| SSB configuration | Config 1,2 | | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| Time offset with Cell 1 | Config 1,2 | | ms | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1,2 | | | SMTC.2 | | | | | |
| OCNG Patterns | | | | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | kHz | 15 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/15kHz | -106+TT | | -88+TT | | -114+TT | |
| $N_{oc}$ Note2 | Config 1,2 | | dBm/SCS | -106+TT | | -88+TT | | Same as Noc/15kHz | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.46 | -5.97 | 2.46 | -5.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6+TT | 1+TT | 6+TT | 1+TT | 3+TT | 0+TT |
| SS-RSRP Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/SCS | -100+TT | -105+TT | -82+TT | -87+TT | -111.00+TT | -114.00+TT |
| Io Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/9.36MHz | -70.09 | | -52.09 | | -80.03 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

**Table 14.6.1.1.5-2: SS-RSRP Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

**Table 11.6.1.1.5-3: SS-RSRP Intra-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - FFS | SS-RSRP_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP_x + FFS | SS-RSRP_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - FFS | SS-RSRP_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP_x + FFS | SS-RSRP_x + FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.1.2 NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure may need to be updated.
- Test requirements contain parameters in square brackets.

### 14.6.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

### 14.6.1.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

### 14.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.1.0.3 and 14.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.1.2.

#### 14.6.1.2.4 Test description

Supported test configurations are shown in table 14.6.1.2.4.1-1. Both absolute and relative accuracy of SS-RSRP inter-frequency measurements are tested by using the parameters in 14.6.1.2.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

##### 14.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.1.2.4.1-1.

**Table 14.6.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.1.2-1 | GSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 14.6.1.2-2 | NGSO, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.1.2.4.1-2.

**Table 14.6.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [E.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A.<br><br>[4Rx support is FFS, diagram may need to be removed] |
| | [TE Part 4Rx] | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | [DUT Part 4Rx] | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. The general test parameter settings are set up according to Table 14.6.1.2.5-1

2. Message contents are defined in clause 14.6.1.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour, on a different frequency than the PCell, and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

#### 14.6.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 14.6.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 14.6.1.2.4.3.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Tables 14.6.1.2.5-2 and 14.6.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 14.6.1.2.5-1 as appropriate and repeat steps 5-7.

#### 14.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.1.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition SSB.1 FR1<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.1-6 with condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.6.1.2.5 Test requirement

Table 14.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 14.6.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.1.2.5-2 and the relative accuracy requirements in Table 14.6.1.2.5-3, correspondingly.

**Table 14.6.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1, 2 | | freq1 | freq2 | freq1 | freq2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{channel}$ | | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| PDSCH Reference measurement channel | | 1, 2 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | | 1, 2 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| Dedicated CORESET Reference Channel | | 1, 2 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| SSB configuration | | 1, 2 | | SSB.1 FR1 | | SSB.1 FR1 | |
| OCNG Patterns | | 1, 2 | | OP.1 | | OP.1 | |
| TRS configuration | | 1, 2 | | TRS.1.1 FDD | - | TRS.1.1 FDD | |
| Initial BWP Configuration | | 1, 2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | | 1, 2 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | |
| Time offset with Cell 1 | | 1, 2 | ms | - | 3 | - | 3 |
| SMTC configuration | | 1, 2 | | SMTC.2 | | SMTC.2 | |
| EPRE ratio of PSS to SSS | | 1, 2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_SAB_FR1_A | 1,2 | dBm/15 kHz | -94.65+TT | | ($N_{oc}$ for Channel 2 +8dB) | -115+TT |
| $N_{oc}$ Note2 | NR_FDD_SAB_FR1_A | 1,2 | dBm/SSB SCS | -94.65+TT | | ($N_{oc}$ for Channel 2 +8dB) | -115+TT |
| $\hat{E}_s / I_{ot}$ | | 1,2 | dB | 10 | 10 | 13 | -3 |
| SS-RSRP Note3 | NR_FDD_SAB_FR1_A | 1,2 | dBm/SCS | -84.65+TT | | (RSRP for Cell 2 +25dB) | -118.00+TT |
| Io Note3 | NR_FDD_SAB_FR1_A | 1,2 | dBm/9.36MHz | -56.28 | | (Io for Channel 2 +19.75dB) | -85.28 |
| $\hat{E}_s / N_{oc}$ | | 1,2 | dB | 10+TT | 10+TT | 13+TT | -3+TT |
| Propagation condition | | 1,2 | - | AWGN | | AWGN | |
| Antenna configuration | | 1,2 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 14.6.1.2.5-2: SS-RSRP Inter-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

**Table 11.6.1.1.5-3: SS-RSRP Inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - FFS | SS-RSRP_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP_x + FFS | SS-RSRP_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - FFS | SS-RSRP_x - FFS |
| Highest reported value (Cell 2) | SS-RSRP_x + FFS | SS-RSRP_x + FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.2 SS-RSRQ for SAN

### 14.6.2.0 Minimum conformance requirements

#### 14.6.2.0.1 Intra-frequency absolute SS-RSRQ measurement accuracy requirements for FR1 SAN

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 14.6.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.2.0.1-1: SS-RSRQ Intra-frequency absolute accuracy in FR1**

| **Accuracy** | | **Conditions** | | | | |
|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io [Note 1] range** | | | |
| | | | **NR operating band groups [Note 3]** | **Minimum Io** | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±2.5 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.7C.1.1.

### 14.6.2.0.2 Inter-frequency absolute SS-RSRQ measurement accuracy requirements for FR1 SAN

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.2.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.2.0.2-1: SS-RSRQ Inter-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 3] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±[2.5] | ±[4] | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±[3.5] | ±[4] | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.9C.1.1.

### 14.6.2.0.3 Inter-frequency relative SS-RSRQ measurement accuracy requirements for FR1 SAN

The relative accuracy of SS-RSRQ in inter-frequency case is defined as the RSRQ measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|Channel\ 1_Io - Channel\ 2_Io| \leq 20$ dB
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.2.0.3-1: SS-RSRQ Inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot [Note 2] | Io [Note 1] range | | | |
| | | | NR operating band groups [Note 4] | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |

| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
|---|---|---|---|---|---|---|---|
| ±3 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.9C.1.2.

## 14.6.2.1 NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure may need to be updated.
- Test requirements contain parameters in square brackets.

### 14.6.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

### 14.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

### 14.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.2.1.

### 14.6.2.1.4 Test description

Supported test configurations are shown in table 14.6.2.1.4.1-1. The absolute accuracy of SS-RSRQ intra-frequency is tested by using the parameters in 14.6.2.1.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

#### 14.6.2.1.4.1 Initial conditions

**Table 14.6.2.1.4.1-1: Supported test configurations for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Config | Description |
|---|---|
| 14.6.2.1-1 | GSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 14.6.2.1-2 | NGSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.2.1.4.1-2.

**Table 14.6.2.1.4.1-2: Initial conditions for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [E.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A.<br><br>[4Rx support is FFS, diagram may need to be removed] |
| | [TE Part 4Rx] | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | [DUT Part 4Rx] | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. The general test parameter settings are set up according to Table 14.6.2.1.5-1

2. Message contents are defined in clause 14.6.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

### 14.6.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 14.6.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform intra-frequency measurements as specified in section 14.6.2.1.4.3.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 14.6.2.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 14.6.2.1.5-1 as appropriate and repeat steps 5-7.

### 14.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.2.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition SSB.1 FR1<br>Table H.3.1-5<br>Table H.3.1-7<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

14.6.2.1.5 Test requirement

Table 14.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 14.6.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.2.1.5-2.

**Table 14.6.2.1.5-1: Cell specific test parameters for NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | | **Test 3** | |
|---|---|---|---|---|---|---|---|---|
| | | | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1,2 | | FDD | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| Gap Pattern ID | | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| Control Channel RMC | Config 1,2 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| TRS Configuration | Config 1,2 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| OCNG Patterns | | | OP. 1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1,2 | ms | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1,2 | | SMTC.2 | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| CSI-RS for tracking | Config 1,2 | | TRS.1.1 FDD | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/15kHz | -85+TT | | -101+TT | | -114+TT | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/SCS | -85+TT | | -101+TT | | -114+TT | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5..46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3+TT | 3+TT | -2.9+TT | -2.9+TT | -4+TT | -4+TT |
| SS-RSRP Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/SCS | -82+TT | -82+TT | -103.9+TT | -103.9+TT | -118+TT | -118+TT |
| SS-RSRQ Note3 | | NR_FDD_SAB_FR1_A | dB | TBD | -14.84+TT | -14.84+TT | -16.76+TT | -16.76+TT | -17.34+TT |
| Io Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/9.36MHz | -50 | | -70 | | -83.5 | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3A.4.1A.

**Table 14.6.2.1.5-2: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.2.2 NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access

Editor's note: This test case is incomplete in following aspects:

- MU and TT analysis is incomplete.
- Message contents may need to be updated.
- Call setup and test procedure may need to be updated.
- Test requirements contain parameters in square brackets.

#### 14.6.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

#### 14.6.2.2.2 Test applicability

This test applies to all types of NR UE from Release 17 and onwards supporting satellite access.

#### 14.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 14.6.2.0.2 and 14.6.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.2.2.

#### 14.6.2.2.4 Test description

Supported test configurations are shown in table 14.6.2.2.4.1-1. Both absolute and relative accuracy of SS-RSRQ inter-frequency measurements are tested by using the parameters in 14.6.2.2.5-1. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell

##### 14.6.2.2.4.1 Initial conditions

**Table 14.6.2.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Config | Description |
|---|---|
| 14.6.2.2-1 | GSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 14.6.2.2-2 | NGSO, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.2.2.4.1-2.

**Table 14.6.2.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [E.12-1] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A.<br><br>[4Rx support is FFS, diagram may need to be removed] |
| | [TE Part 4Rx] | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | [DUT Part 4Rx] | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. The general test parameter settings are set up according to Table 14.6.2.2.5-1

2. Message contents are defined in clause 14.6.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour, on a different frequency than the PCell, and the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

4. The initial test environment conditions are setup according to section 14.0.5.

#### 14.6.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 14.6.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 configuring the UE to perform inter-frequency measurements as specified in section 14.6.2.2.4.3.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Tables 14.6.2.2.5-2 and 14.6.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 14.6.2.2.5-1 as appropriate and repeat steps 5-7.

#### 14.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.2.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition SSB.1 FR1<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTER-FREQ<br>Table H.3.1-6 with condition Pattern #0<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

14.6.2.2.5 Test requirement

Table 14.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 14.6.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 14.6.2.2.5-2 and the relative accuracy requirements in Table 14.6.2.2.5-3, correspondingly.

**Table 14.6.2.2.5-1: Cell specific test parameters for NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1,2 | | | FDD | | | | | |
| $BW_{channel}$ | Config 1,2 | | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| Gap pattern ID | Config 1,2 | | | 0 | | | | | |
| BWP BW | Config 1,2 | | | 10: $N_{RB,c}$ = 52 | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,2 | | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | Config 1,2 | | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | | CCR.1 .1 FDD | - | CCR.1. 1 FDD | - | CCR.1. 1 FDD | - |
| TRS Configuration | Config 1,2 | | | TRS.1. 1 FDD | - | TRS.1.1 FDD | - | TRS.1. 1 FDD | - |
| OCNG Patterns | | | | OCNG pattern 1 | | | | | |
| Time offset with Cell 1 | Config 1,2 | | ms | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1,2 | | | SMTC pattern 2 | | | | | |
| SSB configuration | Config 1,2 | | | SSB pattern 1 in FR1 | | | | | |
| CSI-RS for tracking | Config 1,2 | | | TRS.1.1 FDD | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | | kHz | 15 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/15kHz | -80.18+TT | | -106+TT | | -116+TT | |
| $N_{oc}$ Note2 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/15kHz | -80.18+TT | | -106+TT | | -116+TT | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | | -1.75 | | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75+TT | | -1.75+TT | | 3+TT | -1.75+TT |
| SS-RSRP Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/SCS | -81.93 +TT | -81.93+ TT | -107.75 +TT | -107.75 +TT | -113+T T | -117.7 5+TT |
| SS-RSRQ Note3 | | NR_FDD_SAB_FR1_A | dB | -14.77 +TT | -14.77+ TT | -14.76+ TT | -14.76+ TT | -12.56+ TT | -14.76 +TT |
| Io Note3 | Config 1,2 | NR_FDD_SAB_FR1_A | dBm/9.36MHz | -50 | | -75.83 | | -83.28 | -85.83 |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | NR operating band groups are as defined in clause 3A.4.1A. |

**Table 14.6.2.2.5-2: SS-RSRQ Inter-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

**Table 11.6.1.1.5-3: SS-RSRQ Inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | [All bands] |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - FFS | SS-RSRQ_x - FFS |
| Highest reported value (Cell 2) | SS-RSRQ_x + FFS | SS-RSRQ_x + FFS |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - FFS | SS-RSRQ_x - FFS |
| Highest reported value (Cell 2) | SS-RSRQ_x + FFS | SS-RSRQ_x + FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.3 SS-SINR Requirements for SAN

### 14.6.3.0 Minimum conformance requirements

#### 14.6.3.0.1 Intra-Frequency SS-SINR accuracy requirements in FR1

##### 14.6.3.0.1.1 Absolute SS-SINR accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 14.6.3.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.3.0.1.1-1: SS-SINR Intra-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | |
|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 1] range |

| | | Note 3 | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
|---|---|---|---|---|---|---|---|
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB under non-HST scenarios.<br>NOTE 4: NR operating band groups for satellite access in FR1 are as defined in clause 3A.4.1A.<br>NOTE 5: The requirements apply for SSB Ês/Iot ≤5 dB with SCS 15kHz or 30kHz under NR high speed scenarios. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.12C.1.1.

### 14.6.3.0.2 Inter-Frequency SS-SINR accuracy requirements in FR1

#### 14.6.3.0.2.1 Absolute SS-SINR accuracy

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 14.6.3.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.3.0.2.1-1: SS-SINR Inter-frequency absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.<br>NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.14C.1.1.

#### 14.6.3.0.2.2 Relative SS-SINR accuracy

The relative accuracy of SS-SINR in inter-frequency case is defined as the SS-SINR measured from one cell on a frequency in FR1 compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 14.6.3.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.3.0.2.2-1: SS-SINR Inter-frequency relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2,4 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | | |
| ±3.5 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: The requirements apply for SSB Ês/Iot ≤ [25] dB.
NOTE 5: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.14C.1.2.

## 14.6.3.1 NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access

### 14.6.3.1.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.3.0.1.

### 14.6.3.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and SS-SINR measurements in FR1.

### 14.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.3.1.

### 14.6.3.1.4 Test description

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table 14.6.3.1.4.1-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table 14.6.3.1.5-1. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

#### 14.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.3.1.4.1-1.

**Table 14.6.3.1.4.1-1: Supported test configurations for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.3.1-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.3.1-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.3.1.4.1-2

**Table 14.6.3.1.4.1-2: Initial conditions for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | NA | | |

1. The general test parameter settings are set up according to Table 14.6.3.1.4.1-3.
2. Message contents are defined in clause 14.6.3.1.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

### 14.6.3.1.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD intra-frequency cells as given in table 14.6.3.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to Table 14.6.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SS-SINR measurements on the UE.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodic *MeasurementReport* messages.
6. After 10s wait from Step 4, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 14.6.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 14.6.3.1.5-1 as appropriate and repeat steps 5-7.

### 14.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.3.1.4.3-1: Common Exception messages for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-3 with Condition SS-SINR<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.3.1.4.3-2: *ReportConfigNR* for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

14.6.3.1.5 Test requirements

Table 14.6.3.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access. Table 14.6.3.1.5-2 defines the requirement that the SS-SINR values contained in the *MeasurementReport* shall meet.

**Table 14.6.3.1.5-1: Cell specific parameters for NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1, 2 | | FDD | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| Satellite information | Config 1 | | SSC.1 | NSC.1 | SSC.1 | NSC.1 |
| | Config 2 | | SSC.2 | NSC.2 | SSC.2 | NSC.2 |
| TRS configuration | Config 1, 2 | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| PDSCH Reference measurement channel | Config 1, 2 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | Config 1, 2 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1, 2 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| SMTC configuration | Config 1, 2 | | SMTC.2 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Time offset with Cell 1 | | Config 1, 2 | ms | - | 3 | - | 3 |
| SSB configuration | | Config 1, 2 | | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 15 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | NR_FDD_SAB_FR1_A, | dBm/15kHz | -93 | | -116 | |
| $N_{oc}$ Note2 | Config 1, 2 | | dBm/SCS | -93 | | Same as Noc for 15kHz | |
| $\hat{E}_s / I_{ot}$ | | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | | dB | 4.54 | 2.66 | -3.50 | -3.50 |
| SS-RSRP Note 3 | Config 1, 2 | NR_FDD_SAB_FR1_A, | dBm/SCS | -88.46 | -90.34 | -119.50 | -119.50 |
| SS-SINR Note3 | | NR_FDD_SAB_FR1_A, | dB | 0 | -3.19 | -5.10 | -5.10 |
| Io Note3 | Config 1, 2 | NR_FDD_SAB_FR1_A, | dBm/ 9.36MHz | -57.50 | | -85.28 | |
| Propagation condition | | | - | AWGN | | | |
| Antenna configuration | | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3A.4.1A.

**T Table 14.6.3.1.5-2: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR_31 | SS-SINR_28 |
| Highest reported value (Cell 2) | SS-SINR_49 | SS-SINR_45 |
| Extreme Conditions | | |
| Lowest reported value (Cell 2) | SS-SINR_30 | SS-SINR_27 |
| Highest reported value (Cell 2) | SS-SINR_50 | SS-SINR_46 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.3.2 NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access

#### 14.6.3.2.1 Test purpose

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.3.0.2.

#### 14.6.3.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access and SS-SINR measurements in FR1.

#### 14.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.3.2.

#### 14.6.3.2.4 Test description

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table 14.6.3.2.4.1-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table 14.6.3.2.5-1. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

##### 14.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.3.2.4.1-1.

**Table 14.6.3.2.4.1-1: Supported test configurations for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.3.2-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.3.2-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.3.2.4.1-2

**Table 14.6.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.3.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | NA | | |

1. The general test parameter settings are set up according to Table 14.6.3.2.4.1-3.
2. Message contents are defined in clause 14.6.3.2.4.3.
3. Cell 1 and Cell 2 are NR cells (PCell and neighbour cell, respectively) with the power level set according to clauses C.1.2 and C.1.3. Both Cell 1 and Cell 2 are satellite access cells.
4. The initial test environment conditions are setup according to section 14.0.5.

#### 14.6.3.2.4.2 Test procedure

The test scenario comprises of two satellite access NR FDD inter-frequency cells as given in table 14.6.3.2.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to Table 14.6.3.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SS-SINR measurements on the UE.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodic *MeasurementReport* messages.
6. After 10s wait from Step 4, the SS shall check the SS-SINR reported values in the periodic *MeasurementReport*. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 14.6.3.2.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the *MeasurementReport* messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 14.6.3.2.5-1 as appropriate and repeat steps 5-7.

#### 14.6.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.3.2.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED<br>Table H.3.1-3 with Condition INTER-FREQ MO and SS-SINR<br>Table H.3.1-5<br>Table H.3.1-6 with Condition Pattern #0<br>Table H.3.1-7 with Condition INTER-FREQ and SINR<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |

**Table 14.6.3.2.4.3-2: *ReportConfigNR* for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| periodical SEQUENCE { | | | PERIODICAL |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | false | | |
| rsrq | false | | |
| sinr | true | | |
| } | | | |
| maxReportCells | 2 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.6.3.2.5 Test requirements

Table 14.6.3.2.5-1 defines the primary level settings including test tolerances for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access. Table 14.6.3.2.5-2 and 14.6.3.2.5-3 define the absolute and relative requirements, correspondingly, that the SS-SINR values contained in the *MeasurementReport* shall meet.

**Table 14.6.3.2.5-1: Cell specific parameters for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1, 2 | | | FDD | | | | | |
| Downlink initial BWP configuration | | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | | ms | Not Applicable | | | | | |
| Satellite information | | | Config 1 | | SSC.1 | NSC.1 | SSC.1 | NSC.1 | SSC.1 |
| | | | Config 2 | | SSC.2 | NSC.2 | SSC.2 | NSC.2 | SSC.2 |
| Gap pattern ID | | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | Config 1, 2 | | | TRS.1.1 FDD | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| PDSCH Reference measurement channel | Config 1, 2 | | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| RMSI CORESET Reference Channel | Config 1, 2 | | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1, 2 | | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| OCNG Patterns | | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1, 2 | | ms | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 2 | | | SMTC pattern 2 | | | | | |
| SSB configuration | Config 1, 2 | | | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | kHz | 15 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2 | NR_FDD_SAB_FR1_A, | dBm/15kHz | -88 | | -108.5 | | -119.5 | |
| $N_{oc}$ Note2 | Config 1, 2 | | dBm/SCS | -88 | | -108.5 | | Same as Noc for 15kHz | |
| $\hat{E}_s / I_{ot}$ | | | dB | -1.75 | -1.75 | 20 | 20 | -2.1 | -2.1 |
| $\hat{E}_s / N_{oc}$ | | | dB | -1.75 | | 20 | | -2.1 | |
| SS-RSRP Note3 | Config 1, 2 | NR_FDD_SAB_FR1_A, | dBm/SCS | -89.75 | | -88.50 | | -121.60 | |
| SS-SINR Note3 | | NR_FDD_SAB_FR1_A, | dB | -1.75 | | 20 | | -2.10 | |
| Io Note3 | Config 1, 2 | NR_FDD_SAB_FR1_A, | dBm/ 9.36MHz | -57.83 | | -60.50 | | -89.46 | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | - | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | | |

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | NR operating band groups are as defined in clause 3A.4.1A. |

**Table 14.6.3.2.5-2: Reported SS-SINR Intra-frequency absolute accuracy requirements for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_35 | SS-SINR_79 | SS-SINR_34 |
| Highest reported value (Cell 2) | SS-SINR_51 | SS-SINR_94 | SS-SINR_51 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_33 | SS-SINR_77 | SS-SINR_33 |
| Highest reported value (Cell 2) | SS-SINR_53 | SS-SINR_96 | SS-SINR_52 |

**Table 14.6.3.2.5-3: Reported SS-SINR Intra-frequency relative accuracy requirements for NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| Normal Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| Extreme Conditions | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.4 L1-RSRP Beam Reporting Measurement Requirements for SAN

### 14.6.4.0 Minimum conformance requirements

#### 14.6.4.0.1 Minimum conformance requirements for SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ is defined in Table 14.6.4.0.1-1 for FR1, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- P value for SSB resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
  - $N_{total} / N_{available}$ with $N_{available} > 0$
- For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any SSB resource occasion:
  - $N_{total}$ is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- $N_{outside_MG}$ is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction-r17* and LEO satellites are measured for intra-frequency measurement, and
  - same as $N_{outside_MG}$, otherwise
- $T_{L1}$ is periodicity of the target SSB.
- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 14.6.4.0.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_SAN}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P)*$T_{SSB}$) |
| DRX cycle ≤ 320ms | max($T_{Report}$, ceil(1.5*M*P)*max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320ms | ceil(M*P)*$T_{DRX}$ |
| Note: $T_{SSB}$ = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.5C.4.1.

### 14.6.4.0.1.1 Absolute SSB based L1-RSRP accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 14.6.4.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.19 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.4.0.1.1-1: SSB based L1-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io [Note 1] range | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±5 | ±9.5 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR_FDD_SAB_FR1_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.1.1.

#### 14.6.4.0.1.2 Relative SSB based L1-RSRP accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 14.6.4.0.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.19 for a corresponding Band for each relevant SSB.
- Valid information for the SAN serving the target cell has been provided.

**Table 14.6.4.0.1.2-1: SSB based L1-RSRP relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.1.2.

### 14.6.4.0.2 Minimum conformance requirements for CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 14.6.4.0.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- P value for a CSI-RS resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$
  - $N_{total} / N_{available}$ with $N_{available} > 0$
- For a window W of duration max($T_{L1,}$ MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CSI-RS resource occasion:
  - $N_{total}$ is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{outside_MG}$ is the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
  - $N_{available}$ is
    - the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support

*parallelMeasurementWithoutRestriction-r17* and LEO satellites are measured for intra-frequency measurement, and

- same as $N_{outside_MG}$, otherwise

- $T_{L1}$ is periodicity of the target CSI-RS.

- $P_{sharing\ factor} = 3$.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

**Table 14.6.4.0.2-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$ for FR1**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_SAN}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, ceil(M*P)*T_{CSI\text{-}RS})$ |
| DRX cycle ≤ 320ms | $\max(T_{Report}, ceil(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$ |
| DRX cycle > 320ms | $ceil(M*P)*T_{DRX}$ |
| Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

The normative reference for this requirement is TS 38.133 [6] clause 9.5C.4.2.

### 14.6.4.0.2.1 Absolute CSI-RS based L1-RSRP accuracy

Unless otherwise specified, the accuracy requirements for absolute CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 14.6.4.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-5 [39] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to annex B.2.19.2 for a corresponding Band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

- Valid information for the SAN serving the target cell has been provided.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 14.6.4.0.2.1-1.

**Table 14.6.4.0.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range | | | | |
| | | | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI\text{-}RS}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI\text{-}RS}$ = 15 kHz | $SCS_{CSI\text{-}RS}$ = 30 kHz | | |
| ±5 | ±9.5 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -70 |
| ±8.5 | ±11.5 | ≥-3 | NR_FDD_SAB_FR1_A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.1A. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.2.1.

#### 14.6.4.0.2.2 Relative CSI-RS based L1-RSRP accuracy

The relative CSI-RS based L1-RSRP accuracy is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 14.6.4.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-5 [39] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to annex B.2.19.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- Valid information for the SAN serving the target cell has been provided.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 14.6.4.0.2.2-1.

**Table 14.6.4.0.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | | |
| ±3 | ±4 | ≥-3 | NR_FDD_SAB_FR1_A | -121 | -118 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1A.

The normative reference for this requirement is TS 38.133 [6] clause 10.1.19C.2.2.

### 14.6.4.1 NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access

#### 14.6.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.4.0.1.

#### 14.6.4.1.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access in FR1.

#### 14.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.4.1.

#### 14.6.4.1.4 Test description

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table 14.6.4.1.5-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table 14.6.4.1.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

##### 14.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.4.1.4.1-1.

**Table 14.6.4.1.4.1-1: Supported test configurations for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.4.1-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.4.1-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.4.1.4.1-2

**Table 14.6.4.1.4.1-2: Initial conditions for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.4.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.6.4.1.4.1-3.
2. Message contents are defined in clause 14.6.4.1.4.3.
3. Cell 1 is an NR cell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.
4. The initial test environment conditions are setup according to section 14.0.5.

##### 14.6.4.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 14.6.4.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, *Connected without release* On and *Test Mode* On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to Table 14.6.4.1.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic SSB based L1-RSRP measurements on the UE.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodic L1-RSRP messages including measurements for both SSB#0 and SSB#1.

6. After 10s wait from Step 4, the SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the reported SSBs is within the limits in Table 14.6.4.1.5-2 and Table 14.6.4.1.5-3, the number of passed iterations is increased by one. If the values are outside the limits in Table 14.6.4.1.5-2 or Table 14.6.4.1.5-3, the number of failed iterations is increased by one.

7. The SS shall continue checking the reported L1-RSRP measurements transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 14.6.4.1.5-1 as appropriate and repeat steps 5-7.

#### 14.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.4.1.4.3-1: Common Exception messages for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and SS-RSRP<br>Table H.3.6-3 with conditions SSB and PERIODIC<br>Table H.3.6-10<br>Table H.3.5-8<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.6.4.1.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.6.4.1.5 Test requirements

Table 14.6.4.1.5-1 defines the primary level settings including test tolerances for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access. Table 14.6.4.1.5-2 and Table 14.6.4.1.5-3 define the absolute and relative accuracy, respectively, that the L1-RSRP shall meet.

**Table 14.6.4.1.5-1: Cell specific parameters for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 | freq1 |
| Duplex mode | 1, 2 | | FDD | FDD |
| TDD Configuration | 1, 2 | | N/A | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| Satellite information | 1 | | SSC.1 | NSC.1 |
| | 2 | | SSC.2 | NSC.2 |

| | | | | | |
|---|---|---|---|---|---|
| PDSCH Reference measurement channel | | 1, 2 | | SR.1.1 FDD | SR.1.1 FDD |
| RMSI CORESET Reference Channel | | 1, 2 | | CR.1.1 FDD | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | | 1, 2 | | CCR.1.1 FDD | CCR.1.1 FDD |
| SSB configuration | | 1, 2 | | SSB.3 FR1 | SSB.3 FR1 |
| OCNG Patterns | | 1, 2 | | OP.1 | OP.1 |
| Initial BWP Configuration | | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| TRS configuration | | 1, 2 | | TRS.1.1 FDD | TRS.1.1 FDD |
| Dedicated BWP configuration | | 1, 2 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | 1, 2 | | SMTC.1 | SMTC.1 |
| reportConfigType | | 1, 2 | | periodic | periodic |
| reportQuantity | | 1, 2 | | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1, 2 | | 2 | 2 |
| L1-RSRP reporting period | | 1, 2 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1, 2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ Note2 | NR_FDD_SAB_FR1_A | 1, 2 | dBm/15kHz | -94.65 | -117 |
| $N_{oc}$ Note2 | NR_FDD_SAB_FR1_A | 1, 2 | dBm/SSB SCS | -94.65 | -117 |
| $\hat{E}_s/I_{ot}$ | | 1, 2 | dB | 10 | -2.2 |
| SSB RSRP Note3 | NR_FDD_SAB_FR1_A | 1, 2 | dBm/SSB SCS | -84.65 | -119.20 |
| Io Note3 | NR_FDD_SAB_FR1_A | 1, 2 | dBm/9.36 MHz | -56.28 | -87.00 |
| $\hat{E}_s/N_{oc}$ | | 1, 2 | dB | 10 | -2.2 |
| Propagation condition | | 1, 2 | | AWGN | AWGN |
| Antenna configuration | | 1, 2 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 14.6.4.1.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value (Cell 1) | 62 | 31 |
| Highest reported value (Cell 1) | 82 | 44 |
| Extreme Conditions | | |
| Lowest reported value (Cell 1) | 59 | 26 |
| Highest reported value (Cell 1) | 85 | 49 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

**Table 14.6.4.1.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 14.6.4.2 NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access

### 14.6.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 14.6.4.0.2.

### 14.6.4.2.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting satellite access in FR1.

### 14.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 14.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.14.6.4.2.

### 14.6.4.2.4 Test description

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table 14.6.4.2.5-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table 14.6.4.2.5-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM, BFD based on SSB#0 and SSB$1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

#### 14.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 14.6.4.2.4.1-1.

**Table 14.6.4.2.4.1-1: Supported test configurations for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| Configuration | Description |
|---|---|
| 14.6.4.2-1 | GSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| 14.6.4.2-2 | NGSO, NR FDD, 15kHz SSB SCS, data SCS 15kHz, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the test case Config 1 can be skipped if the UE passes test case Config 2. | |

Configure the test equipment and the DUT according to the parameters in Table 14.6.4.2.4.1-2

**Table 14.6.4.2.4.1-2: Initial conditions for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.12-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 14.6.4.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

1. The general test parameter settings are set up according to Table 14.6.4.2.4.1-3.
2. Message contents are defined in clause 14.6.4.2.4.3.
3. Cell 1 is an NR cell with the power level set according to clauses C.1.2 and C.1.3 for this test. Cell 1 is a satellite access cell.
4. The initial test environment conditions are setup according to section 14.0.5.

#### 14.6.4.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 14.6.4.2.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, *Connected without release* On and *Test Mode* On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to Table 14.6.4.2.5-1 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message on Cell 1 to configure periodic CSI-RS based L1-RSRP measurements on the UE.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. The UE shall transmit periodic L1-RSRP messages including measurements for both CSI-RS#0 and CSI-RS#1.
6. After 10s wait from Step 4, the SS shall check the L1-RSRP reported values of CSI-RS#0 or CSI-RS#1 in the periodic L1-RSRP reports. If the value for the reported CSI-RSs is within the limits in Table 14.6.4.2.5-2 and Table 14.6.4.2.5-3, the number of passed iterations is increased by one. If the values are outside the limits in Table 14.6.4.2.5-2 or Table 14.6.4.2.5-3, the number of failed iterations is increased by one.
7. The SS shall continue checking the reported L1-RSRP measurements transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 14.6.4.2.5-1 as appropriate and repeat steps 5-7.

#### 14.6.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 14.6.4.2.4.3-1: Common Exception messages for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.6-2 with conditions PERIODIC and CSI-RSRP<br>Table H.3.6-3 with conditions CSI-RS and PERIODIC<br>Table H.3.6-10<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 14.6.4.2.4.3-2: *RadioLinkMonitoringConfig* for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | 1 entry | | |
| purpose | both | UE is configured to perform RLM and BFD based on the SSBs. | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | | |
| } | | | |
| } | | | |
| } | | | |

#### 14.6.4.2.5 Test requirements

Table 14.6.4.2.5-1 defines the primary level settings including test tolerances for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access. Table 14.6.4.2.5-2 and Table 14.6.4.2.5-3 define the absolute and relative accuracy, respectively, that the L1-RSRP shall meet.

**Table 14.6.4.2.5-1: Cell specific parameters for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 | freq1 |
| Duplex mode | 1, 2 | | FDD | FDD |
| TDD Configuration | 1, 2 | | N/A | N/A |
| $BW_{channel}$ | 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| Satellite information | 1 | | SSC.1 | NSC.1 |
| | 2 | | SSC.2 | NSC.2 |
| PDSCH Reference measurement channel | 1, 2 | | SR.1.1 FDD | SR.1.1 FDD |
| RMSI CORESET Reference Channel | 1, 2 | | CR.1.1 FDD | CR.1.1 FDD |
| Dedicated CORESET Reference Channel | 1, 2 | | CCR.1.1 FDD | CCR.1.1 FDD |
| SSB configuration | 1, 2 | | SSB.3 FR1 | SSB.3 FR1 |
| OCNG Patterns | 1, 2 | | OP.1 | OP.1 |
| TRS configuration | 1, 2 | | TRS.1.1 FDD | TRS.1.1 FDD |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.1 | DLBWP.1.1 |

| | | | | |
|---|---|---|---|---|
| | | | ULBWP.1.1 | ULBWP.1.1 |
| SMTC configuration | 1, 2 | | SMTC.1 | SMTC.1 |
| CSI-RS | 1, 2 | | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD |
| reportConfigType | 1, 2 | | periodic | periodic |
| reportQuantity | 1, 2 | | cri-RSRP | cri-RSRP |
| Number of reported RS | 1, 2 | | 2 | 2 |
| L1-RSRP reporting period | 1, 2 | | slot80 | slot80 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 NR_FDD_SAB_FR1_A | 1, 2 | dBm/15kHz | -94.65 | -117 |
| $N_{oc}$ Note2 NR_FDD_SAB_FR1_A | 1, 2 | dBm/CSI-RS SCS | -94.65 | -117 |
| $\hat{E}_s/I_{ot}$ | 1, 2 | dB | 10 | -2.20 |
| CSI-RS RSRP Note3 NR_FDD_SAB_FR1_A | 1, 2 | dBm/CSI-RS SCS | -84.65 | -119.20 |
| Io Note3 NR_FDD_SAB_FR1_A | 1, 2 | dBm/9.36 MHz | -56.28 | -87.00 |
| $\hat{E}_s/N_{oc}$ | 1, 2 | dB | 10 | -2.2 |
| Propagation condition | 1, 2 | | AWGN | AWGN |
| Antenna configuration | 1, 2 | | 1x2 | 1x2 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table 14.6.4.2.5-2: L1-RSRP absolute accuracy requirements for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest reported value | 62 | 31 |
| Highest reported value | 82 | 44 |
| Extreme Conditions | | |
| Lowest reported value | 59 | 26 |
| Highest reported value | 85 | 49 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

**Table 14.6.4.2.5-3: L1-RSRP relative accuracy requirements for NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| Normal Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Extreme Conditions | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| Note 1: NR operating band groups are defined in Table 3A.4.1A-1. | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# 15 FFS

# 16 NR standalone tests in FR1 for RedCap

## 16.0 General

This clause contains test scenarios for NR standalone for Reduced Capability UE. All NR cells are in Frequency Range 1.

## 16.1 RRC_IDLE state mobility

### 16.1.1 NR cell re-selection for RedCap

#### 16.1.1.0 Minimum conformance requirements

##### 16.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection for RedCap

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the re-selection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra_RedCap}$ when that Treselection = 0. An intra-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.4 for a corresponding band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra_RedCap}$ for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra_RedCap}/2$.

The UE shall not consider a NR neighbour cell in cell re-selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met re-selection criterion defined in TS 38.304 [30] within $T_{evaluate,NR_Intra_RedCap}$ when $T_{reselection} = 0$ provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3 dB better ranked in FR1 for 2 Rx RedCap.
- the cell is at least 4 dB better ranked in FR1 for 1 Rx RedCap.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them.
        - the cell is at least 3 dB better ranked in FR1 if the current serving cell is among them for 2 Rx RedCap.
        - the cell is at least 4 dB better ranked in FR1 if the current serving cell is among them for 1 Rx RedCap.

The 1 Rx RedCap UE applies *absThreshSS-BlocksConsolidation* as the signalled value of *absThreshSS-BlocksConsolidation* defined in TS 38.331 [13] + 1 dB.

When evaluating cells for re-selection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the re-selection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

For both 1 Rx RedCap and 2 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 16.1.1.0.1-1.

For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 16.1.1.0.1-2 for FR1, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ when multiple PTWs are used.

**Table 16.1.1.0.1-1: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 | | 5 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |

Note 1: Applies for RedCap UE of all FR2 power class.
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra_RedCap}$ is expected.

**Table 16.1.1.0.1-2: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range 1)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3]) | $T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3]) | $T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3]) |
|---|---|---|---|---|---|
| 2.56 | - | - | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| 5.12 | - | - | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 | - | - | 235.52 (23) | 10.24 (1) | 20.48 (2) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥[1.28] ([1]) | $eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ (23) | 0.32 x M2 (1 x M2) | 0.64 x M2 (2 x M2) |
| | 0.64 | ≥[1.28] ([1]) | | 0.64 (1) | 1.28 (2) |
| | 1.28 | ≥[2.56] ([2]) | | 1.28 (1) | 2.56 (2) |
| | 2.56 | ≥[5.12] ([4]) | | 2.56 (1) | 5.12 (2) |

Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
Note 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56 s, 5.12 s and 10.24 s. Otherwise, number of DRX cycles.
Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
Note 5: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

#### 16.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection for RedCap

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible re-selection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the re-selection criteria defined in TS 38.304 [30] within $K_{carrier_RedCap}$ * $T_{detect,NR_Inter_RedCap}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the re-selection criteria is met

For 2 Rx RedCap by a margin of at least

5 dB in FR1 for re-selections based on ranking or

6 dB in FR1 for SS-RSRP re-selections based on absolute priorities or

4 dB in FR1 for SS-RSRQ re-selections based on absolute priorities.

For 1 Rx RedCap by a margin of at least

6 dB in FR1 or for re-selections based on ranking or

7 dB in FR1 for SS-RSRP re-selections based on absolute priorities or

5 dB in FR1 for SS-RSRQ re-selections based on absolute priorities.

The parameter $K_{carrier_RedCap}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.5 for a corresponding band. When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter_RedCap}$. If, after detecting a cell in a higher priority search, it is determined that re-selection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of re-selection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier_RedCap}$ * $T_{measure,NR_Inter_RedCap}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell re-selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met re-selection criterion defined in TS 38.304 [30] within $K_{carrier}$ * $T_{evaluate,NR_Inter_RedCap}$ when $T_{reselection}$ = 0 provided that the re-selection criteria is met by

- the condition when performing equal priority re-selection and
  - when *rangeToBestCell* is not configured:
    - the cell is at least 5 dB better ranked in FR1 for 2 Rx RedCap.
    - the cell is at least 6 dB better ranked in FR1 for 1 Rx RedCap.
  - when *rangeToBestCell* is configured:
    - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value defined in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
      - if there are multiple such cells, the cell has the highest rank among them
      - the cell is at least 5 dB better ranked in FR1 or 6.5 dB better ranked in FR2 if the current serving cell is among them, or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP re-selections based on absolute priorities for 2 Rx RedCap or 4 dB in FR1 or 4 dB in FR2 for SS-RSRQ re-selections based on absolute priorities for 2 Rx RedCap.
      - the cell is at least 6 dB better ranked in FR1 if the current serving cell is among them, or 7 dB in FR1 for SS-RSRP re-selections based on absolute priorities or 5 dB in FR1 for SS-RSRQ re-selections based on absolute priorities for 1 Rx RedCap.

The 1 Rx RedCap UE applies *absThreshSS-BlocksConsolidation* as the signalled value of *absThreshSS-BlocksConsolidation* defined in TS 38.331 [13] + 1 dB.

When evaluating cells for re-selection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the re-selection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle = 320 ms defined in TS 38.133 [6] Table 4.2B.2.4-1 or Table 4.2.2.4-1 for 1 Rx RedCap and 2 Rx RedCap respectively, under the following conditions:

- $T_{SMTC_intra}$ = $T_{SMTC_inter}$ = 160 ms; where $T_{SMTC_intra}$ and $T_{SMTC_inter}$ are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion defined in TS 38.304 [30].

For UE not configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 16.1.1.0.2-1.

For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 16.1.1.0.2-2 and Table 16.1.1.0.2-3 for FR1 and FR2 respectively. The requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ when multiple PTWs are used.

**Table 16.1.1.0.2-1: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 (36 x N1 x 1.5) | 1.28 x N1 x 1.5 (4 x N1 x 1.5) | 5.12 x N1 x 1.5 (16 x N1 x 1.5) |

| | | | | | |
|---|---|---|---|---|---|
| 0.64 | | 5 | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: Applies for RedCap UE of all FR2 power class. | | | | | |

**Table 16.1.1.0.2-2: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range 1)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 2.56 | - | - | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| 5.12 | - | - | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 | - | - | 235.52 (23) | 10.24 (1) | 20.48 (2) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥1.28 (1) | $eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ (23) | 0.32 x 1.5 (1 x 1.5) | 0.64 x 1.5 (2 x 1.5) |
| | 0.64 | ≥1.28 (1) | | 0.64 (1) | 1.28 (2) |
| | 1.28 | ≥2.56 (2) | | 1.28 (1) | 2.56 (2) |
| | 2.56 | ≥5.12 (4) | | 2.56 (1) | 5.12 (2) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>NOTE 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].<br>NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56 s, 5.12 s and 10.24 s. Otherwise, number of DRX cycles.<br>NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$. | | | | | |

**Table 16.1.1.0.2-3: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range 2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|
| 2.56 | - | - | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | - | - | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 | - | - | 3 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥5.12 (4) | 8 | $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1) | 0.32 x N1 (1 x N1) | 0.64 x N1 (2 x N1) |
| | 0.64 | ≥6.4 (5) | 5 | | 0.64 x N1 (1 x N1) | 1.28 x N1 (2 x N1) |
| | 1.28 | ≥10.24 (8) | 4 | | 1.28 x N1 (1 x N1) | 2.56 x N1 (2 x N1) |
| | 2.56 | ≥15.36 (12) | 3 | | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |
| NOTE 1: Applies for RedCap UE of all power class.<br>NOTE 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs. | | | | | | |

NOTE 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
NOTE 4: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56 s, 5.12 s and 10.24 s. Otherwise, number of DRX cycles.
NOTE 5: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,NR_Inter_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

#### 16.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains the requirements for measurements on intra-frequency NR cells when Srxlev $\leq S_{IntraSearchP}$ or Squal $\leq S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for a stationary UE defined in clause 5.2.4.9.3 in TS 38.304 [30],
- Relaxed measurement criterion for a stationary UE not at cell edge defined in clause 5.2.4.9.4 in TS 38.304 [30],
- Both low mobility criterion and stationary criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.3 or 5.2.4.9.4 in TS 38.304 [30] respectively.The 1 Rx RedCap UE for the evaluation of one or more relaxed measurement criteria defined in clause 5.2.4.9 in TS 38.304 [30] applies:

- *s-SearchDeltaP-r16* as the signalled value of *s-SearchDeltaP-r16* defined in TS 38.331 [13] - 1 dB.
- *s-SearchDeltaP-Stationary-r17* as the signalled value of *s-SearchDeltaP-Stationary-r17* defined in TS 38.331 [13] - 1 dB.
- *s-SearchThresholdP-r16* as the signalled value of *s-SearchThresholdP-r16* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdQ-r16* as the signalled value of *s-SearchThresholdQ-r16* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdP2-r17* as the signalled value of *s-SearchThresholdP2-r17* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdQ2-r17* as the signalled value of *s-SearchThresholdQ2-r17* defined in TS 38.331 [13] + 1 dB.

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and UE is not configured with *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and UE has fulfilled the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion, or
- UE is configured with both *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and *combineRelaxedMeasCondition2* defined in TS 38.331 [13] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

The requirements defined in TS 38.133 [6] clause 4.2B.2.3 apply for this clause except that:

- For UE not configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 16.1.1.0.3-1 and Table 16.1.1.0.3-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 16.1.1.0.3-3 and Table 16.1.1.0.3-4 are applicable for eDRX cycle up to 10.24 s in FR1 and FR2 respectively.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s in FR1 and FR2, then the requirements in Table 16.1.1.0.3-5 and Table 16.1.1.0.3-6 respectively apply provided eDRX cycle is $\leq$ 163.84 sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

**Table 16.1.1.0.3-1: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UEs fulfilling stationary criterion for 1 Rx RedCap UE**

| DRX cycle length [s] | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 x M2 x K3 (36 x M2 x K3) | 1.28 x M2 x K3 (4 x M2 x K3) | 5.12 x M2 x K3 (16 x M2 x K3) |
| 0.64 | 17.92 x K3 (28 x K3) | 1.28 x K3 (2 x K3) | 5.12 x K3 (8 x K3) |
| 1.28 | 32 x K3 (25 x K3) | 1.28x K3 (1 x K3) | 6.4 x K3 (5 x K3) |
| 2.56 | 58.88 x K3 (23 x K3) | 2.56 x K3 (1 x K3) | 7.68 x K3 (3 x K3) |

Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra}$ is expected.

Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

**Table 16.1.1.0.3-2: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UEs fulfilling stationary criterion for 2 Rx RedCap UE**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K3 (36 x N1 x M2 x K3) | 1.28 x N1 x M2 x K3 (4 x N1 x M2 x K3) | 5.12 x N1 x M2 x K3 (16 x N1 x M2 x K3) |
| 0.64 | | 5 | 17.92 x N1 x K3 (28 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) | 5.12 x N1 x K3 (8 x N1 x K3) |
| 1.28 | | 4 | 32 x N1 x K3 (25 x N1 x K3) | 1.28 x N1 x K3 (1 x N1 x K3) | 6.4 x N1 x K3 (5 x N1 x K3) |
| 2.56 | | 3 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x N1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |

Note 1: Applies for RedCap UE of all supporting FR2 power classes.

Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra}$ is expected.

Note 3: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

**Table 16.1.1.0.3-3: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 1) for eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) |
|---|---|---|---|
| 2.56 | 58.88 x K3 (23 x K3) | 2.56 x K3 (1 x K3) | 7.68 x K3 (3 x K3) |
| 5.12 | 117.76 x K3 (23 x K3) | 5.12 x K3 (1 x K3) | 10.24 x K3 (2 x K3) |
| 10.24 | 235.52 x K3 (23 x K3) | 10.24 x K3 (1 x K3) | 20.48 x K3 (2 x K3) |

Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

**Table 16.1.1.0.3-4: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) |
|---|---|---|---|
| 2.56 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |
| 5.12 | 117.76 x N1 x K3 (23 x N1 x K3) | 5.12 x N1 x K3 (1 x N1 x K3) | 10.24 x N1 x K3 (2 x N1 x K3) |
| 10.24 | 235.52 x N1 x K3 (23 x N1 x K3) | 10.24 x N1 x K3 (1 x N1 x K3) | 20.48 x N1 x K3 (2 x N1 x K3) |
| Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.1.0.3-5: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 1)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤[163.84] | 0.32 | ≥[6.4] ([5]) | $eDRX_cycle_length \times \lceil \frac{23}{PTW/DRX_cycle_length} \rceil$ x K3 (23 x K3) | 0.32 x M2 x K3 (1 x M2 x K3) | 0.64 x M2 x K3 (2 x M2 x K3) |
| | 0.64 | ≥[12.8] ([10]) | | 0.64 x K3 (1 x K3) | 1.28 x K3 (2 x K3) |
| | 1.28 | ≥[15.36] ([12]) | | 1.28 x K3 (1 x K3) | 2.56 x K3 (2 x K3) |
| | 2.56 | ≥[30.72] ([24]) | | 2.56 x K3 (1 x K3) | 5.12 x K3 (2 x K3) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs. | | | | | |
| Note 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34]. | | | | | |
| Note 3: The lower bound of PTW length is derived based on $\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \rceil * 1.28$. | | | | | |
| Note 4: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra_RedCap}$ is expected. | | | | | |
| Note 5: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | |

**Table16.1.1.0.3-6: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤[163.84] | 0.32 | ≥30.72 (24) | 8 | K3 x $eDRX_cycle_length \times \lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \rceil$ (23 x N1 x K3) | 0.32 x N1 x K3 (1 x N1 x K3) | 0.64 x N1 x K3 (2 x N1 x K3) |
| | 0.64 | ≥38.4 (30) | 5 | | 0.64 x N1 x K3 (1 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 1.28 | ≥61.44 (48) | 4 | | 1.28 x N1 x K3 (1 x N1 x K3) | 2.56 x N1 x K3 (2 x N1 x K3) |
| | 2.56 | ≥92.16 (72) | 3 | | 2.56 x N1 x K3 (1 x N1 x K3) | 5.12 x N1 x K3 (2 x N1 x K3) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.<br>Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>Note 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].<br>Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,NR_Intra_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.<br>Note 5: The measurement shall not be performed across PTW's. In this case the measurement is performed in the next available PTW.<br>Note 6: The evaluation shall not be performed across PTW's. In this case the evaluation is performed in the next available PTW.<br>Note 7: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | | |

### 16.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains the requirements for measurements on inter-frequency NR cells when Srxlev ≤ $S_{IntraSearchP}$ or Squal ≤ $S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for a stationary UE defined in clause 5.2.4.9.3 in TS 38.304 [30],
- Relaxed measurement criterion for a stationary UE not at cell edge defined in clause 5.2.4.9.4 in TS 38.304 [30],
- Both low mobility criterion and stationary criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.3 or 5.2.4.9.4 in TS 38.304 [30] respectively.The 1 Rx RedCap UE for the evaluation of one or more relaxed measurement criteria defined in clause 5.2.4.9 in TS 38.304 [30] applies:

- *s-SearchDeltaP-r16* as the signalled value of *s-SearchDeltaP-r16* defined in TS 38.331 [13] - 1 dB.
- *s-SearchDeltaP-Stationary-r17* as the signalled value of *s-SearchDeltaP-Stationary-r17* defined in TS 38.331 [13] - 1 dB.
- *s-SearchThresholdP-r16* as the signalled value of *s-SearchThresholdP-r16* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdQ-r16* as the signalled value of *s-SearchThresholdQ-r16* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdP2-r17* as the signalled value of *s-SearchThresholdP2-r17* defined in TS 38.331 [13] + 1 dB.
- *s-SearchThresholdQ2-r17* as the signalled value of *s-SearchThresholdQ2-r17* defined in TS 38.331 [13] + 1 dB.

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and UE has fulfilled that criterion, or
- UE is configured with both *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and *combineRelaxedMeasCondition2* defined in TS 38.331 [13] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion, and

The requirements defined in TS 38.133 [6] in clause 4.2B.2.4 apply for this clause except that:

- $T_{detect,NR_Inter_RedCap_Relax}$ as specified in Table 16.1.1.0.4-1 and Table 16.1.1.0.4-2 for 1 Rx RedCap and 2 Rx RedCap respectively.
- $T_{measure,NR_Inter_RedCap_Relax}$ as specified in Table 16.1.1.0.4-1 and Table 16.1.1.0.4-2 for 1 Rx RedCap and 2 Rx RedCap respectively.
- $T_{evaluate,NR_Inter_RedCap_Relax}$ as specified in Table 16.1.1.0.4-1 and Table 16.1.1.0.4-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every K2*$T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 and, K2 = 240.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 16.1.1.0.4-3 and Table 16.1.1.0.4-4 are applicable for eDRX cycle up to 10.24 s in FR1 and FR2 respectively.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s in FR1 and FR2, then the requirements in Table 16.1.1.0.4-5 and Table 16.1.1.0.4-6 respectively apply provided that eDRX cycle is ≤ 163.84 sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

**Table 16.1.1.0.4-1: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for 1 Rx RedCap UE**

| DRX cycle length [s] | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 x 1.5 x K4(36 x 1.5 x K4) | 1.28 x 1.5 x K4 (4 x 1.5 x K4) | 5.12 x 1.5 x K4 (16 x 1.5 x K4) |
| 0.64 | 17.92 x K4 (28 x K4) | 1.28x K4 (2 x K4) | 5.12 x K4 (8 x K4) |
| 1.28 | 32 x K4 (25 x K4) | 1.28x K4 (1 x K4) | 6.4 x K4 (5 x K4) |
| 2.56 | 58.88 x K4 (23 x K4) | 2.56 x K4 (1 x K4) | 7.68 x K4 (3 x K4) |
| Note 1: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.1.0.4-2: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for 2 Rx RedCap UE**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K4 (36 x N1 x 1.5 x K4) | 1.28 x N1 x 1.5 x K4 (4 x N1 x 1.5 x K4) | 5.12 x N1 x 1.5 x K4 (16 x N1 x 1.5 x K4) |
| 0.64 | | 5 | 17.92x N1 x K4 (28 x N1 x K4) | 1.28 x N1 x K4 (2 x N1 x K4) | 5.12 x N1 x K4 (8 x N1 x K4) |
| 1.28 | | 4 | 32 x N1 x K4 (25 x N1 x K4) | 1.28 x N1 x K4 (1 x N1 x K4) | 6.4 x N1 x K4 (5 x N1 x K4) |
| 2.56 | | 3 | 58.88 x N1 x K4 (23 x N1 x K4) | 2.56 x N1 x K4 (1 x N1 x K4) | 7.68 x N1 x K4 (3 x N1 x K4) |
| Note 1: Applies for RedCap UE of all supporting power class.<br>Note 2: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | |

**Table 16.1.1.0.4-3: $T_{detect,E\text{-}UTRAN_RedCap_Relax}$, $T_{measure,NR_,E\text{-}UTRAN_RedCap_Relax}$ and $T_{evaluate,NR_,E\text{-}UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 2.56 | 58.88 x K3 (23 x K3) | 2.56 x K3 (1 x K3) | 5.12 x K3 (2 x K3) |
| 5.12 | 117.76 x K3 (23 x K3) | 5.12 x K3 (1 x K3) | 10.24 x K3 (2 x K3) |
| Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra}$ is expected.<br>Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.1.0.4-4: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 2.56 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |
| 5.12 | 117.76 x N1 x K3 (23 x N1 x K3) | 5.12 x N1 x K3 (1 x N1 x K3) | 10.24 x N1 x K3 (2 x N1 x K3) |
| 10.24 | 235.52 x N1 x K3 (23 x N1 x K3) | 10.24 x N1 x K3 (1 x N1 x K3) | 20.48 x N1 x K3 (2 x N1 x K3) |
| Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.1.0.4-5: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 1) for eDRX_IDLE cycle larger than 10.24 s**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤[163.84] | 0.32 | ≥[6.4] ([5]) | $eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ x K. (23 x K3) | 0.32 x M2 x K3 (1 x M2 x K3) | 0.64 x M2 x K3 (2 x M2 x K3) |
| | 0.64 | ≥[12.8] ([10]) | | 0.64 x K3 (1 x K3) | 1.28 x K3 (2 x K3) |
| | 1.28 | ≥[15.36] ([12]) | | 1.28 x K3 (1 x K3) | 2.56 x K3 (2 x K3) |
| | 2.56 | ≥[30.72] ([4]) | | 2.56 x K3 (1 x K3) | 5.12 x K3 (2 x K3) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>Note 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].<br>Note 3: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28.$<br>Note 4: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | |

**Table 16.1.1.0.4-6: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle larger than 10.24 s**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤[163.84] | 0.32 | ≥30.72 (24) | 8 | K3 x $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1 x K3) | 0.32 x N1 x K3 (1 x N1 x K3) | 0.64 x N1 x K3 (2 x N1 x K3) |
| | 0.64 | ≥38.4 (30) | 5 | | 0.64 x N1 x K3 (1 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) |
| | 1.28 | ≥61.44 (48) | 4 | | 1.28 x N1 x K3 (1 x N1 x K3) | 2.56 x N1 x K3 (2 x N1 x K3) |
| | 2.56 | ≥92.16 (72) | 3 | | 2.56 x N1 x K3 (1 x N1 x K3) | 5.12 x N1 x K3 (2 x N1 x K3) |

Note 1: Applies for RedCap UE of all supporting FR2 power classes.
Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
Note 5: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

## 16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE

### 16.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.3.

### 16.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward.

### 16.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.1.

### 16.1.1.1.4 Test description

#### 16.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.1.4.1-1.

**Table 16.1.1.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.1.1.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.1.4.1-2.

**Table 16.1.1.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.1.4.1-3.
2. Message contents are defined in clause 16.1.1.1.4.3.

3. There is 1 NR carrier, and 2 cells specified in the test. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 16.1.1.1.4.1-3: General test parameters for intra-frequency NR cell re-selection test case for 1 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| *rangeToBestCell* | | | 1, 2, 3, 4 | Not configured | |
| T1 | | s | 1, 2, 3, 4 | > 7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, the intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1, 2, 3, 4 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3, 4 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 16.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise, count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 16.1.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise, count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Repeat steps 2-12 until a test verdict has been achieved.
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 16.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 16.1.1.1.4.3-2: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| q-RxLevMin | -65 | -130 is actual value in dBm (-65 * 2 dBm) | 16.1.1.1-1, 16.1.1.1-2 |
| | -64 | -128 is actual value in dBm (-64 * 2 dBm) | 16.1.1.1-3 |
| } | | | |
| } | | | |

**Table 16.1.1.1.4.3-3: *SIB2* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | Actual value is -65*2 = -130 dBm | 16.1.1.1-1, 16.1.1.1-2 |
| | -64 | Actual value is -64*2 = -128 dBm | 16.1.1.1-3 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | (16.1.1.1-1 OR 16.1.1.1-4) AND Cell 1 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | (16.1.1.1-1 OR 16.1.1.1-4) AND Cell 2 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.1-2, 16.1.1.1-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.1-1 |
| | true | | 16.1.1.1-2, 16.1.1.1-3 |
| } | | | |
| } | | | |

**Table 16.1.1.1.4.3-4: *SIB3*: (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB3 ::= SEQUENCE { | | | |
| intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE { | | | |
| IntraFreqNeighCellInfo SEQUENCE { | | | |
| q-OffsetCell | dB-1 | | |
| } | | | |
| } | | | |
| } | | | |

16.1.1.1.5 Test requirement

Table 16.1.1.1.5-1 defines the primary level settings including test tolerances for intra-frequency NR cell re-selection test case in AWGN for 1 Rx UE.

**Table 16.1.1.1.5-1: NR cell specific test parameters for intra-frequency NR cell re-selection test case in AWGN for 1 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -130 | | | -130 | | |
| | | 3 | -127 | | | -127 | | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ Note 4 | dB | 1, 2, 3, 4 | -1 | | | -1 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 2 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 3 | -79 | -82 | -78.55 | -infinity | -78.55 | -82 |
| Io | dBm/9.36 MHz | 1, 4 | -53.94 | -51.91 | -51.91 | Same as parameters specified in Cell 1 columns- | | |
| | dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 | | | |
| | dBm/18.36 MHz | 3 | -51.02 | -48.99 | -48.99 | | | |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3, 4 | 60 | | | 60 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Value modified in Test Tolerance analysis in TS 38.903 [22]. |

During T2 the cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

During T3 the cell re-selection delay to an already detected cell shall be less than 8 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $T_{detect,NR_Intra_RedCap} + T_{SI\text{-}NR}$, and to an already detected cell can be expressed as: $T_{evaluate,NR_Intra_RedCap} + T_{SI\text{-}NR}$,

Where:

$T_{detect,NR_Intra_RedCap}$See Table 16.1.1.0.1-1 in clause 16.1.1.0.1

$T_{evaluate,NR_Intra_RedCap}$ See Table 16.1.1.0.1-1 in clause 16.1.1.0.1

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

## 16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE

### 16.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.3.

### 16.1.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward.

### 16.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.2.

### 16.1.1.2.4 Test description

#### 16.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.2.4.1-1.

**Table 16.1.1.2.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.1.1.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.2.4.1-2.

**Table 16.1.1.2.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.2.4.1-3.
2. Message contents are defined in clause 16.1.1.2.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 16.1.1.2.4.1-3: General test parameters for intra-frequency NR cell re-selection test case for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |

| | | | | |
|---|---|---|---|---|
| DRX cycle length | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | 1, 2, 3, 4 | Not configured | |
| T1 | s | 1, 2, 3, 4 | > 7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, the intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | s | 1, 2, 3, 4 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2, 3, 4 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.1.2.4.2 Test procedure

Same test procedure as in clause 16.1.1.1.4.2, except Table 16.1.1.1.5-1 will be replaced with Table 16.1.1.2.5-1.

### 16.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 16.1.1.2.4.3-2: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | -130 is actual value in dBm (-65 * 2 dBm) | 16.1.1.2-1, 16.1.1.2-2 |
| | -64 | -128 is actual value in dBm (-64 * 2 dBm) | 16.1.1.2-3 |
| } | | | |
| } | | | |

**Table 16.1.1.2.4.3-3: *SIB2* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -65 | Actual value is -65*2 = -130 dBm | 16.1.1.2-1, 16.1.1.2-2 |
| | -64 | Actual value is -64*2 = -128 dBm | 16.1.1.2-3 |

| | | | |
|---|---|---|---|
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | (16.1.1.2-1 OR 16.1.1.2-4) AND Cell 1 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | (16.1.1.2-1 OR 16.1.1.2-4) AND Cell 2 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.2-2, 16.1.1.2-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.2-1 |
| | true | | 16.1.1.2-2, 16.1.1.2-3 |
| } | | | |
| } | | | |

### 16.1.1.2.5 Test requirement

Table 16.1.1.2.5-1 defines the primary level settings including test tolerances for intra frequency NR cell re-selection test case in AWGN for 2 Rx UE.

Table 16.1.1.2.5-1 defines the primary level settings including test tolerances for intra-frequency NR cell re-selection test case in AWGN for 2 Rx UE.

**Table 16.1.1.2.5-1: NR cell specific test parameters for intra-frequency NR cell re-selection test case in AWGN for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -130 | | | -130 | | |
| | | 3 | -127 | | | -127 | | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | | SS-RSRP | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 16 | -3.55 | 3.24 | -infinity | 3.24 | -3.55 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 16 | 13 | 16.45 | -infinity | 16.45 | 13 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 2 | -82 | -85 | -81.55 | -infinity | -81.55 | -85 |
| | | 3 | -79 | -82 | -78.54 | -infinity | -78.54 | -82 |
| Io | dBm/9.36 MHz | 1, 4 | -53.94 | -51.91 | -51.91 | Same as parameters specified in Cell 1 columns- | | |
| | dBm/9.36 MHz | 2 | -53.94 | -51.91 | -51.91 | | | |
| | dBm/18.36 MHz | 3 | -51.01 | -48.99 | -48.99 | | | |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3, 4 | 60 | | | 60 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T2 the cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

During T3 the cell re-selection delay to an already detected cell shall be less than 8 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $T_{detect, NR_Intra} + T_{SI\text{-}NR}$, and to an already detected cell can be expressed as: $T_{evaluate, NR_intra} + T_{SI\text{-}NR}$,

Where:

$T_{detect, NR_Intra}$ See Table 16.1.1.0.1-1 in clause 16.1.1.0.1

$T_{evaluate, NR_intra}$ See Table 16.1.1.0.1-1 in clause 16.1.1.0.1

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

### 16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE

#### 16.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.4.

#### 16.1.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward.

#### 16.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.3.

#### 16.1.1.3.4 Test description

##### 16.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.3.4.1-1.

**Table 16.1.1.3.4.1-1: Supported test configurations for FR1-FR1 Cell reselection for 1 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.1.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.3-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.3-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.3.4.1-2.

**Table 16.1.1.3.4.1-2: Initial conditions for FR1-FR1 Cell reselection for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.3.4.1-3.
2. Message contents are defined in clause 16.1.1.3.4.3.
3. There are 2 NR carriers, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

**Table 16.1.1.3.4.1-3: General test parameters for FR1-FR1 Cell reselection for 1 Rx UE**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE camps on Cell 2 in the initial phase and during T1 period the UE reselects to Cell 1. |
| | Neighbour cell | | 1, 2, 3, 4 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE shall perform reselection to Cell 1 during T1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T3 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T3. |
| | Neighbour cell | | 1, 2, 3, 4 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB4 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | | 1, 2, 3, 4 | Not configured | |
| T1 | | s | 1, 2, 3, 4 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4 | > 7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2, 3, 4 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 16.1.1.3.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 16.1.1.3.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise, count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.3.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 16.1.1.3.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise, count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat steps 2-11 until a test verdict has been achieved.
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

### 16.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1<br><br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 16.1.1.3-1/4 and Cell 1<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 16.1.1.3-1/4 and Cell 2<br>Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 16.1.1.3-2<br>Table H.2.2-2 with Condition SSB.1 RedCap FR1, SMTC.1 and synchronous cells for configuration 16.1.1.3-3<br><br>Table H.2.2-3 |
| Default RRC messages and information elements contents exceptions | |

### 16.1.1.3.5 Test requirement

Table 16.1.1.3.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 1 Rx UE

**Table 16.1.1.3.5-1: NR cell specific test parameters for FR1-FR1 Cell reselection for 1 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4 | 15.6 | 15.6 | 15.6 | -3.7 | -infinity | 13.6 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | -98 | -98 | -102 | -98 | -98 |
| | | 2 | -98 | -98 | -98 | -102 | -98 | -98 |
| | | 3 | -95 | -95 | -95 | -99 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | -98 | -98 | -102 | -98 | -98 |
| | | 2 | -98 | -98 | -98 | -102 | -98 | -98 |
| | | 3 | -98 | -98 | -98 | -102 | -99 | -98 |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4 | 15.6 | 15.6 | 15.6 | -3.7 | -infinity | 13.6 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -82.4 | -82.4 | -82.4 | -105.7 | -infinity | -84.4 |
| | | 2 | -82.4 | -82.4 | -82.4 | -105.7 | -infinity | -84.4 |
| | | 3 | -79.4 | -79.4 | -79.4 | -102.7 | -infinity | -81.4 |
| Io | dBm/9.36 MHz | 1, 4 | -54.35 | -54.35 | -54.35 | -72.51 | -70.05 | -56.26 |
| | dBm/9.36 MHz | 2 | -54.35 | -54.35 | -54.35 | -72.51 | -70.05 | -56.26 |
| | dBm/18.36 MHz | 3 | -51.43 | -51.43 | -51.43 | -72.59 | -70.13 | -56.35 |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4 | 50 | | | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4 | 48 | | | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4 | 44 | | | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3, 4 | 50 | | | 50 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the cell re-selection delay to a lower priority cell shall be less than 8 s.

The cell re-selection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

During T3, the cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell re-selection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate,NR_Inter_RedCap}$ + $T_{SI-NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap}$ + $T_{SI-NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2B.2.7 in TS 38.133 [6]

$T_{evaluate,NR_Inter_RedCap}$ See Table 4.2B.2.4-1 in clause 16.1.1.0.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## 16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE

### 16.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.4.

### 16.1.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward.

### 16.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.4.

### 16.1.1.4.4 Test description

#### 16.1.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.4.4.1-1.

**Table 16.1.1.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for 2 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.4-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.4-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.4.4.1-2.

**Table 16.1.1.4.4.1-2: Initial conditions for FR1-FR1 Cell reselection for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.4.4.1-3.
2. Message contents are defined in clause 16.1.1.4.4.3.
3. There are 2 NR carriers, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

**Table 16.1.1.4.4.1-3: General test parameters for FR1-FR1 Cell reselection for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE camps on Cell 2 in the initial phase and during T1 period the UE reselects to Cell 1. |
| | Neighbour cell | | 1, 2, 3, 4 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE shall perform reselection to Cell 1 during T1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T3 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T3. |
| | Neighbour cell | | 1, 2, 3, 4 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB4 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB4 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | | 1, 2, 3, 4 | Not configured | |
| T1 | | s | 1, 2, 3, 4 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2, 3, 4 | > 7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3, 4 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 16.1.1.4.4.2 Test procedure

Same test procedure as in clause 16.1.1.3.4.2 except Table 16.1.1.3.5-1 will be replaced with Table 16.1.1.4.5-1.

#### 16.1.1.4.4.3 Message contents

Same message contents as in clause 16.1.1.3.4.3.

### 16.1.1.4.5 Test requirement

Table 16.1.1.4.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

**Table 16.1.1.4.5-1: NR cell specific test parameters for FR1-FR1 Cell reselection for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | | -140 | | |
| | | 3 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | | SS-RSRP | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 15.6 | 15.6 | 15.6 | -4 | -infinity | 12 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | -100 | -98 | -98 |
| | | 2 | -98 | | | -100 | -98 | -98 |
| | | 3 | -95 | | | -97 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | | -100 | -98 | -98 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 15.60 | 15.60 | 15.60 | -3.60 | -infinity | 13.60 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -82.40 | -82.40 | -82.40 | -103.60 | -infinity | -84.40 |
| | | 2 | -82.40 | -82.40 | -82.40 | -103.60 | -infinity | -84.40 |
| | | 3 | -79.40 | -79.40 | -79.40 | -100.60 | -infinity | -81.40 |
| Io | dBm/9.36 MHz | 1, 4 | -54.33 | -54.33 | -54.33 | -70.48 | -70.05 | -56.26 |
| | dBm/9.36 MHz | 2 | -54.33 | -54.33 | -54.33 | -70.48 | -70.05 | -56.26 |
| | dBm/18.36 MHz | 3 | -51.40 | -51.40 | -51.40 | -70.56 | -70.13 | -56.35 |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4 | 50 | | | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4 | 48 | | | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4 | 44 | | | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3, 4 | 50 | | | 50 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the cell re-selection delay to a lower priority cell shall be less than 8 s.

The cell re-selection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

During T3, the cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell re-selection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search}$ + $T_{evaluate,NR_Inter_RedCap}$ + $T_{SI-NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap}$ + $T_{SI-NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2B.2.7 in TS 38.133 [6]

$T_{evaluate,NR_Inter_RedCap}$ See Table 4.2B.2.4-1 in clause 16.1.1.0.2

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## 16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

### 16.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.9.2.

#### 16.1.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

#### 16.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.5.

#### 16.1.1.5.4 Test description

##### 16.1.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.5.4.1-1.

**Table 16.1.1.5.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.1.1.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.5.4.1-2.

**Table 16.1.1.5.4.1-2: Initial conditions for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.5.4.1-3.
2. Message contents are defined in clause 16.1.1.5.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 16.1.1.5.4.1-3: General test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE camps on Cell 1 in the initial phase. |

| | | | | | |
|---|---|---|---|---|---|
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE reselects to Cell 2 during T1 period. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE reselects to Cell 1 during T2 period. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | | 1, 2, 3, 4 | Not configured | |
| T1 | | s | 1, 2, 3, 4 | 32 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4 | 32 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 16.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *stationaryMobilityEvaluation-r17* is provided in *SIB2* of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T2 in Table 16.1.1.5.5-1. Then wait 113 s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 16.1.1.5.5-1. T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

5. If the UE responds on Cell 2 within 32 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise, count a fail for the event “Re-select Cell 2”.

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, skip to step 13.
7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.5.3.5-1. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
10. If the UE responds on Cell 1 within 32 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise, count a fail for the event “Re-select Cell 1”.
11. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
13. The SS shall power OFF/ON the UE, then proceed with step 1.
14. Repeat steps 3-11 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

#### 16.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 16.1.1.5.4.3-2: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -69 | -137 is actual value in dBm (-69 * 2+1 dBm) | Config 16.1.1.5-3 |
| } | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.1.1.5.4.3-3: *SIB2* (Cell 1)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 16.1.1.5-1, 16.1.1.5-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.5-2, 16.1.1.5-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.5-1, 16.1.1.5-4 |
| | true | | 16.1.1.5-2, 16.1.1.5-3 |
| } | | | |
| relaxedMeasurement-r16 | Not present | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB6 | | 16.1.1.5-1 |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.5.4.3-4: *SIB2* (Cell 2)**

| Derivation Path: Table H.2.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| s-IntraSearchP | 31 | Actal value = 31 * 2 = 62 dB | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 16.1.1.5-1, 16.1.1.5-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.5-2, 16.1.1.5-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.5-1 |
| | true | | 16.1.1.5-2, 16.1.1.5-3 |
| } | | | |
| relaxedMeasurement-r16 | Not present | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB6 | | 16.1.1.5-1 |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.5.4.3-5: *SIB3***

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB3 ::= SEQUENCE { | | | |
| intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE { | | | |
| IntraFreqNeighCellInfo SEQUENCE{ | | | |

| | | | |
|---|---|---|---|
| physCellId | Set according to the neighbour cell PCI | | |
| q-OffsetCell | dB-1 | | |
| } | | | |
| } | | | |
| } | | | |

16.1.1.5.5 Test requirement

Table 16.1.1.5.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

**Table 16.1.1.5.5-1: NR cell specific test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qoffset_{s,n}$ Note4 | dB | 1, 2, 3, 4 | -1 | | -1 | |
| $S_{SearchDeltaP-Stationary}$ Note4 | dB | 1, 2, 3, 4 | 6 | | 6 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4 | 5 | | 5 | |
| Cell_selection_and_ reselection_quality_ measurement | | 1, 2, 3, 4 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2, 3, 4 | -3.55 | 3.24 | 3.24 | -3.55 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2, 3, 4 | 13 | 16.45 | 16.45 | 13 |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -85 | -81.55 | -81.55 | -85 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 2 | -85 | -81.55 | -81.55 | -85 |
| | | 3 | -82 | -78.55 | -78.55 | -82 |
| Io | dBm/9.36 MHz | 1, 4 | -52.56 | -51.91 | specified in Cell 1 columns- | |
| | dBm/9.36 MHz | 2 | -52.56 | -51.91 | | |
| | dBm/18.36 MHz | 3 | -49.64 | -48.99 | | |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 |
| SintrasearchP Note4 | dB | 1, 2, 3, 4 | 62 | | 62 | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Value modified in Test Tolerance analysis in TS 38.903 [22].

During T1, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

During T2, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to an already detected cell can be expressed as: $T_{evaluate,NR_Intra_RedCap_Relax} + T_{SI-NR}$,

Where:

$T_{evaluate,NR_Intra_RedCap_Relax}$ See Table 4.2B.2.9.2-1 in clause 16.1.1.0.3 for reselection to Cell 2 during T1 with UE fulfilling stationary criterion, 30.72 s.

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 32 s for the cell re-selection delay to an already detected cell for UE fulfilling stationary criterion in the test case.

## 16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

### 16.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the intra-frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.9.2.

### 16.1.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

#### 16.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.6.

#### 16.1.1.6.4 Test description

##### 16.1.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.6.4.1-1.

**Table 16.1.1.6.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.1.1.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.6.4.1-2.

**Table 16.1.1.6.4.1-2: Initial conditions for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.6.4.1-3.
2. Message contents are defined in clause 16.1.1.6.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 16.1.1.6.4.1-3: General test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE camps on Cell 1 in the initial phase. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE reselects to Cell 2 during T1 period. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |

| | | | | | |
|---|---|---|---|---|---|
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE reselects to Cell 1 during T2 period. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | Configured in SIB2 of Cell 1 |
| | | | | SMTC.6 | Configured in SIB2 of Cell 2 |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| *rangeToBestCell* | | | 1, 2, 3, 4 | Not configured | |
| T1 | | s | 1, 2, 3, 4 | 32 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4 | 32 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.1.6.4.2 Test procedure

Same test procedure as in clause 16.1.1.5.4.2.

### 16.1.1.6.4.3 Message contents

Same message content as in clause 16.1.1.5.4.3 with the following exceptions:

- Table 16.1.1.5.4.3-5 is replaced by Table 16.1.1.6.4.3-1.

**Table 16.1.1.6.4.3-1: *SIB3***

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB3 ::= SEQUENCE { | | | |
| intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE { | | | |
| IntraFreqNeighCellInfo SEQUENCE{ | | | |
| physCellId | Set according to the neighbour cell PCI | | |
| q-OffsetCell | dB0 | | |
| } | | | |
| } | | | |
| } | | | |

### 16.1.1.6.5 Test requirement

Table 16.1.1.6.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

**Table 16.1.1.6.5-1: NR cell specific test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $S_{SearchDeltaP-Stationary}$ Note4 | dB | 1, 2, 3, 4 | 6 | | 6 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4 | 5 | | 5 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2, 3, 4 | -3.56 | 3.22 | 3.22 | -3.56 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2, 3, 4 | 12.55 | 16 | 16 | 12.55 |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -85.45 | -82 | -82 | -85.45 |
| | | 2 | -85.45 | -82 | -82 | -85.45 |
| | | 3 | -82.45 | -79 | -79 | -82.45 |
| Io | dBm/9.36 MHz | 1, 4 | -52.44 | -52.44 | specified in Cell 1 columns- | |
| | dBm/9.36 MHz | 2 | -52.44 | -52.44 | | |
| | dBm/18.36 MHz | 3 | -49.43 | -49. 43 | | |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3, 4 | 60 | | 60 | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SSearchDeltaP includes Test Tolerance applied to fulfil the low mobility criterion. |

During T1, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

During T2, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to an already detected cell can be expressed as: $T_{evaluate,NR_Intra_RedCap_Relax} + T_{SI-NR}$,

Where:

$T_{evaluate,NR_Intra_RedCap_Relax}$ See Table 4.2B.2.9.2-2 in clause 16.1.1.0.3 for reselection to Cell 2 during T1 with UE fulfilling stationary criterion, 30.72 s.

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 32 s for the cell re-selection delay to an already detected cell for UE fulfilling stationary criterion in the test case.

## 16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

### 16.1.1.7.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.10.2.

### 16.1.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

### 16.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.7.

### 16.1.1.7.4 Test description

#### 16.1.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.7.4.1-1.

**Table 16.1.1.7.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.1.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.7-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.7-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.7.4.1-2.

**Table 16.1.1.7.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.7.4.1-3.
2. Message contents are defined in clause 16.1.1.7.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 1.

**Table 16.1.1.7.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfils stationary relaxation measurements criterion, and during T1 period the UE reselects to Cell 1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE shall perform reselection to Cell 1 during T1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T2 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | | 1, 4 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |

| | | | | |
|---|---|---|---|---|
| SMTC configuration | | 1, 4 | SMTC.2 | Configured in SIB4 of Cell 1 |
| | | | SMTC.6 | Configured in SIB4 of Cell 2 |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3, 4 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | 1, 2, 3, 4 | Not configured | |
| T1 | s | 1, 2, 3, 4 | 32 | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3, 4 | 32 | T2 is defined so that cell re-selection reaction time is taken into account. |

#### 16.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test, and cell parameters are set according to T2. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Power on Cell 2 and set its parameters according to T2 in Table 16.1.1.7.5-1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. Then power on Cell 1 and set its parameters according to T2 in Table 16.1.1.7.5-1. *SIB2* of Cell 1 and Cell 2 are configured as in clause 16.1.1.7.4.3. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.
2. Wait 113 s to ensure that Cell 1 has been detected by the UE.
3. Set the parameters according to T1 in Table 16.1.1.7.5-1. T1 starts.
4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
5. If the UE responds on Cell 1 within 32 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise, count a fail for the event “Re-select Cell 1”.
6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, skip to step 13.
7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.7.5-1. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
10. If the UE responds on Cell 2 within 32 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise, count a fail for the event “Re-select Cell 2”.
11. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
13. The SS shall power OFF/ON the UE, then proceed with step 1.
14. Repeat steps 3-11 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

16.1.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.7.4.3-1: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.1.1.7.4.3-2: *SIB2* (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 22 | Actual value = 22*2 = 44 dB | |
| } | | | |
| relaxedMeasurement-r16 | Not present | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB3 | | |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.7.4.3-3: *SIB2* (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 23 | Actual value = 23*2 = 46 dB | Cell 2 |
| } | | | |
| relaxedMeasurement-r16 | Not present | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB15 | | Cell 2 |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.7.4.3-4: *SIB4* (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 16.1.1.7-1, 16.1.1.7-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.7-2, 16.1.1.7-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.7-1, 16.1.1.7-4 |
| | true | | 16.1.1.7-2, 16.1.1.7-3 |
| threshX-HighP | 24 | Actual value = 24*2 = 48 dB | |
| threshX-LowP | 24 | Actual value = 25*2 = 50 dB | |
| cellReselectionPriority | 5 | Same as the priority in *SIB2* of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.1.1.7.4.3-5: *SIB4* (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | Cell 2 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 16.1.1.7-1, 16.1.1.7-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.7-2, 16.1.1.7-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.7-1, 16.1.1.7-4 |
| | true | | 16.1.1.7-2, 16.1.1.7-3 |
| threshX-HighP | 22 | Actual value = 22*2 = 44 dB | Cell 2 |
| threshX-LowP | 25 | Actual value = 25*2 = 50 dB | Cell 2 |
| cellReselectionPriority | 4 | Same as the priority in *SIB2* of Cell 1. | Cell 2 |
| } | | | |
| } | | | |
| } | | | |

#### 16.1.1.7.5 Test requirement

Table 16.1.1.7.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 1 Rx UE

**Table 16.1.1.7.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 14 | 14 | -3.7 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 14 | 14 | -3.7 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -84 | -84 | -101.7 | -88.25 |
| | | 2 | -84 | -84 | -101.7 | -88.25 |
| | | 3 | -81 | -81 | -98.7 | -85.25 |
| Io | dBm/9.36 MHz | 1, 4 | -55.88 | -55.88 | -68.51 | -59.86 |
| | dBm/9.36 MHz | 2 | -55.88 | -55.88 | -68.51 | -59.86 |
| | dBm/18.36 MHz | 3 | -52.96 | -52.96 | 65.58 | -56.93 |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4 | Not sent | | Not sent | |
| $Thresh_{x,highP}$ Note 4 | dB | 1, 2, 3, 4 | 48 | | 44 | |
| $Thresh_{serving,lowP}$ Note 4 | dB | 1, 2, 3, 4 | 44 | | 46 | |
| $Thresh_{x,lowP}$ Note 4 | dB | 1, 2, 3, 4 | 48 | | 50 | |
| $S_{SearchDeltaP-Stationary}$ Note 4 | dB | 1, 2, 3, 4 | 3 | | 15 | |

| | | | | |
|---|---|---|---|---|
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4 | 5 | 5 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Value modified in Test Tolerance analysis in TS 38.903 [22].

During T1, the cell re-selection delay to a lower priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell re-selection delay to an already detected lower priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

During T2, the cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a known lower priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax}$ + $T_{SI-NR}$,

Where:

$T_{evaluate,NR_Inter_RedCap_Relax}$ See Table 4.2B.2.10.2-1 in clause 16.1.1.0.4

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 32 s for the cell re-selection delay to an already detected lower priority cell and 32 s for the cell re-selection delay to an already detected higher priority cell, for UE fulfilling stationary relaxed measurements in the test case.

## 16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

### 16.1.1.8.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.10.2.

### 16.1.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

### 16.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.8.

16.1.1.8.4 Test description

16.1.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.8.4.1-1.

**Table 16.1.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.1.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.1.1.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.1.1.8-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.1.1.8-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.8.4.1-2.

**Table 16.1.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without faders. Without LTE link. | | |

1. The general test parameter settings are set up according to Table 16.1.1.8.4.1-3.
2. Message contents are defined in clause 16.1.1.8.4.3.
3. There are 2 NR carriers, and 2 cells specified in the test. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 1.

**Table 16.1.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE camps on Cell 2 in the initial phase, it fulfils stationary relaxation measurements criterion, and during T1 period the UE reselects to Cell 1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2, 3, 4 | Cell 1 | The UE shall perform reselection to Cell 1 during T1. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| T2 end condition | Active cell | | 1, 2, 3, 4 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T2. |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 1 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |

| | | | | |
|---|---|---|---|---|
| | | 2 | 3 µs | Synchronous cells |
| | | 3 | 3 µs | Synchronous cells |
| Access Barring Information | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB Configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | Configured in SIB4 of Cell 1 |
| | | | SMTC.6 | Configured in SIB4 of Cell 2 |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3, 4 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2, 3, 4 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | 1, 2, 3, 4 | Not configured | |
| T1 | s | 1, 2, 3, 4 | 32 | T1 is defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3, 4 | 32 | T2 is defined so that cell re-selection reaction time is taken into account. |

### 16.1.1.8.4.2 Test procedure

Same test procedure as in clause 16.1.1.7.4.2.

### 16.1.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.1.8.4.3-1: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| pcch-Config SEQUENCE { | | | |
| defaultPagingCycle | rf64 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.1.1.8.4.3-2: *SIB2* (Cell 1)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 22 | Actual value = 22*2 = 44 dB | |
| } | | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB3 | | |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |

| | | | |
|---|---|---|---|
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.8.4.3-3: *SIB2* (Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | | |
| threshServingLowP | 23 | Actual value = 23*2 = 46 dB | Cell 2 |
| } | | | |
| cellEquivalentSize-r17 | Not present | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB15 | | Cell 2 |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 16.1.1.8.4.3-4: *SIB4* (Cell 1)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 2 | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 16.1.1.8-1, 16.1.1.8-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.8-2, 16.1.1.8-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.8-1, 16.1.1.8-4 |
| | true | | 16.1.1.8-2, 16.1.1.8-3 |
| threshX-HighP | 24 | Actual value = 24*2 = 48 dB | |
| threshX-LowP | 24 | Actual value = 24*2 = 48 dB | |
| cellReselectionPriority | 5 | Same as the priority in *SIB2* of Cell 2. | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.1.1.8.4.3-5: *SIB4* (Cell 2)**

| Derivation Path: Table H.2.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | entry 1 | |
| dl-CarrierFreq | ARFCN-ValueNR for Cell 1 SSB | | Cell 2 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6 | | 16.1.1.8-1, 16.1.1.8-4 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.1.8-2, 16.1.1.8-3 |
| deriveSSB-IndexFromCell | false | | 16.1.1.8-1, 16.1.1.8-4 |
| | true | | 16.1.1.8-2, 16.1.1.8-3 |
| threshX-HighP | 22 | Actual value = 22*2 = 44 dB | Cell 2 |
| threshX-LowP | 25 | Actual value = 25*2 = 50 dB | Cell 2 |
| cellReselectionPriority | 4 | Same as the priority in *SIB2* of Cell 1. | Cell 2 |
| } | | | |
| } | | | |
| } | | | |

### 16.1.1.8.5 Test requirement

Table 16.1.1.8.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

**Table 16.1.1.8.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4 | -140 | | -140 | |
| | | 3 | -137 | | -137 | |
| Pcompensation | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4 | SS-RSRP | | SS-RSRP | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 14 | 14 | -3.7 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 14 | 14 | -3.70 | 9.75 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4 | -84 | -84 | -101.70 | -88.25 |
| | | 2 | -84 | -84 | -101.70 | -88.25 |
| | | 3 | -81 | -81 | -98.7 | -85.25 |
| Io | dBm/9.36 MHz | 1, 4 | -55.96 | -55.96 | -68.60 | -59.95 |
| | dBm/9.36 MHz | 2 | -55.96 | -55.96 | -68.60 | -59.95 |
| | dBm/18.36 MHz | 3 | -52.95 | -52.95 | -65.58 | -56.93 |
| Treselection | s | 1, 2, 3, 4 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4 | Not sent | | Not sent | |
| $Thresh_{x,highP}$ Note 4 | dB | 1, 2, 3, 4 | 48 | | 44 | |
| $Thresh_{serving,lowP}$ Note 4 | dB | 1, 2, 3, 4 | 44 | | 46 | |
| $Thresh_{x,lowP}$ Note 4 | dB | 1, 2, 3, 4 | 48 | | 50 | |
| $S_{SearchDeltaP-Stationary}$ Note 4 | dB | 1, 2, 3, 4 | 3 | | 15 | |

| | | | | |
|---|---|---|---|---|
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4 | 5 | 5 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Thresholds include Test Tolerance applied to fulfil the cell re-selection criterion.

During T1, the cell re-selection delay to a lower priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell re-selection delay to an already detected lower priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 1.

During T2, the cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on Cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The cell re-selection delay to a known lower priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax}$ + $T_{SI-NR}$,

Where:

$T_{evaluate,NR_Inter_RedCap_Relax}$ See Table 4.2B.2.10.2-2 in clause 16.1.1.0.4

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 32 s for the cell re-selection delay to an already detected lower priority cell and 32 s for the cell re-selection delay to an already detected higher priority cell, for UE fulfilling stationary relaxed measurements in the test case.

## 16.1.2 NR – E-UTRA cell re-selection for RedCap

### 16.1.2.0 Minimum conformance requirements

#### 16.1.2.0.1 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection for 1 Rx

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] in clause 4.2B.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible re-selection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP

and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

The parameter $N_{EUTRA_carrier_RedCap}$ is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,EUTRAN_RedCap}/2$.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [23], Annex B.1.2 are fulfilled for a corresponding band, and

- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [23], Annex B.1.2 are fulfilled for a corresponding band.

- SCH conditions specified in TS 36.133 [23], Annex B.1.2 are fulfilled for a corresponding band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the re-selection criteria defined in TS 38.304 [30] within $(N_{EUTRA_carrier_RedCap}) * T_{detect,EUTRAN_RedCap}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ when $T_{reselection} = 0$ provided that the re-selection criteria are met by a margin of at least 6 dB for RSRP re-selections based on absolute priorities or 4 dB for RSRQ re-selections based on absolute priorities for 2 Rx RedCap and at least 6 dB for RSRP re-selections based on absolute priorities or 4 dB for RSRQ re-selections based on absolute priorities for 1 Rx RedCap.

Cells which have been detected shall be measured at least every $(N_{EUTRA_carrier_RedCap}) * T_{measure,EUTRAN_RedCap}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,EUTRAN_RedCap}$. If, after detecting a cell in a higher priority search, it is determined that re=selection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of re=selection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell re=selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met re=selection criterion defined in TS 38.304 [30] within $(N_{EUTRA_carrier_RedCap}) * T_{evaluate,EUTRAN_RedCap}$ when $T_{reselection} = 0$ provided that the re=selection criteria are met by a margin of at least 6 dB for RSRP re-selections based on absolute priorities or 4 dB for RSRQ re-selections based on absolute priorities for 2 Rx RedCap and at least 6 dB for RSRP re-selections based on absolute priorities or 4 dB for RSRQ re-selections based on absolute priorities for 1 Rx RedCap.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the re-selection criteria which are defined in TS 38.304 [30], the UE shall evaluate this E-UTRA cell for the $T_{reselection}$ time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

For 1 Rx RedCap and 2 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ are specified in Table 16.1.2.0.1-1.

For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ are specified in Table 16.1.2.0.1-2, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ when multiple PTWs are used.

**Table 16.1.2.0.1-1: $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$, and $T_{evaluate,EUTRAN_RedCap}$**

| DRX cycle length [s] | $T_{detect,EUTRAN}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32 (25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Table 16.1.2.0.1-2: $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$, and $T_{evaluate,EUTRAN_RedCap}$ for UE configured with eDRX_IDLE cycle**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | $T_{detect,EUTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3) | $T_{measure,EUTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3) | $T_{evaluate,E-UTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 2.56 | N/A | N/A | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| 5.12 | N/A | N/A | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 | N/A | N/A | 235.52 (23) | 10.24 (1) | 20.48 (2) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥1.28 (1) | $eDRX_cycle_length \times \left\lceil \frac{23}{\lceil PTW / DRX_cycle_length \rceil} \right\rceil$ (23) | 0.32 (1) | 0.64 (2) |
| | 0.64 | ≥1.28 (1) | | 0.64 (1) | 1.28 (2) |
| | 1.28 | ≥2.56 (2) | | 1.28 (1) | 2.56 (2) |
| | 2.56 | ≥5.12 (4) | | 2.56 (1) | 5.12 (2) |

NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
NOTE 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 5.12 s, number of DRX cycles otherwise.
NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,E-UTRAN_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
NOTE 5: When eDRX = 20.48 s and DRX = 0.32 s, UE is allowed to perform cell evaluation within PTW in every 2 eDRX cycles.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

### 16.1.2.0.2 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection for 2 Rx

Same Minimum conformance requirements as in clause 16.1.2.0.1.

### 16.1.2.0.3 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection for UE fulfilling stationary relaxed measurement criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- UE is configured with *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and UE has fulfilled that criterion, or

- UE is configured with both *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and *combineRelaxedMeasCondition2* defined in TS 38.331 [13] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion, and

The requirements defined in TS 38.133 [6] clause 4.2B.2.5 apply for this clause except that:

- If the UE is not configured with eDRX_IDLE cycle, $T_{detect,EUTRAN_RedCap_Relax}$, $T_{measure,EUTRAN_RedCap_Relax}$ and $T_{evaluate,EUTRAN_RedCap_Relax}$ as specified in Table 16.1.2.0.3-1 for 1 Rx RedCap and 2 Rx RedCap respectively.If the UE is configured with eDRX_IDLE cycle then the requirements in Table 16.1.2.0.3-3 are applicable for eDRX cycle < 10.24 s.

If the UE is configured with eDRX_IDLE cycle ≥ 10.24 s, then the requirements in Table 16.1.2.0.3-4 apply provided that filtering of a measurement is done within a single PTW and provided that the eDRX cycle is ≤ 163.84 sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

**Table 16.1.2.0.3-1: $T_{detect,EUTRAN_RedCap_Relax}$, $T_{measure,EUTRAN_RedCap_Relax}$ and $T_{evaluate,EUTRAN_RedCap_Relax}$ for 1 Rx RedCap and 2 Rx RedCap**

| DRX cycle length [s] | $T_{detect,EUTRAN_Relax}$ [s] (number of DRX cycles) | $T_{measure,EUTRAN_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,EUTRAN_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 0.32 | 11.52 x K5 (36 x K5) | 1.28 x K5 (4 x K5) | 5.12 x K5 (16 x K5) |
| 0.64 | 17.92 x K5 (28 x K5) | 1.28 x K5 (2 x K5) | 5.12 x K5 (8 x K5) |
| 1.28 | 32 x K5 (25 x K5) | 1.28 x K5 (1 x K5) | 6.4 x K5 (5 x K5) |
| 2.56 | 58.88 x K5 (23 x K5) | 2.56 x K5 (1 x K5) | 7.68 x K5 (3 x K5) |
| Note 1: K5 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.2.0.3-2: Void**

**Table 16.1.2.0.3-3: $T_{detect,E\text{-}UTRAN_RedCap_Relax}$, $T_{measure,E\text{-}UTRAN_RedCap_Relax}$ and $T_{evaluate,E\text{-}UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 5.12 | 117.76 x K3 (23 x K3) | 5.12 x K3 (1 x K3) | 10.24 x K3 (2 x K3) |
| Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra}$ is expected.<br>Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 16.1.2.0.3-4: $T_{detect,E\text{-}UTRAN_RedCap_Relax}$, $T_{measure,E\text{-}UTRAN_RedCap_Relax}$ and $T_{evaluate,E\text{-}UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle greater than 10.24 s**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28 s periods) | $T_{detect,EUTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3) | $T_{measure,EUTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3) | $T_{evaluate,E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3) |
|---|---|---|---|---|---|
| 10.24 ≤ eDRX_IDLE cycle length ≤ 163.84 | 0.32 | ≥1.28 (1) | $eDRX_cycle_length \times \left\lceil \frac{\text{K3 x (23 x K3)}}{\lceil PTW / DRX_cycle_length \rceil} \right\rceil$ | 0.32 x K3 (1 x K3) | 0.64 x K3 (2 x K3) |
| | 0.64 | ≥1.28 (1) | | 0.64 x K3 (1 x K3) | 1.28 x K3 (2 x K3) |
| | 1.28 | ≥2.56 (2) | | 1.28 x K3 (1 x K3) | 2.56 x K3 (2 x K3) |
| | 2.56 | ≥5.12 (4) | | 2.56 x K3 (1 x K3) | 5.12 x K3 (2 x K3) |

NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
NOTE 2: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 5.12 s, number of DRX cycles otherwise.
NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,E-UTRAN_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.

## 16.1.2.1 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx UE

### 16.1.2.1.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to higher priority E-UTRA cell, for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

### 16.1.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward.

### 16.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.1.

### 16.1.2.1.4 Test description

#### 16.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.1.4.1-1.

**Table 16.1.2.1.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.1-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.1-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.1-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.1.4.1-2.

**Table 16.1.2.1.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.1.4.1-3.
2. Message contents are defined in clause 16.1.2.1.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1. E-UTRAN Cell 2 is of higher priority than Cell 1.

**Table 16.1.2.1.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase and during T2 period the UE reselects to Cell 2. |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T2. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T3 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 during T3 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| E-UTRAN PRACH configuration index | | | 1, 2, 3, 7 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6, 8 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | > 7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

Before T1 the UE is camped on to Cell 1. During T1, Cell 2 shall be powered off. At the start of T2 the UE is expected to detect Cell 2, send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2. At the start of T3 Cell 2 becomes weaker than Cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.
2. Set the parameters according to T1 in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T1 starts.
3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008 for one iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T2 starts.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority Cell 2.
6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then count a success, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, count a fail, and the TE shall switch off and, on the UE, and skip to step 12.
7. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T2 to T3 as specified in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T3 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority Cell 1.
10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and, on the UE and skip to step 12.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
13. Repeat steps 2-12 until a test verdict with the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 16.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 1 and higher priority for configuration 16.1.2.1-2, 16.1.2.1-3, 16.1.2.1-5 and 16.1.2.1-6<br>Table H.2.3-2 with Condition SMTC 2 and higher priority for configuration 16.1.2.1-1, 16.1.2.1-4, 16.1.2.1-7 and 16.1.2.1-8<br><br>Table H.2.3-3 with Condition higher priority |
| Default RRC messages and information elements contents exceptions | |

**Table 16.1.2.1.4.3-2: *SystemInformationBlockType3***

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 5 | | higher priority E-UTRA |
| } | | | |
| } | | | |

**Table 16.1.2.1.4.3-3: *SystemInformationBlockType24***

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[1] | 4 | | higher priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

16.1.2.1.5 Test requirement

Table 16.1.2.1.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 1 Rx UE.

**Table 16.1.2.1.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx**

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4, 7, 8 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| PDSCH parameters | | 1, 4, 7, 8 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET parameters | | 1, 4, 7, 8 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET parameters | | 1, 4, 7, 8 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| SSB parameters | | 1, 4, 7, 8 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.1 RedCap FR1 | | |
| NR SMTC parameters | | 1, 4, 7, 8 | SMTC.2 | | |
| | | 2, 5 | SMTC.1 | | |
| | | 3, 6 | SMTC.1 | | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5, 7, 8 | -140 | | |
| | | 3, 6 | -137 | | |
| $N_{oc}$ | dBm/SCS | 1, 4, 7, 8 | -98 | | |
| | | 2, 5 | -98 | | |
| | | 3, 6 | -95 | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -84 | -84 | -82.40- |
| | | 2, 5 | -84 | -84 | -82.40- |
| | | 3, 6 | -81 | -81 | -79.40- |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4, 7, 8 | 14 | 14 | 15.60 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4, 7, 8 | 14 | 14 | 15.60 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -55.88 | -55.88 | -54.33 |
| | dBm/9.36 MHz | 2, 5 | -55.88 | -55.88 | -54.33 |
| | dBm/18.36 MHz | 3, 6 | -52.95 | -52.95 | -51.40 |
| Treselection | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | | |
| $Thresh_{x, highP}$ (Note 2) | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell. | | | | | |

**Table 16.1.2.1.5-2: E-UTRA Cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 Rx**

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA[Note 1] | dB | | | |
| OCNG_RB[Note 1] | dB | | | |
| Qrxlevmin[Note 3] | dBm | -139 | | |
| Noc | | -98 | -98 | -100 |
| RSRP | dBm/15 kHz | -infinity | -84.4 | -103.6 |
| $\hat{E}_s/I_{ot}$ | dB | -infinity | 13.6 | -3.6 |
| $\hat{E}_s/N_{oc}$ | dB | -infinity | 13.6 | -3.6 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | Not sent | | |
| $Thresh_{x, highP}$ | dB | 48 | | |

| | | |
|---|---|---|
| $Thresh_{serving, lowP}$ | dB | 44 |
| $Thresh_{x, lowP}$ (Note 2) | dB | 50 |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in E-UTRA system information, and is a threshold for the NR target cell.<br>Note 3: Value modified in Test Tolerance analysis in TS 38.903 [22]. | | |

The cell re-selection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 16.1.2.2 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx UE

### 16.1.2.2.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to higher priority E-UTRA cell, for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

### 16.1.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward.

### 16.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.2.

### 16.1.2.2.4 Test description

#### 16.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.2.4.1-1.

**Table 16.1.2.2.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.2-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.2-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.2-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.2-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.2.4.1-2.

**Table 16.1.2.2.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.2.4.1-3.
2. Message contents are defined in clause 16.1.2.2.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 16.1.2.2.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase and during T2 period the UE reselects to Cell 2. |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T2. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T3 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 during T3 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| E-UTRAN PRACH configuration index | | | 1, 2, 3, 7 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6, 8 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | > 7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

16.1.2.2.4.2 Test procedure

Same test procedure as in clause 16.1.2.1.4.2.

16.1.2.2.4.3 Message contents

Same message contents as in clause 16.1.2.1.4.3.

16.1.2.2.5 Test requirement

Table 16.1.2.2.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 2 Rx UE.

**Table 16.1.2.2.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx**

| Parameter | Unit | Test configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4, 7, 8 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| PDSCH parameters | | 1, 4, 7, 8 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET parameters | | 1, 4, 7, 8 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| Dedicated CORESET parameters | | 1, 4, 7, 8 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| SSB parameters | | 1, 4, 7, 8 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.1 RedCap FR1 | | |
| NR SMTC parameters | | 1, 4, 7, 8 | SMTC.2 | | |
| | | 2, 5 | SMTC.1 | | |
| | | 3, 6 | SMTC.1 | | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5, 7, 8 | -140 | | |
| | | 3, 6 | -137 | | |
| $N_{oc}$ | dBm/SCS | 1, 4, 7, 8 | -98 | | |
| | | 2, 5 | -98 | | |
| | | 3, 6 | -95 | | |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -84 | -82.40 | -82.40 |
| | | 2, 5 | -84 | -82.40 | -82.40 |
| | | 3, 6 | -81 | -79.40 | -79.40 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4, 7, 8 | 14 | 15.60 | 15.60 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4, 7, 8 | 14 | 15.60 | 15.60 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -55.88 | -54.33 | -54.33 |
| | dBm/9.36 MHz | 2, 5 | -55.88 | -54.33 | -54.33 |
| | dBm/18.36 MHz | 3, 6 | -52.95 | -51.40 | -51.40 |
| Treselection | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | | |

| | | | |
|---|---|---|---|
| $Thresh_{x, highP (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell. | | | |

**Table 16.1.2.2.5-2: E-UTRA Cell specific test parameters for for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 Rx**

| Parameter | Unit | Cell 2 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA[Note 1] | dB | | | |
| OCNG_RB[Note 1] | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ | dBm/15 kHz | -98 | -98 | -100 |
| RSRP | dBm/15 kHz | -infinity | -84.4 | -103.6 |
| $\hat{E}_s / I_{ot}$ | dB | -infinity | 13.6 | -3.6 |
| $\hat{E}_s / N_{oc}$ | dB | -infinity | 13.6 | -3.6 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | Not sent | | |
| $Thresh_{x, highP}$ | dB | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP (Note 2)}$ | dB | 50 | | |
| Propagation Condition | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in E-UTRA system information, and is a threshold for the NR target cell. | | | | |

The cell re-selection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 16.1.2.3 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx UE

### 16.1.2.3.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to lower priority E-UTRA cell, for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

### 16.1.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward.

### 16.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.3.

### 16.1.2.3.4 Test description

#### 16.1.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.3.4.1-1.

**Table 16.1.2.3.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.3-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.3-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.3-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.3-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.3.4.1-2.

**Table 16.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.3.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.3.4.1-3.
2. Message contents are defined in clause 16.1.2.3.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 16.1.2.3.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| E-UTRAN PRACH configuration index | | | 1, 2, 3, 7 | 534 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6, 8 | | |
| T1 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR Cell 1 and E-UTRAN Cell 2 are already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of lower priority than Cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T2 in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. SS waits at least for 32 sec ($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbour cell (Cell 2).

3. Set the parameters according to T1 in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

5. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then count a success for the event "re-select lower priority E-UTRA Cell 2" and continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, count a failure for the event "re-select lower priority E-UTRA Cell 2", the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off the UE and skip to step 11.

10. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.1.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.2.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | |

**Table 16.1.2.3.4.3-2: *SIB2***

| Derivation Path: Table H.2.3-2 with condition lower priority | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | Not present | UE applies the default value of infinity | |
| } | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1 | | 16.1.2.3-2, 16.1.2.3-3, 16.1.2.3-5, 16.1.2.3-6 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 | | 16.1.2.3-1, 16.1.2.3-4, 16.1.2.3-7, 16.1.2.3-8, |
| } | | | |
| } | | | |

#### 16.1.2.3.4.3-3: *SystemInformationBlockType3*

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

#### 16.1.2.3.4.3-4: *SystemInformationBlockType24*

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[1] | 5 | | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

### 16.1.2.3.5 Test requirement

Table 16.1.2.3.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 1 Rx UE.

**Table 16.1.2.3.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4, 7, 8 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4, 7, 8 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4, 7, 8 | SMTC.2 | |
| | | 2, 5 | SMTC.1 | |
| | | 3, 6 | SMTC.1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | |
| Qrxlevmin[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -139 | |
| | | 3, 6 | -136 | |
| $N_{oc}$ | dBm/SCS | 1, 4, 7, 8 | -100 | |

| | | | | |
|---|---|---|---|---|
| | | 2, 5 | -100 | |
| | | 3, 6 | -97 | |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.6 | -81.4 |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -70.48 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.48 | -56.26 |
| | dBm/18.36 MHz | 3, 6 | -65.12 | -53.15 |
| Treselection | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6, 7, 8 | Not sent | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | |
| $Thresh_{x, lowP (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.<br>Note 3: Value modified in Test Tolerance analysis in TS 38.903 [22]. | | | | |

**Table 16.1.2.3.5-2: E-UTRA Cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 Rx**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA[Note 1] | dB | | |
| OCNG_RB[Note 1] | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s/I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s/N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| $Thresh_{x, highP (Note 2)}$ | dB | 48 | |

| | | |
|---|---|---|
| $Thresh_{serving, lowP}$ | dB | 44 |
| $Thresh_{x, lowP}$ | dB | 50 |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell. | | |

The cell re-selection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 16.1.2.4 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx UE

### 16.1.2.4.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to lower priority E-UTRA cell, for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

### 16.1.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward.

### 16.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.4.

### 16.1.2.4.4 Test description

#### 16.1.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.4.4.1-1.

**Table 16.1.2.4.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.4-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.4-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.4-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.4-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.4.4.1-2.

**Table 16.1.2.4.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.4.4.1-3.
2. Message contents are defined in clause 16.1.2.4.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 16.1.2.4.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 during T2 for iteration of the tests. |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| E-UTRAN PRACH configuration index | | | 1, 2, 3, 7 | 534 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6, 8 | | |
| T1 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 75 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.2.4.4.2 Test procedure

Same test procedure as in clause 16.1.2.3.4.2.

### 16.1.2.4.4.3 Message contents

Same message contents as in clause 16.1.2.3.4.3.

### 16.1.2.4.5 Test requirement

Table 16.1.2.4.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 2 Rx UE.

**Table 16.1.2.4.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4, 7, 8 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4, 7, 8 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4, 7, 8 | SMTC.2 | |
| | | 2, 5 | SMTC.1 | |
| | | 3, 6 | SMTC.1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5, 7, 8 | -140 | |
| | | 3, 6 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 4 | -100 | |
| | | 2, 5 | -100 | |
| | | 3, 6 | -97 | |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -102 | -86 |
| | | 2, 5 | -102 | -86 |
| | | 3, 6 | -99 | -83 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -70.84 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.84 | -56.26 |
| | dBm/18.36 MHz | 3, 6 | -65.12 | -55.15 |
| Treselection | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6, 7, 8 | Not sent | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | |
| $Thresh_{x, lowP}$ (Note 2) | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.

**Table 16.1.2.4.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 Rx**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA Note 1 | dB | | |
| OCNG_RB Note 1 | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s / I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s / N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| SnonintrasearchP | dB | Not sent | |
| $Thresh_{x, highP}$ (Note 2) | dB | 48 | |
| $Thresh_{serving, lowP}$ | dB | 44 | |
| $Thresh_{x, lowP}$ | dB | 50 | |
| Propagation Condition | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell.

The cell re-selection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

## 16.1.2.5 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

### 16.1.2.5.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.11.2.

#### 16.1.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

#### 16.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.5.

#### 16.1.2.5.4 Test description

##### 16.1.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.5.4.1-1.

**Table 16.1.2.5.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.5-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.5-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.5-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.5-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.5-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.5-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.5-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.5-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.5.4.1-2.

**Table 16.1.2.5.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.5.4.1-3.
2. Message contents are defined in clause 16.1.2.5.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 16.1.2.5.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase, it fulfils stationary criterion, and during T1 period the UE reselects to Cell 2. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 with higher priority during T2 for iteration of the tests. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| Access Barring Information | | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| E-UTRAN PRACH configuration index | | | 1, 2, 3, 7, 8 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | | 4, 5, 6 | 4 | |
| T1 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 35 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2, 3, 4, 5, 6, 7, 8 | 35 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.2.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR Cell 1 and E-UTRAN Cell 2 are already identified by the UE prior to the start of the test. E-UTRAN Cell 2 is of lower priority than Cell 1.

The UE is configured with the relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion is configured according to the parameters listed TS 38.133 [6] in Table A.16.1.1.8.2-3;
- *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion is not configured;
- *combineRelaxedMeasCondition2* defined in TS 38.331 [13] is not configured;

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling stationary relaxed measurement criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The physical cell identity of Cell 2 does not change throughout the test.1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

1a. Set the parameters according to T2 in Table 16.1.2.5.5-1 and Table 16.1.2.5.5-2. SS waits at least for 113 sec ($T_{detect,EUTRAN_Relax}$ + *t-SearchDeltaP-Stationary-r17*) to ensure the UE can detect E-UTRA neighbor cell (Cell 2).

2. Set the parameters according to T1 in Table 16.1.2.5.5-1 and 16.1.2.5.5-2. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 32 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an *RRCConnectionRelease* to ensure that the UE is in state RRC_IDLE.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.2.5.5-1 and 16.1.2.5.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

11a. Set the parameters according to T2 in Table 16.1.2.5.5-1 and Table 16.1.2.5.5-2. SS waits at least for 113 sec (Tdetect,EUTRAN_Relax+ *t-SearchDeltaP-Stationary-r17*) to ensure the UE can detect E-UTRA neighbor cell (Cell 2).

12. Repeat steps 2-11 a until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.1.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.1.2.5.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.3-1<br><br>Table H.2.3-2 with Condition SMTC 1 and lower priority for configurations 16.1.2.5-2, 16.1.2.5-3, 16.1.2.5-5 and 16.1.2.5-6<br>Table H.2.3-2 with Condition SMTC 2 and lower priority for configurations 16.1.2.5-1, 16.1.2.5-4, 16.1.2.5-7 and 16.1.2.5-8<br><br>Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

**16.1.2.5.4.3-2: *SIB2***

| Derivation Path: TS 38.508-1 [14] Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB3 | | |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

#### 16.1.2.5.4.3-3: *SystemInformationBlockType3*

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| relaxedMeasurement-r16 SEQUENCE { | | | |
| threshServingLow | 22 | Actual value = 44 dB | |
| cellReselectionPriority | 4 | | lower priority E-UTRA |
| } | | | |
| } | | | |

#### 16.1.2.5.4.3-4: *SystemInformationBlockType24*

| Derivation Path: TS 36.508 [25] Table 4.4.3.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType24-r15 ::= SEQUENCE { | | | |
| carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 entry | | |
| cellReselectionPriority-r15[1] | 5 | | lower priority E-UTRA |
| threshX-High-r15[1] | 24 | Actual value = 48 dB | |
| threshX-Low-r15[1] | 25 | Actual value = 50 dB | |
| } | | | |
| } | | | |

### 16.1.2.5.5 Test requirement

Table 16.1.2.5.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE.

**Table 16.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4, 7, 8 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4, 7, 8 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4, 7, 8 | SMTC.2 | |
| | | 2, 5 | SMTC.1 | |
| | | 3, 6 | SMTC.1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | |
| Qrxlevmin[Note3] | dBm/SCS | 1, 2, 4, 5,7, 8 | -139 | |
| | | 3, 6 | -136 | |
| $N_{oc}$ | dBm/SCS | 1, 4, 7, 8 | -100 | |

| | | | | |
|---|---|---|---|---|
| | | 2, 5 | -100 | |
| | | 3, 6 | -97 | |
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.6 | -81.4 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -70.84 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.84 | -56.26 |
| | dBm/18.36 MHz | 3, 6 | -65.12 | -55.15 |
| TreselectionP | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| Snonintrasearch | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | |
| $Thresh_{x, lowP (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| $S_{SearchDeltaP-Stationary}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 3 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4, 5, 6, 7, 8 | 5 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: This refers to the value of $Thresh_{x, low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.
Note 3: Value modified in Test Tolerance analysis in TS 38.903 [22].

**Table 16.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |

| | | | |
|---|---|---|---|
| OCNG_RA[Note 1] | dB | | |
| OCNG_RB[Note 1] | dB | | |
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s / I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s / N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| Snonintrasearch | dB | Not sent | |
| $Thresh_{x, high (Note 2)}$ | dB | 48 | |
| $Thresh_{serving, low}$ | dB | 44 | |
| $Thresh_{x, low}$ | dB | 50 | |
| Propagation Condition | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell.

The cell re-selection delay to a lower priority E-UTRAN cell with UE fulfilling stationary relaxed measurement criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 32 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 16.1.2.6 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

#### 16.1.2.6.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.11.2.

#### 16.1.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 and forward supporting Rel-17 stationary idle mode relaxed measurement criterion.

#### 16.1.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.6.

#### 16.1.2.6.4 Test description

##### 16.1.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.6.4.1-1.

**Table 16.1.2.6.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.1.2.6-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.6-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.6-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.6-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.6-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.6-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| 16.1.2.6-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| 16.1.2.6-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | LTE 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.6.4.1-2.

**Table 16.1.2.6.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.1.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 16.1.2.6.4.1-3.
2. Message contents are defined in clause 16.1.2.6.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

**Table 16.1.2.6.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE camps on Cell 1 in the initial phase, it fulfils stationary criterion, and during T1 period the UE reselects to Cell 2. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | The UE shall perform reselection to Cell 2 during T1. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 1 | The UE shall perform reselection to Cell 1 with higher priority during T2 for iteration of the tests. |
| | Neighbour cells | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell 2 | |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | s | 1, 2, 3, 4, 5, 6, 7, 8 | 0.64 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | | 1, 2, 3, 7 | 53 | As specified in table 5.7.1-2 in TS 36.211 [24] |
| | | 4, 5, 6, 8 | 4 | |
| T1 | s | 1, 2, 3, 4, 5, 6, 7, 8 | 35 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3, 4, 5, 6, 7, 8 | 35 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

### 16.1.2.6.4.2 Test procedure

Same test procedure as in clause 16.1.2.5.4.2.

### 16.1.2.6.4.3 Message contents

Same message contents as in clause 16.1.2.5.4.3.

### 16.1.2.6.5 Test requirement

Table 16.1.2.6.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

**Table 16.1.2.6.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1, 4, 7, 8 | N/A | |
| | | 2, 5 | TDDConf.1.1 | |
| | | 3, 6 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | 2, 5 | SR.1.1 TDD | |
| | | 3, 6 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | 2, 5 | CR.1.1 TDD | |
| | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | |
| SSB configuration | | 1, 4, 7, 8 | SSB.1 FR1 | |
| | | 2, 5 | SSB.1 FR1 | |
| | | 3, 6 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4, 7, 8 | SMTC.2 | |
| | | 2, 5 | SMTC.1 | |
| | | 3, 6 | SMTC.1 | |
| OCNG Pattern | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5, 7 ,8 | -140 | |
| | | 3, 6 | -137 | |
| $N_{oc}$ | dBm/SCS | 1, 4, 7, 8 | -100 | |
| | | 2, 5 | -100 | |
| | | 3, 6 | -97 | |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | |
| SS-RSRP | dBm/SCS | 1, 4, 7, 8 | -103.6 | -84.4 |
| | | 2, 5 | -103.6 | -84.4 |
| | | 3, 6 | -100.6 | -81.4 |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4, 7, 8 | -3.6 | 13.6 |
| | | 2, 5 | | |
| | | 3, 6 | | |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -70.84 | -56.26 |
| | dBm/9.36 MHz | 2, 5 | -70.84 | -56.26 |
| | dBm/18.36 MHz | 3, 6 | -65.12 | -53.15 |
| TreselectionP | S | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| Snonintrasearch | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | |
| $Thresh_{x, lowP (Note 2)}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | |
| $S_{SearchDeltaP-Stationary}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 3 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2, 3, 4, 5, 6, 7, 8 | 5 | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.

**Table 16.1.2.6.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| E-UTRA RF Channel number | | 1 | |
| $BW_{channel}$ | MHz | 10 | |
| OCNG Patterns defined in TS 36.133 [23] clause A.3.2 | | OP.2 TDD for test configurations 1, 2, 3, 7; OP.2 FDD for test configurations 4, 5, 6, 8 | |
| PBCH_RA | dB | 0 | |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA Note 1 | dB | | |
| OCNG_RB Note 1 | dB | | |

| | | | |
|---|---|---|---|
| Qrxlevmin | dBm | -140 | |
| $N_{oc}$ | dBm/15 kHz | -98 | |
| RSRP | dBm/15 kHz | -82.4 | -84 |
| $\hat{E}_s / I_{ot}$ | dB | 15.6 | 14 |
| $\hat{E}_s / N_{oc}$ | dB | 15.6 | 14 |
| $Treselection_{EUTRAN}$ | S | 0 | |
| Snonintrasearch | dB | Not sent | |
| $Thresh_{x, high (Note 2)}$ | dB | 48 | |
| $Thresh_{serving, low}$ | dB | 44 | |
| $Thresh_{x, low}$ | dB | 50 | |
| Propagation Condition | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell. | | | |

The cell re-selection delay to a lower priority E-UTRAN cell with UE fulfilling stationary relaxed measurement criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a lower priority cell shall be less than 32 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

# 16.2 RRC_INACTIVE state mobility for RedCap

## 16.2.1 Configured Grant based Small Data Transmissions for RedCap

### 16.2.1.0 Minimum conformance requirements

#### 16.2.1.0.1 Minimum conformance requirements for TA validation using CG-SDT

The requirements in this clause are applicable when the UE is configured with timing alignment (TA) validation using *cg-SDT-RSRP-ChangeThreshold* for transmitting in uplink using CG-SDT as specified in TS 38.331 [13].

The requirements in this clause are applicable for the UE performing small data tranmissions using configured resources as TS 38.331 [13].

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available $N_{TA}$ value as specified in subclause 7.1.2) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration as specified in TS 38.331 [13].

When *cg-SDT-RSRP-ChangeThreshold* as specified in TS 38.331 [13] is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 in TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available $N_{TA}$ value as specified in TS 38.133 [6] subclause 7.1 provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 in TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 16.2.1.0.1-1 are met for FR1.

**Table 16.2.1.0.1-1 Valid measurement for FR1**

| Measurement | FR1 |
|---|---|
| $RSRP_1$ | $(T1 – \min(640\ ms, M1*T_{DRX})) \leq T1' \leq (T1 + \min(640\ ms, M1*T_{DRX}))$ |
| $RSRP_2$ | $(T2 – \min(640\ ms, M1*T_{DRX})) \leq T2' \leq T2$ |

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, for the initial CG-SDT transmission, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when
  - *RRCRelease* with CG-SDT configuration (TS 38.331 [13]) is received, or
  - the latest TA is received if TA is received while in RRC_INACITVE state.
- T1' is the time when the UE has completed $RSRP_1$.
- T2 is the time when the UE performs TA validation as defined in TS 38.321 [12] clause 5.27.2 for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- $T_{DRX}$ is the DRX cycle length in ms.
- M1 the scaling factor as defined in TS 38.133 [6] clause 4.2.2.2.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to SS-RSRP/RSRQ measurement

- If *deriveSSB_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.
- If *deriveSSB_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH on all symbols within SMTC window duration.

For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* as specified in TS 38.331 [13] the following restrictions apply due to measurement of serving cell.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/ on SSB symbols of the serving cell.

The UE is not required to meet the following measurement requirements during subsequent SDT transmissions:

- Measurements of inter-frequency NR cells in TS 38.133 [6] clause 5.1.2.4
- Measurements of inter-RAT E-UTRAN cells in TS 38.133 [6] clause 5.1.2.5

- Idle Mode CA/DC Measurements in TS 38.133 [6] clause 5.4

The UE is allowed to delay the reception of PRS resources on the positioning frequency layer until the SDT session is completed if the measurement using PRS resource overlaps with the SDT resources.

The normative reference for this requirement is TS 38.133 [6] clauses 5.2B.

## 16.2.1.1 NR SA FR1 CG-SDT for 1 Rx UE

### 16.2.1.1.1 Test purpose

To verify that the UE properly perform TA validation for CG-SDT transmission as specified in TS 38.133 [6] clause 5.2B.2.1.

### 16.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards and supporting CG-SDT.

### 16.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.2.1.1.

### 16.2.1.1.4 Test description

Same as the test description given in clause 6.2.1.4.

#### 16.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.2.1.4.1 with following exceptions:

- Table 6.2.1.4.1-1 is replaced by Table 16.2.1.1.4.1-1;
- Table 6.2.1.4.1-2 is replaced by Table 16.2.1.1.4.1-2;
- Table 6.2.1.4.1-3 is replaced by Table 16.2.1.1.4.1-3;

**Table 16.2.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.2.1.1-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR FDD |
| 16.2.1.1-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR TDD |
| 16.2.1.1-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, NR TDD |
| 16.2.1.1-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR HD-FDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.2.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.2.1.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD Configuration | Config 1, 4 | | N/A | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD | |
| | Config 2 | | CCR.1.3 TDD | |
| | Config 3 | | CCR.2.2 TDD | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | |
| | Config 3 | | SSB.1 RedCap FR1 | |
| OCNG Patterns | | | OP.1 | |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | | | SMTC.1 | |
| DRX configuration | | | DRX.7 | |
| T_delay_modeB | | s | 4 | |
| T1 | | s | 0.4 | |
| T2 | | s | 1.28 | 2 x W1 |
| T3 | | s | 2.72 | T_timer_modeB - W1 -W2 |
| T4 | | s | 1.5 | W2+W3 |
| T5 | | s | 1.68 | T1+T2 |
| T6 | | s | 4.22 | T3+W2+W3 |
| *cg-SDT-RSRP-ChangeThreshold* | | dB | 8 | |
| *cg-SDT-RSRP-ThresholdSSB* | | Config 1, 2, 4 | dBm | -115 |
| | | Config 3 | | -112 |
| *cg-SDT-TimeAlignmentTime* | | | Infinity | |
| CG-SDT resource period | | ms | 320 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| Propagation condition | | | AWGN | |

### 16.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.2.1.4.2.

### 16.2.1.1.4.3 Message contents

Same as the message contents given in clause 6.2.1.4.3 with following exceptions:

- Table 6.2.1.4.3-2 is replaced by Table 16.2.1.1.4.3-1.

**Table 16.2.1.1.4.3-1: *SDT-MAC-PHY-CG-Config-r17***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SDT-MAC-PHY-CG-Config-r17::= SEQUENCE { | | | |
| cg-SDT-ConfigLCH-RestrictionToAddModList-r17 SEQUENCE (SIZE(1..maxLC-ID)) OF CG-SDT-Config-LCH-restriction-r17 { | 1 entry | | |
| logicalChannelIdentity-r17 | LogicalChannelIdentity with condition DRB1 | | |
| configuredGrantType1Allowed-r17 | true | | |
| allowedCG-List-r17 | Not present | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE { | | | |
| setup | BWP-UplinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-SUL-r17 | Not present | | |
| cg-SDT-ConfigInitialBWP-DL-r17 CHOICE { | | | |
| setup | BWP-DownlinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-TimeAlignmentTimer-r17 | infinity | | |
| cg-SDT-RSRP-ThresholdSSB-r17 | 44 | -112 dBm | Config 3 |
| | 41 | -115 dBm | Config 1, 2, 4 |
| cg-SDT-TA-ValiditationConfig-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cg-SDT-RSRP-ChangeThreshold-r17 | dB8 | | |
| } | | | |
| } | | | |
| } | | | |

16.2.1.1.5 Test requirements

Same as the test requirements given in clause 6.2.1.5 with following exceptions:

- Table 6.2.1.5-1 is replaced by Table 16.2.1.1.5-1.

**Table 16.2.1.1.5-1: Cell-specific test parameters (NR Cell 1)**

| Parameter | Config | Unit | SSB#0 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| $N_{oc}$ Note1 | 1, 2, 3, 4 | dBm/15 kHz | -100 | | | | | |
| $N_{oc}$ Note1 | 1, 2, 4 | dBm/SSB SCS | -100 | | | | | |
| | 3 | | -97 | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 0 | 12.43 | 0 | 14 | 14 | -0.43 |
| SS RSRP Note2 | 1, 2, 4 | dBm/SSB SCS | -100 | -87.57 | -100 | -86 | -86 | -100.43 |
| | 3 | | -97 | -84.57 | -97 | -83 | -83 | -97.43 |
| Io Note2 | 1, 2, 4 | dBm/9.36 MHz | -69.04 | -59.38 | -69.04 | -57.88 | -57.88 | -69.25 |
| | 3 | dBm/18.36 MHz | -66.11 | -56.45 | -66.11 | -54.95 | -54.95 | -66.32 |
| $\hat{E}_s / N_{oc}$ | | dB | 0 | 12.43 | 0 | 14 | 14 | -0.43 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.2.1.2 NR SA FR1 CG-SDT for 2 Rx UE

### 16.2.1.2.1 Test purpose

To verify that the UE properly perform TA validation for CG-SDT transmission as specified in TS 38.133 [6] clause 5.2B.2.1.

### 16.2.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting CG-SDT.

### 16.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.2.1.2.

### 16.2.1.2.4 Test description

Same as the test description given in clause 6.2.1.4.

#### 16.2.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.2.1.4.1 with following exceptions:

- Table 6.2.1.4.1-1 is replaced by Table 16.2.1.2.4.1-1;
- Table 6.2.1.4.1-2 is replaced by Table 16.2.1.2.4.1-2;
- Table 6.2.1.4.1-3 is replaced by Table 16.2.1.2.4.1-3;

**Table 16.2.1.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.2.1.2-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR FDD |
| 16.2.1.2-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR TDD |
| 16.2.1.2-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, NR TDD |
| 16.2.1.2-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, NR HD-FDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.2.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.2.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.2.1.2.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD Configuration | Config 1, 4 | | N/A | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |

| | | | | |
|---|---|---|---|---|
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD | |
| | Config 2 | | CCR.1.3 TDD | |
| | Config 3 | | CCR.2.2 TDD | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | |
| | Config 3 | | SSB.1 RedCap FR1 | |
| OCNG Patterns | | | OP.1 | |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | | | SMTC.1 | |
| DRX configuration | | | DRX.7 | |
| T_delay_modeB | | s | 4 | |
| T1 | | s | 0.4 | |
| T2 | | s | 1.28 | 2 x W1 |
| T3 | | s | 2.72 | T_timer_modeB - W1 -W2 |
| T4 | | s | 1.5 | W2+W3 |
| T5 | | s | 1.68 | T1+T2 |
| T6 | | s | 4.22 | T3+W2+W3 |
| *cg-SDT-RSRP-ChangeThreshold* | | dB | 8 | |
| *cg-SDT-RSRP-ThresholdSSB* | | dBm | -110 | |
| *cg-SDT-TimeAlignmentTime* | | | Infinity | |
| CG-SDT resource period | | ms | 320 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| Propagation condition | | | AWGN | |

### 16.2.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.2.1.4.2.

### 16.2.1.2.4.3 Message contents

Same as the message contents given in clause 6.2.1.4.3 with following exceptions:

- Table 6.2.1.4.3-2 is replaced by Table 16.2.1.2.4.3-1.

**Table 16.2.1.2.4.3-1: *SDT-MAC-PHY-CG-Config-r17***

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SDT-MAC-PHY-CG-Config-r17::= SEQUENCE { | | | |
| cg-SDT-ConfigLCH-RestrictionToAddModList-r17 SEQUENCE (SIZE(1..maxLC-ID)) OF CG-SDT-Config-LCH-restriction-r17 { | 1 entry | | |

| | | | |
|---|---|---|---|
| logicalChannelIdentity-r17 | LogicalChannelIdentity with condition DRB1 | | |
| configuredGrantType1Allowed-r17 | true | | |
| allowedCG-List-r17 | Not present | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE { | | | |
| setup | BWP-UplinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-ConfigInitialBWP-SUL-r17 | Not present | | |
| cg-SDT-ConfigInitialBWP-DL-r17 CHOICE { | | | |
| setup | BWP-DownlinkDedicatedSDT-r17 | | |
| } | | | |
| cg-SDT-TimeAlignmentTimer-r17 | infinity | | |
| cg-SDT-RSRP-ThresholdSSB-r17 | 46 | -110 dBm | |
| cg-SDT-TA-ValiditationConfig-r17 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cg-SDT-RSRP-ChangeThreshold-r17 | dB8 | | |
| } | | | |
| } | | | |
| } | | | |

### 16.2.1.2.5 Test requirements

Same as the test requirements given in clause 6.2.1.5 with following exceptions:

- Table 6.2.1.5-1 is replaced by Table 16.2.1.2.5-1.

**Table 16.2.1.2.5-1: Cell-specific test parameters (NR Cell 1)**

| Parameter | Config | Unit | SSB#0 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T6 |
| $N_{oc}$ Note1 | 1, 2, 3, 4 | dBm/15 kHz | -100 | | | | | |
| $N_{oc}$ Note1 | 1, 2, 4 | dBm/SSB SCS | -100 | | | | | |
| | 3 | | -97 | | | | | |
| $\hat{E}_s / I_{ot}$ | 1, 2, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0.25 |
| | 3 | | 0 | 12 | 0 | 14 | 14 | 0 |
| SS RSRP Note2 | 1, 2, 4 | dBm/SSB SCS | -100 | -88 | -100 | -86 | -86 | -99.75 |
| | 3 | | -97 | -85 | -97 | -83 | -83 | -97 |
| Io Note2 | 1, 2, 4 | dBm/9.36 MHz | -69.04 | -59.78 | -69.04 | -57.88 | -57.88 | -68.91 |
| | 3 | dBm/18.36 MHz | -66.11 | -56.86 | -66.11 | -54.95 | -54.95 | -66.11 |
| $\hat{E}_s / N_{oc}$ | 1, 2, 4 | dB | 0 | 12 | 0 | 14 | 14 | 0.25 |
| | 3 | | 0 | 12 | 0 | 14 | 14 | 0 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | | | |
| Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

# 16.3 RRC_CONNECTED state mobility for RedCap

## 16.3.1 Handover for RedCap

### 16.3.1.0 Minimum conformance requirements

#### 16.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

The requirements in clause 6.3.1.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements for category 1bis UE defined in TS 36.133 [23] clause 5.1.2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 6.1D.2.1.

#### 16.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

The purpose of NR handover is to change the NR PCell to another NR cell for RedCap UE. The requirements in this clause are applicable to SA NR.

The requirements in this clause apply for the following handover scenarios:

- Handover to a target cell's initial BWP associated with CD-SSB;
- Handover to a target cell's specific Redcap BWP associated with NCD-SSB besides to the initial BWP associated with CD-SSB (i.e. UE directly sync to the NCD-SSB and perform RACH on that BWP).

The requirements in clause 6.3.1.0.2 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.1.1.2 shall apply except that:

- $T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = 2*$T_{rs}$ ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search}$ = 5* $T_{rs}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.
- $T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise, $T_{rs}$ is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by *nonCellDefiningSSB-r17* if the first active DL BWP included in handover command is configured with *nonCellDefiningSSB-r17*, otherwise, as CD-SSB indicated by *absoluteFrequencySSB* in *frequencyInfoDL* in handover command.
- If the *measObjectNRs* having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms. If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

For RedCap UE with HD-FDD, the handover requirements are met provided that

- SSB is available at the UE once every SMTC period during Tsearch
- One SSB is available during $T_{\Delta}$
- One SSB is available during $T_{IU.}$

The normative reference for this requirement is TS 38.133 [6] clause 6.1D.1.2.

## 16.3.1.1 NR SA FR1 handover with known target cell for 1 Rx UE

### 16.3.1.1.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency handover requirements for 1 Rx RedCap UE specified in TS 38.133 [6] clause 6.1D.1.2.

### 16.3.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.1.

### 16.3.1.1.4 Test description

#### 16.3.1.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.1.4.1 with the following exceptions:

- Table 6.3.1.1.4.1-1 is replaced by Table 16.3.1.1.4.1-1.
- Table 6.3.1.1.4.1-2 is replaced by Table 16.3.1.1.4.1-2.
- Table 6.3.1.1.4.1-3 is replaced by Table 16.3.1.1.4.1-3.

**Table 16.3.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.1-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.1-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |

| | | | |
|---|---|---|---|
| *A3-Offset* | dB | -2.5 | A3 offset is updated via TT analysis |
| *Hysteresis* | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| Access Barring Information | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | 3 μs | Synchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤ 5 | |
| T3 | s | 1 | |

#### 16.3.1.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.1.4.2.

#### 16.3.1.1.4.3 Message contents

Same as the message contents specified in sub-clause 6.3.1.1.4.3 with following exceptions:

- Table H.3.1-4 is used with *A3-offset* = -2.5 dB.

### 16.3.1.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.1.5 with following exceptions:

- Table 6.3.1.1.5-1 is replaced by Table 16.3.1.1.5-1.
- $T_{interrupt}$ in test requirements is specified in TS 38.133 [6] clause 6.1D.2.2.

**Table 16.3.1.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | SSB.1 FR1 | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | SSB.1 RedCap FR1 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | | | |
| Initial DL BWP | | | DLBWP.0.1 | | | | | |
| Dedicated DL BWP | | | DLBWP.1.1 | | | | | |
| Initial UL BWP | | | ULBWP.0.1 | | | | | |
| Dedicated UL BWP | | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -1.65 | -1.65 | -∞ | 0.51 | 0.51 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | -∞ | 9.15 | 9.15 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -90 | -90 | -90 | -∞ | -88.85 | -88.85 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -∞ | -85.85 | -85.85 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -61.41 | -58.14 | -58.14 | -61.41 | -58.14 | -58.14 |
| | Config 3 | dBm/18.36 MHz | -58.49 | -55.21 | -55.21 | -58.49 | -55.21 | -55.21 |
| Propagation condition | | - | AWGN | | | AWGN | | |
| Antenna Configuration | | | 1x1 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [13].

$T_{interrupt}$ = 62 ms in the test. $T_{interrupt}$ is defined in clause 6.1D.1.2.

This gives a total of 72 ms.

## 16.3.1.2 NR SA FR1 handover with known target cell for 2 Rx UE

### 16.3.1.2.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency handover requirements for 2 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

#### 16.3.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.2.

#### 16.3.1.2.4 Test description

##### 16.3.1.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.1.4.1 with the following exceptions:

- Table 6.3.1.1.4.1-1 is replaced by Table 16.3.1.2.4.1-1.
- Table 6.3.1.1.4.1-2 is replaced by Table 16.3.1.2.4.1-2.
- Table 6.3.1.1.4.1-3 is replaced by Table 16.3.1.2.4.1-3.

**Table 16.3.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.2-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.2-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.2-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.2-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.2.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| *A3-Offset* | | dB | -1 | |
| *Hysteresis* | | dB | 0 | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | |

| | | | |
|---|---|---|---|
| T2 | s | ≤ 5 | |
| T3 | s | 1 | |

### 16.3.1.2.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.1.4.2.

### 16.3.1.2.4.3 Message contents

Same as the message contents specified in clause 6.3.1.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1.

### 16.3.1.2.5 Test requirement

Table 16.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 16.3.1.2.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR.2.1 TDD | | | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | SSB.1 FR1 | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | SSB.1 RedCap FR1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -2.41 | -2.41 | -∞ | 1.36 | 1.36 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | 8 | -∞ | 10 | 10 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -90 | -90 | -90 | -∞ | -88 | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -∞ | -85 | -85 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -61.41 | -57.67 | -57.67 | -61.41 | -57.67 | -57.67 |
| | Config 3 | dBm/18.36 MHz | -58.49 | -54.74 | -54.74 | -58.49 | -54.74 | -54.74 |
| Propagation condition | | - | AWGN | | | AWGN | | |
| Antenna Configuration | | | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12.
- $T_{interrupt}$ = 62 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 72 ms.

### 16.3.1.3 NR SA FR1 handover with unknown target cell for 1 Rx UE

#### 16.3.1.3.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency handover requirements for 1 Rx RedCap as specified in TS 38.133 [6] clause 6.1D.1.2.

#### 16.3.1.3.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards.

#### 16.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.3.

#### 16.3.1.3.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively.

Before the test starts,

- UE is connected to Cell 1 with active DL BWP and active UL BWP
- UE is configured with *nonCellDefiningSSB-r17* under *BWP-DownlinkDedicated* which serves as the reference SSB for the serving cell. The *nonCellDefiningSSB-r17* corresponds to the NCD-SSB within the active DL BWP.

At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to Cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

#### 16.3.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.3.4.1-1.

**Table 16.3.1.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.3.1.3-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.3-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.3-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.3-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.3.4.1-2

**Table 16.3.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 16.3.1.3.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 16.3.1.3.4.1-3 below.

**Table 16.3.1.3.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |

#### 16.3.1.3.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell and RedCap-specific dedicated BWP of Cell 1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

2. Set the parameters according to T1 in Table 16.3.1.3.5-1.
3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.
4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.
5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.3.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.
6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.3.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall
   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.
8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and RedCap-specific dedicated BWP of Cell 1 is the activated BWP.
9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.3.1.3.4.3-1: *RRCReconfiguration* (Steps 1, 4 and 8, test procedure)**

| Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 16.3.1.3.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.3.4.3-2: *CellGroupConfig* (Table 16.3.1.3.4.3-1)**

| Derivation Path: Table H.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | Table 16.3.1.3.4.3-3 | |
| } | | | |
| } | | | |

**Table 16.3.1.3.4.3-3: *ServingCellConfig* (Table 16.3.1.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1 Table 16.3.1.3.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 16.3.1.3.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| } | | | |
| } | | | |

**Table 16.3.1.3.4.3-4: *BWP-Downlink* (Table 16.3.1.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.1 RedCap | | |

| | | | |
|---|---|---|---|
| | corresponding to NCD-SSB PRB index | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.3.4.3-5: *BWP-Uplink* (Table 16.3.1.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.1 RedCap.<br><br>The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP | | |
| } | | | |
| } | | | |
| } | | | |

16.3.1.3.5 Test requirements

Table 16.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

**Table 16.3.1.3.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 25 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 25 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration for CD-SSB | | | SMTC.1 | | | |
| SMTC configuration for NCD-SSB | | | SMTC.2 RedCap | | | |
| CD-SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| NCD-SSB Configuration | Config 1, 2, 4 | | SSB.6 RedCap FR1 Note 1 | | | |
| | Config 3 | | SSB.7 RedCap FR1 Note 1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 RedCap Note 2 | | DLBWP.1.1 RedCap Note 2 | |
| | Initial UL BWP | | ULBWP.0.1 | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 RedCap Note 3 | | ULBWP.1.1 RedCap Note 3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 4 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 4 | | | | | | |
| $N_{oc}$ Note5 | | dBm/15 kHz | -98 | | | |
| $N_{oc}$ Note5 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -0.64 | -Infinity | -0.64 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | -Infinity | 8 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -90 | -90 | -Infinity | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| Io Note6 | Config 1, 2, 4 | dBm/9.36 MHz | -61.41 | -58.71 | -61.41 | -58.71 |
| | Config 3 | dBm/18.36 MHz | -58.48 | -55.78 | -58.48 | -55.78 |
| Propagation condition | | | AWGN | | AWGN | |
| Antenna Configuration | | | 1x1 | | 1x1 | |

Note 1: NCD-SSB is configured within dedicated RedCap DL BWP and CD-SSB is configured completely outside the dedicated RedCap DL BWP.
Note 2: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 3: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 282 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 292 ms.

### 16.3.1.4 NR SA FR1 handover with unknown target cell for 2 Rx UE

#### 16.3.1.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency handover requirements for 2 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

#### 16.3.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.4.

#### 16.3.1.4.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively.

Before the test starts,

- UE is connected to Cell 1 with active DL BWP and active UL BWP;
- UE is configured with *nonCellDefiningSSB-r17* under *BWP-DownlinkDedicated* which serves as the reference SSB for the serving cell. The *nonCellDefiningSSB-r17* corresponds to the NCD-SSB within the active DL BWP.

At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to Cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

##### 16.3.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.4.4.1-1.

**Table 16.3.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.4-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.4-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.4-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.4-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.4.4.1-2.

**Table 16.3.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 16.3.1.4.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 16.3.1.4.4.1-3 below.

**Table 16.3.1.4.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |

### 16.3.1.4.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell and RedCap-specific dedicated BWP of Cell 1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

2. Set the parameters according to T1 in Table 16.3.1.4.5-1.
3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.

5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.4.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.4.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall

   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and RedCap-specific dedicated BWP of Cell 1 is the activated BWP.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.3.1.4.4.3-1: *RRCReconfiguration* (Steps 1, 4 and 8, test procedure)**

| Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 16.3.1.4.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.4.4.3-2: *CellGroupConfig* (Table 16.3.1.4.4.3-1)**

| Derivation Path: Table H.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | Table 16.3.1.4.4.3-3 | |
| } | | | |
| } | | | |

**Table 16.3.1.4.4.3-3: *ServingCellConfig* (Table 16.3.1.4.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 16.3.1.4.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 16.3.1.4.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| } | | | |
| } | | | |

**Table 16.3.1.4.4.3-4: *BWP-Downlink* (Table 16.3.1.4.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.4.4.3-5: *BWP-Uplink* (Table 16.3.1.4.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.1 RedCap.<br><br>The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap- | | |

| | | | |
|---|---|---|---|
| | specific dedicated DL BWP | | |
| } | | | |
| } | | | |
| } | | | |

16.3.1.4.5 Test requirement

Table 16.3.1.4.5-1 defines the primary level settings including test tolerances for all tests.

**Table 16.3.1.4.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf. 2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 25 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 25 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration for CD-SSB | | | SMTC.1 | | | |
| SMTC configuration for NCD-SSB | | | SMTC.2 RedCap | | | |
| CD-SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| NCD-SSB Configuration | Config 1, 2, 4 | | SSB.6 RedCap FR1 Note 1 | | | |
| | Config 3 | | SSB.7 RedCap FR1 Note 1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 RedCap Note 2 | | DLBWP.1.1 RedCap Note 2 | |
| | Initial UL BWP | | ULBWP.0.1 | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 RedCap Note 3 | | ULBWP.1.1 RedCap Note 3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS Note 4<br>EPRE ratio of OCNG to OCNG DMRS Note 4 | | | | | | |
| $N_{oc}$ Note5 | | dBm/15 kHz | -98 | | | |
| $N_{oc}$ Note5 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 8 | -0.64 | -Infinity | -0.64 |
| $\hat{E}_s/N_{oc}$ | | dB | 8 | 8 | -Infinity | 8 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -90 | -90 | -Infinity | -90 |
| | Config 3 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| Io Note6 | Config 1, 2, 4 | dBm/9.36 MHz | -61.41 | -58.71 | -61.41 | -58.71 |
| | Config 3 | dBm/18.36 MHz | -58.41 | -55.71 | -58.41 | -55.71 |
| Propagation condition | | | AWGN | | AWGN | |

Note 1: NCD-SSB is configured within dedicated RedCap DL BWP and CD-SSB is configured completely outside the dedicated RedCap DL BWP.
Note 2: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 3: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index.
Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 202 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 212 ms.

## 16.3.1.5 NR SA FR1-FR1 handover with unknown target cell for 1 Rx UE

### 16.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-frequency handover requirements for 1 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

### 16.3.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.5.

### 16.3.1.5.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration

T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to Cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP, where Cell 2's DL BWP is the Redcap specific BWP associated with NCD-SSB, then UE handover from Cell 1's CD-SSB to Cell 2's specific Redcap BWP associated with NCD-SSB. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

#### 16.3.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.5.4.1-1.

**Table 16.3.1.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.5-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.5-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.5-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.5-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.5.4.1-2.

**Table 16.3.1.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 16.3.1.5.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 16.3.1.5.4.1-3 and 16.3.1.5.5-1 below.

**Table 16.3.1.5.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |

16.3.1.5.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 16.3.1.5.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.

5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.5.5-1. T2 starts. The SS transmits NCD-SSB on Cell 2 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.5.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall

   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

16.3.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.3.1.5.4.3-1: *RRCReconfiguration* (Step 4, test procedure)**

| Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 16.3.1.5.4.3-2 | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.5.4.3-2: *CellGroupConfig* (Table 16.3.1.5.4.3-1)**

| Derivation Path: Table H.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | Table 16.3.1.5.4.3-3 | |
| } | | | |
| } | | | |

**Table 16.3.1.5.4.3-3: *ServingCellConfig* (Table 16.3.1.5.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 16.3.1.5.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 16.3.1.5.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| } | | | |
| } | | | |

**Table 16.3.1.5.4.3-4: *BWP-Downlink* (Table 16.3.1.5.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.5.4.3-5: *BWP-Uplink* (Table 16.3.1.5.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.1 RedCap<br><br>The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP | | |
| } | | | |
| } | | | |
| } | | | |

16.3.1.5.5 Test requirement

Table 16.3.1.5.5-1 defines the primary level settings including test tolerances for all tests.

**Table 16.3.1.5.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 25 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 25 | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR. 2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration for CD-SSB | | | SMTC.1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SMTC configuration for NCD-SSB | | | SMTC.2 RedCap | | | |
| CD-SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | N/A | |
| | Config 3 | | SSB.1 RedCap FR1 | | N/A | |
| NCD-SSB Configuration | Config 1, 2, 4 | | N/A | | SSB.6 RedCap FR1 Note 4 | |
| | Config 3 | | N/A | | SSB.7 RedCap FR1 Note 4 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| Initial DL BWP | | | DLBWP.0.1 | | | |
| Dedicated DL BWP | | | DLBWP.1.1 RedCap Note 5 | | DLBWP.1.1 RedCap Note 6 | |
| Initial UL BWP | | | ULBWP.0.1 | | | |
| Dedicated UL BWP | | | DLBWP.1.1 RedCap Note 7 | | ULBWP.1.1 RedCap Note 8 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -64.59 | -64.59 | -70.05 | -63.85 |
| | Config 3 | dBm/18.36 MHz | -61.67 | -61.67 | -67.13 | -60.93 |
| Propagation condition | | - | AWGN | | AWGN | |
| Antenna Configuration | | | 1x1 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: NCD-SSB is configured within dedicated RedCap DL BWP.
Note 5: The starting PRB index for dedicated DL BWP corresponding to CD-SSB PRB index;
Note 6: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 7: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to CD-SSB PRB index;
Note 8: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index;

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 522 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 532 ms.

## 16.3.1.6 NR SA FR1-FR1 handover with unknown target cell for 2 Rx UE

### 16.3.1.6.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-frequency handover requirements for 2 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

### 16.3.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.6.

### 16.3.1.6.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to Cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP, where Cell 2's DL BWP is the Redcap specific BWP associated with NCD-SSB, then UE handover from Cell 1's CD-SSB to Cell 2's specific Redcap BWP associated with NCD-SSB. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

#### 16.3.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.6.4.1-1.

**Table 16.3.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.6-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.1.6-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.1.6-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.1.6-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.6.4.1-2.

**Table 16.3.1.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 16.3.1.6.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 16.3.1.6.4.1-3 and 16.3.1.6.5-1 below.

**Table 16.3.1.6.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |

### 16.3.1.6.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 16.3.1.6.5-1.
3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop.
4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.
5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.6.5-1. T2 starts. The SS transmits NCD-SSB on Cell 2 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.6.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall
   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

- switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat steps 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.3.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.3.1.6.4.3-1: *RRCReconfiguration* (Step 4, test procedure)**

| Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 16.3.1.6.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.6.4.3-2: *CellGroupConfig* (Table 16.3.1.6.4.3-1)**

| Derivation Path: Table H.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | Table 16.3.1.6.4.3-3 | |
| } | | | |
| } | | | |

**Table 16.3.1.6.4.3-3: *ServingCellConfig* (Table 16.3.1.6.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 16.3.1.6.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 16.3.1.6.4.3-5 | |
| } | | | |

| | | | |
|---|---|---|---|
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| } | | | |
| } | | | |

**Table 16.3.1.6.4.3-4: *BWP-Downlink* (Table 16.3.1.6.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.3.1.6.4.3-5: *BWP-Uplink* (Table 16.3.1.6.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.1 RedCap.<br><br>The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP | | |
| } | | | |
| } | | | |
| } | | | |

16.3.1.6.5 Test requirement

Table 16.3.1.6.5-1 defines the primary level settings including test tolerances for all tests.

**Table 16.3.1.6.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR. 2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration for CD-SSB | | | SMTC.1 | | | |
| SMTC configuration for NCD-SSB | | | SMTC.2 RedCap | | | |
| CD-SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | N/A | |
| | Config 3 | | SSB.1 RedCap FR1 | | N/A | |
| NCD-SSB Configuration | Config 1, 2, 4 | | N/A | | SSB.6 RedCap FR1 Note 4 | |
| | Config 3 | | N/A | | SSB.7 RedCap FR1 Note 4 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| Initial DL BWP | | | DLBWP.0.1 | | | |
| Dedicated DL BWP | | | DLBWP.1.1 RedCap Note 5 | | DLBWP.1.1 RedCap Note 6 | |
| Initial UL BWP | | | ULBWP.0.1 | | | |
| Dedicated UL BWP | | | DLBWP.1.1 RedCap Note 7 | | ULBWP.1.1 RedCap Note 8 | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1, 2, 4 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -64.59 | -64.59 | -70.05 | -63.85 |
| | Config 3 | dBm/18.36 MHz | -61.67 | -61.67 | -67.13 | -60.93 |
| Propagation condition | | - | AWGN | | AWGN | |
| Antenna Configuration | | | 1x2 | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | NCD-SSB is configured within dedicated RedCap DL BWP. |
| Note 5: | The starting PRB index for dedicated DL BWP corresponding to CD-SSB PRB index; |
| Note 6: | The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index; |
| Note 7: | The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to CD-SSB PRB index; |
| Note 8: | The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index; |

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 362 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 372 ms.

## 16.3.1.7 NR SA FR1 - E-UTRA handover with known target cell for 1 Rx UE

### 16.3.1.7.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements as specified in TS 38.133 [6] clause 6.1D.2.1.

### 16.3.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.7.

### 16.3.1.7.4 Test description

#### 16.3.1.7.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.4.4.1 with the following exceptions:

- Table 6.3.1.4.4.1-1 is replaced by Table 16.3.1.7.4.1-1.
- Table 6.3.1.4.4.1-2 is replaced by Table 16.3.1.7.4.1-2.
- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.7.4.1-3.

**Table 16.3.1.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.7-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.3.1.7-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.7-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.7-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.1.7-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.7-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.7-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD |

| | |
|---|---|
| 16.3.1.7-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.7.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| *b2-Threshold1* | | dBm | As specified in Table 16.3.1.7.5-1 | Absolute NR SS-RSRP threshold for event B2 |
| *b2-Threshold2EUTRAN* | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| *Hysteresis* | | dB | 0 | |
| *TimeToTrigger* | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts |
| T1 | | s | 5 | |
| T2 | | s | ≤ 5 | |
| T3 | | s | 1 | |

### 16.3.1.7.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.4.4.2.

### 16.3.1.7.4.3 Message contents

Same as the message contents specified in clause 6.3.1.4.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.
- Table H.3.1-4A is replaced by Table 16.3.1.7.4.3-1.

**Table 16.3.1.7.4.3-1: *ReportConfigInterRAT- DEFAULT***

| |
|---|
| Derivation Path: Table H.3.1-4A |

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| rsrp | 63 | Actual value = 63 – 156 = -93 dBm | 16.3.1.7-1<br>16.3.1.7-2<br>16.3.1.7-4<br>16.3.1.7-5<br>16.3.1.7-7<br>16.3.1.7-8 |
| | 66 | Actual value = 66 – 156 = -90 dBm | 16.3.1.7-3<br>16.3.1.7-6 |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| rsrp | 42 | Actual value = 42 – 140 = -98 dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 16.3.1.7.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.4.5 with following exceptions:

- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.7.4.1-3.
- Table 6.3.1.4.5-1 is replaced by Table 16.3.1.7.5-1.
- Table 6.3.1.4.5-2 is replaced by Table 16.3.1.7.5-2.
- $T_{interrupt}$ in test requirements is specified in TS 38.133 [6] clause 6.1D.2.1.

**Table 16.3.1.7.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | | |
| Duplex mode | | | 1, 4 | FDD | | |
| | | | 2, 3, 5, 6 | TDD | | |
| | | | 7, 8 | HD-FDD | | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | | |
| | | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | | | 1, 4, 7, 8 | TRS.1.1 FDD | | |
| | | | 2, 5 | TRS.1.1 TDD | | |
| | | | 3, 6 | TRS.1.2 TDD | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |

| | | | | | |
|---|---|---|---|---|---|
| Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 RedCap | | |
| SSB configuration | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.1 RedCap FR1 | | |
| b2-Threshold1[Note 4] | dBm | 1, 2, 4, 5, 7, 8 | -93 | | |
| | | 3, 6 | -90 | | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | -104 | -100 |
| $N_{oc}$[Note2] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -100 | -104 | -100 |
| | | 3, 6 | -97 | -101 | -97 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 12 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 12 | 0 | 0 |
| SS-RSRP[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -88 | -104 | -100 |
| | | 3, 6 | -85 | -101 | -97 |
| Io[Note3] | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -59.78 | -73.04 | -69.04 |
| | dBm/18.36 MHz | 3, 6 | -56.86 | -70.11 | -66.11 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Including test tolerance given in Annex F.

**Table 16.3.1.7.5-2: Cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | | |
| Duplex mode | | 1, 2, 3, 7 | FDD | | |
| | | 4, 5, 6, 8 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PRACH Configuration[Note2] | | 1, 2, 3, 7 | 4 | | |
| | | 4, 5, 6, 8 | 53 | | |
| PDSCH parameters: DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters: DL Reference | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |

| | | | | | |
|---|---|---|---|---|---|
| Measurement Channel[Note3] | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note4] | | | | | |
| OCNG_RB[Note4] | | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 10.55 | 8 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 10.55 | 8 |
| RSRP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -87.45 | -90 |
| SCH_RP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -87.45 | -90 |
| Io[Note6] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -67.21 +10log($N_{RB,c}$/100) | -56.29 +10log($N_{RB,c}$/100) | -58.57 +10log($N_{RB,c}$/100) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

## 16.3.1.8 NR SA FR1 - E-UTRA handover with known target cell for 2 Rx UE

### 16.3.1.8.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements as specified in TS 38.133 [6] clause 6.1D.2.1.

### 16.3.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.8.

### 16.3.1.8.4 Test description

#### 16.3.1.8.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.4.4.1 with the following exceptions:

- Table 6.3.1.4.4.1-1 is replaced by Table 16.3.1.8.4.1-1.
- Table 6.3.1.4.4.1-2 is replaced by Table 16.3.1.8.4.1-2.
- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.8.4.1-3.

**Table 16.3.1.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.8-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.3.1.8-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.8-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.8-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.1.8-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.8-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.8-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD |
| 16.3.1.8-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.8.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |
| *b2-Threshold1* | | dBm | As specified in Table 16.3.1.8.5-2 | Absolute NR SS-RSRP threshold for event B2 |
| *b2-Threshold2EUTRAN* | | dBm | -98 | Absolute E-UTRAN RSRP threshold for event B2 |
| *Hysteresis* | | dB | 0 | |
| *TimeToTrigger* | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |

| | | | |
|---|---|---|---|
| Time offset between cells | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts |
| T1 | s | 5 | |
| T2 | s | ≤ 5 | |
| T3 | s | 1 | |

### 16.3.1.8.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.4.4.2.

### 16.3.1.8.4.3 Message contents

Same as the message contents specified in clause 6.3.1.4.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

### 16.3.1.8.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.4.5 with following exceptions:

- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.8.4.1-3.
- Table 6.3.1.4.5-1 is replaced by Table 16.3.1.8.5-1.
- Table 6.3.1.4.5-2 is replaced by Table 16.3.1.8.5-2.
- $T_{interrupt}$ in test requirements is specified in TS 38.133 [6] clause 6.1D.2.1.

**Table 16.3.1.8.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | | |
| Duplex mode | | | 1, 4 | FDD | | |
| | | | 2, 3, 5, 6 | TDD | | |
| | | | 7, 8 | HD-FDD | | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | | |
| | | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| TRS configuration | | | 1, 4, 7, 8 | TRS.1.1 FDD | | |
| | | | 2, 5 | TRS.1.1 TDD | | |
| | | | 3, 6 | TRS.1.2 TDD | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 RedCap | | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.1 RedCap FR1 | | |

| | | | | | |
|---|---|---|---|---|---|
| b2-Threshold1 | dBm | 1, 2, 4, 5, 7, 8 | -94 | | |
| | | 3, 6 | -91 | | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -100 | -104 | -100 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5, 7, 8 | -100 | -104 | -100 |
| | | 3, 6 | -97 | -101 | -97 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 12 | 0 | 0 |
| $\hat{E}_s/I_{ot}$ Note3 | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 12 | 0 | 0 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4, 5, 7, 8 | -88 | -104 | -100 |
| | | 3, 6 | -85 | -101 | -97 |
| Io Note3 | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -59.78 | -73.04 | -69.04 |
| | dBm/18.36 MHz | 3, 6 | -56.86 | -70.11 | -66.11 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.3.1.8.5-2: Cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | | |
| Duplex mode | | 1, 2, 3, 7 | FDD | | |
| | | 4, 5, 6, 8 | TDD | | |
| TDD special subframe configuration Note1 | | 4, 5, 6, 8 | 6 | | |
| TDD uplink-downlink configuration Note1 | | 4, 5, 6, 8 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PRACH Configuration Note2 | | 1, 2, 3, 7 | 4 | | |
| | | 4, 5, 6, 8 | 53 | | |
| PDSCH parameters: DL Reference Measurement Channel Note3 | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters: | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD | | |

| | | | | | |
|---|---|---|---|---|---|
| DL Reference Measurement Channel[Note3] | | | 20 MHz: R.10 FDD | | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note4] | | | | | |
| OCNG_RB[Note4] | | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 9.55 | 9.55 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 9.55 | 9.55 |
| RSRP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -88.45 | -88.45 |
| SCH_RP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -88.45 | -88.45 |
| Io[Note6] | dBm/Ch BW | 1, 2, 3, 4, 5, 6, 7, 8 | $-67.21+10\log(N_{RB,c}/100)$ | $-57.20+10\log(N_{RB,c}/100)$ | $-57.20+10\log(N_{RB,c}/100)$ |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

## 16.3.1.9 NR SA FR1 - E-UTRA handover with unknown target cell for 1 Rx UE

### 16.3.1.9.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in TS 38.133 [6] clause 6.1D.2.1.

#### 16.3.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.9.

#### 16.3.1.9.4 Test description

##### 16.3.1.9.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.5.4.1 with the following exceptions:

- Table 6.3.1.5.4.1-1 is replaced by Table 16.3.1.9.4.1-1.
- Table 6.3.1.5.4.1-2 is replaced by Table 16.3.1.9.4.1-2.
- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.9.4.1-3.

**Table 16.3.1.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.9-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.3.1.9-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.9-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.9-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.1.9-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.9-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.9-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD |
| 16.3.1.9-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.9.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.9.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |

| | | | |
|---|---|---|---|
| Time offset between cells | | 3 ms | Asynchronous cells |
| T1 | s | ≤ 5 | |
| T2 | s | 1 | |

### 16.3.1.9.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.5.4.2.

### 16.3.1.9.4.3 Message contents

Same as the message contents specified in clause 6.3.1.5.4.3.

### 16.3.1.9.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.5.5 with following exceptions:

- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.9.4.1-3.
- Table 6.3.1.5.5-1 is replaced by Table 16.3.1.9.5-1.
- Table 6.3.1.5.5-2 is replaced by Table 16.3.1.9.5-2.
- $T_{interrupt}$ in test requirements is specified in TS 38.133 [6] clause 6.1D.2.1.

**Table 16.3.1.9.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | | 1, 4 | FDD | |
| | | | 2, 3, 5, 6 | TDD | |
| | | | 7, 8 | HD-FDD | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | |
| | | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| TRS configuration | | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 RedCap | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.1 RedCap FR1 | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH_DMRS | | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4, 5, 7, 8 | -98 | |
| | | 3, 6 | -95 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | 0 |
| $\hat{E}_s/I_{ot}$ Note3 | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | 0 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4, 5, 7, 8 | -98 | -98 |
| | | 3, 6 | -95 | -95 |
| Io Note3 | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -67.04 | -67.04 |
| | dBm/38.16 MHz | 3, 6 | -64.12 | -64.12 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.3.1.9.5-2: Cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration Note1 | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration Note1 | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration Note2 | | 1, 2, 3, 7 | 4 | |
| | | 4, 5, 6, 8 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note3 | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note3 | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns Note3 | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |

| | | | | |
|---|---|---|---|---|
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 7 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 7 |
| RSRP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -91 |
| SCH_RP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -91 |
| Io[Note6] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -70.22 | -62.43 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

## 16.3.1.10 NR SA FR1 - E-UTRA handover with unknown target cell for 2 Rx UE

### 16.3.1.10.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in TS 38.133 [6] clause 6.1D.2.1.

### 16.3.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.10.

### 16.3.1.10.4 Test description

#### 16.3.1.10.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.5.4.1 with the following exceptions:

- Table 6.3.1.5.4.1-1 is replaced by Table 16.3.1.10.4.1-1.
- Table 6.3.1.5.4.1-2 is replaced by Table 16.3.1.10.4.1-2.
- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.10.4.1-3.

**Table 16.3.1.10.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.1.10-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |

| | |
|---|---|
| 16.3.1.10-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.10-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.1.10-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.1.10-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.10-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.1.10-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD |
| 16.3.1.10-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.1.10.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.1.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.1.10.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | NR cell |
| | Neighbouring cell | | Cell 2 | E-UTRAN cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| DRX | | | OFF | Non-DRX test |
| Access Barring Information | | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | | 3 ms | Asynchronous cells |
| T1 | | s | ≤ 5 | |
| T2 | | s | 1 | |

### 16.3.1.10.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.5.4.2.

### 16.3.1.10.4.3 Message contents

Same as the message contents specified in clause 6.3.1.5.4.3.

### 16.3.1.10.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.5.5 with following exceptions:

- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.10.4.1-3.
- Table 6.3.1.5.5-1 is replaced by Table 16.3.1.10.5-1.
- Table 6.3.1.5.5-2 is replaced by Table 16.3.1.10.5-2.
- $T_{interrupt}$ in test requirements is specified in TS 38.133 [6] clause 6.1D.2.1.

**Table 16.3.1.10.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3,4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | | 1, 4 | FDD | |
| | | | 2, 3, 5, 6 | TDD | |
| | | | 7, 8 | HD-FDD | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | |
| | | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | 0 | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| TRS configuration | | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| BWP | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | | DLBWP.1.1 | |
| | Initial UL BWP | | | ULBWP.0.1 | |
| | Dedicated UL BWP | | | ULBWP.1.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 RedCap | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.1 RedCap FR1 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PBCH-DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH-DMRS | | | | | |
| EPRE ratio of PDCCH-DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH-DMRS | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH-DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -98 | |
| | | | 3, 6 | -95 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | 0 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | 0 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -98 | -98 |
| | | | 3, 6 | -95 | -95 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5, 7,8 | -67.04 | -67.04 |
| | | dBm/18.36 MHz | 3, 6 | -64.12 | -64.12 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.3.1.10.5-2: Cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration[Note2] | | 1, 2, 3, 7 | 4 | |
| | | 4, 5, 6, 8 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 7 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 7 |
| RSRP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -91 |
| SCH_RP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -91 |
| Io[Note6] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -70.22 | -62.43 |

| | | | |
|---|---|---|---|
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN |
| Antenna Configuration and Correlation Matrix Note7 | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

## 16.3.2 RRC connection mobility control for RedCap

### 16.3.2.1 RRC re-establishment for RedCap

#### 16.3.2.1.0 Minimum conformance requirements

##### 16.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

The requirements in clause 6.3.2.1.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.3.2.1.0.1 shall apply except that:

- $T_{identify_intra_NR}$ as specified in Table 16.3.2.1.0.1-1.
- $T_{identify_inter_NR,\ i}$ as specified in Table 16.3.2.1.0.1-2.

**Table 16.3.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| Serving cell SSB $\hat{E}s/Iot$ (dB) | FR of target NR cell | $T_{identify_intra_NR}$ [ms] | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x $T_{SMTC}$) | MAX (800 ms, [11] x $T_{SMTC}$) |
| < -8 | FR1 | N/A | 800 Note1 |

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC}$ > 20 ms and serving cell SSB $\hat{E}s/Iot$ < -8 dB.

**Table 16.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB $\hat{E}s/Iot$ (dB) | FR of target NR cell | $T_{identify_inter_NR,\ i}$ [ms] | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 7 x $T_{SMTC,\ i}$) | MAX (800 ms, [14] x $T_{SMTC,\ i}$) |
| < -8 | FR1 | N/A | 800 Note1 |

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB $\hat{E}s/Iot$ < -8 dB.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1B.

### 16.3.2.1.1 NR SA FR1 RRC Re-establishment for 1 Rx UE

#### 16.3.2.1.1.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.1.

#### 16.3.2.1.1.4 Test description

##### 16.3.2.1.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.1.4.1 with following exceptions:

- Table 6.3.2.1.1.4.1-1 is replaced by Table 16.3.2.1.1.4.1-1.
- Table 6.3.2.1.1.4.1-2 is replaced by Table 16.3.2.1.1.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.1.4.1-3.

**Table 16.3.2.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.1.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |

| | | | | | |
|---|---|---|---|---|---|
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |
| T2 | | ms | 1, 2, 3, 4 | 440 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | | s | 1, 2, 3, 4 | 2 | |

#### 16.3.2.1.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.1.4.2 with the following exception:

- Step 7 is replaced by

7. If the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2 within 2040 ms (= 420 ms + 1.6 s) from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

#### 16.3.2.1.1.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.1.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.1-4.

#### 16.3.2.1.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.1.5 with following exceptions:

- Table 6.3.2.1.1.5-1 is replaced by Table 16.3.2.1.1.5-1.

**Table 16.3.2.1.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| configuration | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 7 | -infinity | -infinity | 4 | 4 | 4 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 3 | -88 | -infinity | -infinity | -91 | -91 | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| | dBm/18.36 MHz | 3 | -57.81 | -61.66 | -61.66 | -57.81 | -61.66 | -61.66 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

- RRC re-establishment delay allows for 2040 ms (440 ms + 1.6 s) from the beginning of T2 in the test case.

### 16.3.2.1.2 NR SA FR1 RRC Re-establishment for 2 Rx UE

#### 16.3.2.1.2.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.2.

#### 16.3.2.1.2.4 Test description

##### 16.3.2.1.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.1.4.1 with following exceptions:

- Table 6.3.2.1.1.4.1-1 is replaced by Table 16.3.2.1.2.4.1-1.
- Table 6.3.2.1.1.4.1-2 is replaced by Table 16.3.2.1.2.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.2.4.1-3.

**Table 16.3.2.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.1.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.3.2.1.2.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |

| | | | | |
|---|---|---|---|---|
| T2 | ms | 1, 2, 3, 4 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | s | 1, 2, 3, 4 | 2 | |

#### 16.3.2.1.2.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.1.4.2.

#### 16.3.2.1.2.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.1.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.2-4.

### 16.3.2.1.2.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.1.5 with following exceptions:

- Table 6.3.2.1.1.5-1 is replaced by Table 16.3.2.1.2.5-1.

**Table 16.3.2.1.2.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 7 | -infinity | -infinity | 4 | 4 | 4 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 3 | -88 | -infinity | -infinity | -91 | -91 | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | dBm/18.36 MHz | 3 | -57.81 | -61.66 | -61.66 | -57.81 | -61.66 | -61.66 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### 16.3.2.1.3 NR SA FR1-FR1 RRC Re-establishment for 1 Rx UE

#### 16.3.2.1.3.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.3.

#### 16.3.2.1.3.4 Test description

##### 16.3.2.1.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.2.4.1 with following exceptions:

- Table 6.3.2.1.2.4.1-1 is replaced by Table 16.3.2.1.3.4.1-1.
- Table 6.3.2.1.2.4.1-2 is replaced by Table 16.3.2.1.3.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.3.4.1-3.

**Table 16.3.2.1.3.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.3.2.1.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.3-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.3-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

**Table 16.3.2.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.1.3.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |
| T2 | | ms | 1, 2, 3, 4 | 440 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | | s | 1, 2, 3, 4 | 5 | |

### 16.3.2.1.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.2.4.2.

### 16.3.2.1.3.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.2.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.3-4.

### 16.3.2.1.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.2.5 with following exceptions:

- Table 6.3.2.1.2.5-1 is replaced by Table 16.3.2.1.3.5-1.

**Table 16.3.2.1.3.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| RF Channel Number | | 1, 2, 3, 4 | 1 | | | 2 | | |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -88 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -62.26 |
| | dBm/18.36 MHz | 3 | -61.66 | -67.12 | -67.12 | -67.12 | -67.12 | -59.33 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### 16.3.2.1.4 NR SA FR1-FR1 RRC Re-establishment for 2 Rx UE

#### 16.3.2.1.4.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.4.

#### 16.3.2.1.4.4 Test description

##### 16.3.2.1.4.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.2.4.1 with following exceptions:

- Table 6.3.2.1.2.4.1-1 is replaced by Table 16.3.2.1.4.4.1-1.
- Table 6.3.2.1.2.4.1-2 is replaced by Table 16.3.2.1.4.4.1-2.
- Table 6.3.2.1.2.4.1-3 is replaced by Table 16.3.2.1.4.4.1-3.

**Table 16.3.2.1.4.4.1-1: Supported test configurations**

| Configuration | Description of serving cell | Description of target cell |
|---|---|---|
| 16.3.2.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.4-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.4-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

**Table 16.3.2.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.3.2.1.4.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1, 2 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |
| T2 | | ms | 1, 2, 3, 4 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | | s | 1, 2, 3, 4 | 5 | |

#### 16.3.2.1.4.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.2.4.2.

#### 16.3.2.1.4.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.2.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.4-4.

#### 16.3.2.1.4.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.2.5 with following exceptions:

- Table 6.3.2.1.2.5-1 is replaced by Table 16.3.2.1.4.5-1.

**Table 16.3.2.1.4.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| RF Channel Number | | 1, 2, 3, 4 | 1 | | | 2 | | |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -88 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -62.26 |
| | dBm/18.36 MHz | 3 | -61.66 | -67.12 | -67.12 | -67.12 | -67.12 | -59.33 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### 16.3.2.1.5 NR SA FR1 RRC Re-establishment for 1 Rx UE without serving cell timing

#### 16.3.2.1.5.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.5.

#### 16.3.2.1.5.4 Test description

##### 16.3.2.1.5.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.3.4.1 with following exceptions:

- Table 6.3.2.1.3.4.1-1 is replaced by Table 16.3.2.1.5.4.1-1.

- Table 6.3.2.1.3.4.1-2 is replaced by Table 16.3.2.1.5.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.5.4.1-3.

**Table 16.3.2.1.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.1.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.1.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.1.5.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 6000 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |
| T2 | | s | 1, 2, 3, 4 | 6.24 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |

| | | | | |
|---|---|---|---|---|
| T3 | s | 1, 2, 3, 4 | 3 | |

### 16.3.2.1.5.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.3.4.2.

### 16.3.2.1.5.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.3.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.5-4.

### 16.3.2.1.5.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.3.5 with following exceptions:

- Table 6.3.2.1.3.5-1 is replaced by Table 16.3.2.1.5.5-1.

**Table 16.3.2.1.5.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 4 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94 | -infinity | -infinity | -infinity | -infinity | -94 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 |
| | dBm/18.36 MHz | 3 | -61.68 | -67.12 | -67.12 | -67.12 | -67.12 | -61.68 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

### 16.3.2.1.6 NR SA FR1 RRC Re-establishment for 2 Rx UE without serving cell timing

#### 16.3.2.1.6.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 16.3.2.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.2.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.6.

#### 16.3.2.1.6.4 Test description

##### 16.3.2.1.6.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.3.4.1 with following exceptions:

- Table 6.3.2.1.3.4.1-1 is replaced by Table 16.3.2.1.6.4.1-1.
- Table 6.3.2.1.3.4.1-2 is replaced by Table 16.3.2.1.6.4.1-2.
- Table 6.3.2.1.3.4.1-3 is replaced by Table 16.3.2.1.6.4.1-3.

**Table 16.3.2.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.1.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.1.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.1.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.1.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.3.2.1.6.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3, 4 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3, 4 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3, 4 | 1 | |
| Time offset between cells | | | 1, 4 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3, 4 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3, 4 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3, 4 | 6000 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3, 4 | 3000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3, 4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1, 2, 4 | SSB.1 FR1 | |
| | | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | | 1, 4 | SMTC.2 | |
| | | | 2, 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3, 4 | OFF | |
| PRACH configuration | | | 1, 2, 3, 4 | PRACH.1 FR1 | Table A.7.1-1 |
| T1 | | s | 1, 2, 3, 4 | 5 | |
| T2 | | s | 1, 2, 3, 4 | 6.24 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | | s | 1, 2, 3, 4 | 3 | |

### 16.3.2.1.6.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.3.4.2.

### 16.3.2.1.6.4.3 Message contents

Same as the message contents given in clause 6.3.2.1.3.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.6-4.

### 16.3.2.1.6.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.3.5 with following exceptions:

- Table 6.3.2.1.3.5-1 is replaced by Table 16.3.2.1.6.5-1.

**Table 16.3.2.1.6.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 4 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | | SR.1.1 FDD | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | | CR.1.1 FDD | | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | | CCR.1.1 FDD | | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | | |
| OCNG Pattern | | 1, 2, 3, 4 | OP.1 | | | OP.1 | | | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | | TRS.1.1 FDD | | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | | |
| Initial DL BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 | | | DLBWP.0.1 | | | |
| Initial UL BWP configuration | | 1, 2, 3, 4 | ULBWP.0.1 | | | ULBWP.0.1 | | | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | | SSB | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 4 | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | | | | | | |
| | | 3 | -95 | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2, 3, 4 | 4 | -infinity | -infinity | -infinity | -infinity | 4 | |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94 | -infinity | -infinity | -infinity | -infinity | -94 | |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -91 | |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.59 | -70.05 | -70.05 | -70.05 | -70.05 | -64.59 | |
| | dBm/18.36 MHz | 3 | -61.66 | -67.12 | -67.12 | -67.12 | -67.12 | -61.66 | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.3.2.2 Random access for RedCap

### 16.3.2.2.0 Minimum conformance requirements

#### 16.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The 4-step and 2-step random access requirements described in clause 6.3.2.2.0.1 are applicable for TDD and FDD RedCap UEs.

The 4-step and 2-step RA requirements for contention based random access defined in clause 6.3.2.2.0.1 apply to HD-FDD UE with the following conditions:

- The RedCap UE operating in HD-FDD mode is not expected to perform PRACH transmission on a PRACH resource of a cell if UE has not received at least one SSB associated with that PRACH resource during the last $T_p$ period in the cell, where $T_p$ = 160 ms.

- The RedCap UE operating in HD-FDD mode shall meet the PRACH requirements when performing PRACH transmission on a PRACH resource of a cell provided that the UE has received at least one SSB associated with that PRACH resource during the last $T_p$ period before the PRACH transmission, where $T_p$ = 160 ms.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2B.

#### 16.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The 4-step and 2-step non-contention based random access requirements described in clause 6.3.2.2.0.1 are applicable for TDD and FDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1B.

### 16.3.2.2.1 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE

#### 16.3.2.2.1.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 16.3.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.1.

#### 16.3.2.2.1.4 Test description

##### 16.3.2.2.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.1.4.1 with following exceptions:

- Table 6.3.2.2.1.4.1-1 is replaced by Table 16.3.2.2.1.4.1-1.
- Table 6.3.2.2.1.4.1-2 is replaced by Table 16.3.2.2.1.4.1-2.

**Table 16.3.2.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

##### 16.3.2.2.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.1.4.2 with following exceptions:

- Step 4 (Test 1) is replaced by following steps:

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB* + 1 dB.

#### 16.3.2.2.1.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.1.4.3.

### 16.3.2.2.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.1.5 with following exceptions:

- Table 6.3.2.2.1.5-1 is replaced by Table 16.3.2.2.1.5-1.
- The check on the power of the first preamble in Test 2, Test 3, Test 5 and Test 7 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 16.3.2.2.1.5-2, where
    - X = -23.55 for test configurations 16.3.2.2.1-1, 16.3.2.2.1-3 and 16.3.2.2.1-4,
    - X = -26.55 for test configuration 16.3.2.2.1-2.

**Table 16.3.2.2.1.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | As defined in A.3 and A.3A, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 3 | | SSB.1 RedCap FR1 | |
| Number of SSBs per SS-burst | | | 2 | Different from the definition in A.3 and A.3A |
| SS/PBCH block index | | | 0, 1 | Different from the definition in A.3 and A.3A |
| Duplex Mode for Cell 1 | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD Configuration | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | Config 1, 4 | | SR.1.1 FDD | As defined in A.1.1 |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |

| | | | | | |
|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 4.55 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* + 1 dB |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 4.55 | |
| | SS-RSRP Note 3 | | dBm/SCS | -93.45 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* + 1 dB |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -64.19/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -64.27/18.36 MHz | |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | PRACH.1 FR1 | As defined in A.7.1 |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

**Table 16.3.2.2.1.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 20.1 dB |

## 16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE

### 16.3.2.2.2.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

### 16.3.2.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.2.

#### 16.3.2.2.2.4 Test description

##### 16.3.2.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.3.2.2.1.4.1 with following exceptions:

- Table 6.3.2.2.1.4.1-1 is replaced by Table 16.3.2.2.2.4.1-1.
- Table 6.3.2.2.1.4.1-2 is replaced by Table 16.3.2.2.2.4.1-2.

**Table 16.3.2.2.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.3.2.2.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 16.3.2.2.2.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

##### 16.3.2.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.1.4.2.

##### 16.3.2.2.2.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.1.4.3.

#### 16.3.2.2.2.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.1.4.2 with following exceptions:

- Table 6.3.2.2.1.5-1 is replaced by Table 16.3.2.2.2.5-1.
- The check on the power of the first preamble in Test 2, Test 3, Test 5 and Test 7 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 6.3.2.2.1.5-2, where
    - X = -22 for test configurations 16.3.2.2.2-1, 16.3.2.2.2-3 and 16.3.2.2.2-4,
    - X = -25 for test configuration 16.3.2.2.2-2.

**Table 16.3.2.2.2.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | |

| | | | | | |
|---|---|---|---|---|---|
| | | Config 3 | | SSB.1 RedCap FR1 | As defined in A.3 and A.3A, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3.10 and A.3.10B |
| SS/PBCH block index | | | | 0, 1 | Different from the definition in A.3.10 and A.3.10B |
| Duplex Mode for Cell 1 | | Config 1, 4 | | FDD | |
| | | Config 2, 3 | | TDD | |
| TDD Configuration | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1, 4 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.1 TDD | |
| | | Config 3 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1. |
| PDSCH parameters Note 4 | | Config 1, 4 | | SR.1.1 FDD | As defined in A.1.1. |
| | | Config 2 | | SR.1.1 TDD | |
| | | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -95 | |
| | | Config 3 | | -98 | |
| | SS-RSRP Note 3 | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -115 | |
| | | Config 3 | | -118 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -65.38/18.36 MHz | |

| | | | |
|---|---|---|---|
| *ss-PBCH-BlockPower* | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | PRACH.1 FR1 | As defined in A.7.1. |
| Propagation Condition | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.<br>Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.<br>Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | |

### 16.3.2.2.3 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE

#### 16.3.2.2.3.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 16.3.2.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards. In addition, Test 2 is applicable to UEs that support CSI-RS based Random Access Preamble which requires UE to support *csi-RS-CFRA-ForHO*.

#### 16.3.2.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.3.

#### 16.3.2.2.3.4 Test description

##### 16.3.2.2.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.2.4.1 with following exceptions:

- Table 6.3.2.2.2.4.1-1 is replaced by Table 16.3.2.2.3.4.1-1.
- Table 6.3.2.2.2.4.1-2 is replaced by Table 16.3.2.2.3.4.1-2.

**Table 16.3.2.2.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.2.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.3-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.3-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.2.3.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.3.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

#### 16.3.2.2.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.2.4.2.

#### 16.3.2.2.3.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.2.4.3.

### 16.3.2.2.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.2.5 with following exceptions:

- Table 6.3.2.2.2.5-1 is replaced by Table 16.3.2.2.3.5-1.
- The check on the power of the first preamble in Test 3 and Test 4 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 16.3.2.2.3.5-2, where
    - X = -23.55 for test configurations 16.3.2.2.3-1, 16.3.2.2.3-3 and 16.3.2.2.3-4,
    - X = -26.55 for test configuration 16.3.2.2.3-2.

**Table 16.3.2.2.3.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | SSB.1 FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 3 | | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | |
| Number of SSBs per SS-burst | | | 2 | 2 | Different from the definition in A.3.10B |
| SS/PBCH block index | | | 0, 1 | 0, 1 | Different from the definition in A.3.10B |
| CSI-RS Configuration | Config 1, 2, 4 | | N/A | CSI-RS.1.1 FDD | As defined in A.1.4 |
| | Config 3 | | | CSI-RS.2.1 TDD | |
| Duplex Mode for Cell 1 | Config 1 | | FDD | FDD | |
| | Config 2, 3 | | TDD | TDD | |
| | Config 4 | | HD-FDD | HD-FDD | |
| TDD Configuration | Config 2 | | TDDConf.1.1 | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | TDDConf.2.1 | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | OP.1 | OP.1 | As defined in A.2.1. |
| PDSCH parameters Note 4 | Config 1, 4 | | SR.1.1 FDD | SR.1.1 FDD | As defined in A.3.1.1 |
| | Config 2 | | SR.1.1 TDD | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 TDD | CR.1.1 TDD | |
| | Config 2 | | CR.1.1 TDD | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | CR.2.1 TDD | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 TDD | CCR.1.1 TDD | |
| | | Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 4.55 | 4.55 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* + 1 dB |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | -98 | |
| | | Config 3 | | -101 | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 4.55 | 4.55 | |
| | SS-RSRP Note 3 | | dBm/SCS | -93.45 | -93.45 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* + 1 dB |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | -98 | |
| | | Config 3 | | -101 | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | -17 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -64.19/9.36 MHz | -64.19/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -64.27/18.36 MHz | -64.27/18.36 MHz | |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | PRACH.2 FR1 | PRACH.3 FR1 | As defined in A.3.8B.2. |
| Propagation Condition | | | - | AWGN | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

**Table 16.3.2.2.3.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 20.1 dB |

### 16.3.2.2.4 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE

#### 16.3.2.2.4.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 16.3.2.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards. In addition, Test 2 is applicable to UEs that support CSI-RS based Random Access Preamble which requires UE to support *csi-RS-CFRA-ForHO*.

#### 16.3.2.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.4.

#### 16.3.2.2.4.4 Test description

##### 16.3.2.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.3.2.2.2.4.1 with following exceptions:

- Table 6.3.2.2.2.4.1-1 is replaced by Table 16.3.2.2.4.4.1-1.
- Table 6.3.2.2.2.4.1-2 is replaced by Table 16.3.2.2.4.4.1-2.

**Table 16.3.2.2.4.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.3.2.2.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 16.3.2.2.4.4.1-2: Initial conditions for non-contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

#### 16.3.2.2.4.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.2.4.2.

#### 16.3.2.2.4.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.2.4.3.

### 16.3.2.2.4.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.2.4.2 with following exceptions:

- Table 6.3.2.2.2.5-1 is replaced by Table 16.3.2.2.4.5-1.
- The check on the power of the first preamble in Test 3 and Test 4 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 6.3.2.2.2.5-2, where
    - X = -22 for test configurations 16.3.2.2.4-1, 16.3.2.2.4-3 and 16.3.2.2.4-4,
    - X = -25 for test configuration 16.3.2.2.4-2.

**Table 16.3.2.2.4.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | SSB.1 FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 3 | | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | |
| Number of SSBs per SS-burst | | | 2 | 2 | Different from the definition in A.3.10B |
| SS/PBCH block index | | | 0, 1 | 0, 1 | Different from the definition in A.3.10B |
| CSI-RS Configuration | Config 1, 2, 4 | | N/A | CSI-RS.1.1 FDD | As defined in A.1.4 |
| | Config 3 | | | CSI-RS.2.1 TDD | |
| Duplex Mode for Cell 1 | Config 1 | | FDD | FDD | |
| | Config 2, 3 | | TDD | TDD | |
| | Config 4 | | HD-FDD | HD-FDD | |
| TDD Configuration | Config 2 | | TDDConf.1.1 | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | TDDConf.2.1 | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | OP.1 | OP.1 | As defined in A.2.1. |
| PDSCH parameters Note 4 | Config 1, 4 | | SR.1.1 FDD | SR.1.1 FDD | As defined in A.3.1.1 |
| | Config 2 | | SR.1.1 TDD | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 TDD | CR.1.1 TDD | |
| | Config 2 | | CR.1.1 TDD | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 TDD | CCR.1.1 TDD | |
| | Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD | |
| NR RF Channel Number | | | 1 | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | -98 | |
| | | Config 3 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | 3 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -95 | -95 | |
| | | Config 3 | | -98 | -98 | |
| | SS-RSRP Note 3 | | dBm/SCS | -95 | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | -98 | |
| | | Config 3 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | -17 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -115 | -115 | |
| | | Config 3 | | -118 | -118 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -65.3/9.36 MHz | -65.3/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -65.38/18.36 MHz | -65.38/18.36 MHz | |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| PRACH Configuration | | | | PRACH.2 FR1 | PRACH.3 FR1 | As defined in A.3.8B.2. |
| Propagation Condition | | | - | AWGN | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

### 16.3.2.2.5 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE

#### 16.3.2.2.5.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 16.3.2.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx and supporting 2-step RACH from Release 17 onwards.

#### 16.3.2.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.5.

#### 16.3.2.2.5.4 Test description

#### 16.3.2.2.5.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.3.4.1 with following exceptions:

- Table 6.3.2.2.3.4.1-1 is replaced by Table 16.3.2.2.5.4.1-1.
- Table 6.3.2.2.3.4.1-2 is replaced by Table 16.3.2.2.5.4.1-2.

**Table 16.3.2.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.2.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.2.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

#### 16.3.2.2.5.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.3.4.2.

#### 16.3.2.2.5.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.3.4.3.

**Table 16.3.2.2.5.4.3-1: *BWP-UplinkCommon* (Void)**

#### 16.3.2.2.5.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.3.5 with following exceptions:

- Table 6.3.2.2.3.5-1 is replaced by Table 16.3.2.2.5.5-1.
- The check on the power of the first preamble in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 16.3.2.2.5.5-2, where
    - X = -23.55 for test configurations 16.3.2.2.5-1, 16.3.2.2.5-3 and 16.3.2.2.5-4,
    - X = -26.55 for test configuration 16.3.2.2.5-2.
- The check on the power of the first MsgA PUSCH transmission in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first MsgA PUSCH transmission shall be Y dBm within the accuracy specified in Table 16.3.2.2.5.5-2, where
    - Y = -26.55 for test configurations 16.3.2.2.5-1, 16.3.2.2.5-2 and 16.3.2.2.5-4,

- Y = -23.55 for test configuration 16.3.2.2.5-3.

**Table 16.3.2.2.5.5-1: General test parameters**

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | | Config 3 | | SSB.1 RedCap FR1 | |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3 |
| SS/PBCH block index | | | | 0, 1 | Different from the definition in A.3 |
| Duplex Mode for Cell 1 | | Config 1 | | FDD | |
| | | Config 2, 3 | | TDD | |
| | | Config 4 | | HD-FDD | |
| TDD Configuration | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1, 4 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.1 TDD | |
| | | Config 3 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1, 4 | | SR.1.1 FDD | As defined in A.1.1 |
| | | Config 2 | | SR.1.1 TDD | |
| | | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 4.55 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 4.55 | |
| | SS-RSRP Note 3 | | dBm/SCS | -93.45 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -64.19/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -64.27/18.36 MHz | |

| | | | |
|---|---|---|---|
| *ss-PBCH-BlockPower* | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | MsgA.1 FR1 | As defined in A.7A.1 |
| *msgA-RSRP-ThresholdSSB* | dBm | RSRP_51 | The actual value of the threshold is -105 dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.<br>Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.<br>Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | |

**Table 16.3.2.2.5.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 20.1 dB |

## 16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE

### 16.3.2.2.6.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

### 16.3.2.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx and supporting 2-step RACH from Release 17 onwards.

### 16.3.2.2.6.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.6.

### 16.3.2.2.6.4 Test description

#### 16.3.2.2.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.3.2.2.3.4.1 with following exceptions:

- Table 6.3.2.2.3.4.1-1 is replaced by Table 16.3.2.2.6.4.1-1.
- Table 6.3.2.2.3.4.1-2 is replaced by Table 16.3.2.2.6.4.1-2.

**Table 16.3.2.2.6.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.3.2.2.6-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.2.6-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.6-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.6-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |

| Note: | The UE is only required to be tested in one of the supported test configurations depending on UE capability. |
|---|---|

**Table 16.3.2.2.6.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

### 16.3.2.2.6.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.3.4.2.

### 16.3.2.2.6.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.3.4.3.

**Table 16.3.2.2.6.4.3-1: *BWP-UplinkCommon* (Void)**

### 16.3.2.2.6.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.3.4.2 with following exceptions:

- Table 6.3.2.2.3.5-1 is replaced by Table 16.3.2.2.6.5-1.
- The check on the power of the first preamble in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first preamble shall be X dBm within the accuracy specified in Table 6.3.2.2.3.5-2, where
    - X = -22 for test configuration 16.3.2.2.6-1, 16.3.2.2.6-3 and 16.3.2.2.6-4,
    - X = -25 for test configuration 16.3.2.2.6-2.
- The check on the power of the first MsgA PUSCH transmission in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first MsgA PUSCH transmission shall be Y dBm within the accuracy specified in Table 6.3.2.2.4.5-2A, where
    - Y = -25 for test configuration 16.3.2.2.6-1, 16.3.2.2.6-2 and 16.3.2.2.6-4,
    - Y = -22 for test configuration 16.3.2.2.6-3.

**Table 16.3.2.2.6.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 3 | | SSB.1 RedCap FR1 | |
| Number of SSBs per SS-burst | | | 2 | Different from the definition in A.3 |
| SS/PBCH block index | | | 0, 1 | Different from the definition in A.3 |

| | | | | | |
|---|---|---|---|---|---|
| Duplex Mode for Cell 1 | | Config 1 | | FDD | |
| | | Config 2, 3 | | TDD | |
| | | Config 4 | | HD-FDD | |
| TDD Configuration | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1, 4 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.1 TDD | |
| | | Config 3 | | TRS.1.2 TDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1, 4 | | SR.1.1 FDD | As defined in A.1.1 |
| | | Config 2 | | SR.1.1 TDD | |
| | | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -95 | |
| | | Config 3 | | -98 | |
| | SS-RSRP Note 3 | | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | |
| | | Config 3 | | -101 | |
| | $\hat{E}_s / N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | Config 1, 2, 4 | dBm/15 kHz | -115 | |
| | | Config 3 | | -118 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1, 2, 4 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| | | Config 3 | | -65.38/18.36 MHz | |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | MsgA.1 FR1 | As defined in A.7A.1 |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105 dBm, as defined in TS 38.331 [13]. |

| | | | |
|---|---|---|---|
| Propagation Condition | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. | | | |
| Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. | | | |
| Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | |

### 16.3.2.2.7 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE

#### 16.3.2.2.7.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 16.3.2.2.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx and 2-step RACH from Release 17 onwards.

#### 16.3.2.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.7.

#### 16.3.2.2.7.4 Test description

##### 16.3.2.2.7.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.4.4.1 with following exceptions:

- Table 6.3.2.2.4.4.1-1 is replaced by Table 16.3.2.2.7.4.1-1.
- Table 6.3.2.2.4.4.1-2 is replaced by Table 16.3.2.2.7.4.1-2.

**Table 16.3.2.2.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.2.7-1 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.2.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

#### 16.3.2.2.7.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.4.4.2.

### 16.3.2.2.7.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.4.4.3.

**Table 16.3.2.2.7.4.3-1: *BWP-UplinkCommon* (Void)**

### 16.3.2.2.7.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.4.5 with following exceptions:

- Table 6.3.2.2.4.5-1 is replaced by Table 16.3.2.2.7.5-1.
- The check on the power of the first preamble in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first preamble shall be -23.55 dBm within the accuracy specified in Table 16.3.2.2.7.5-2.
- The check on the power of the first MsgA PUSCH transmission in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first MsgA PUSCH transmission shall be -23.55 dBm for test configuration 16.3.2.2.7-1 and -26.55 dBm for test configuration 16.3.2.2.7-2 within the accuracy specified in Table 16.3.2.2.7.5-2.

**Table 16.3.2.2.7.5-1: General test parameters**

| Parameter | | | Unit | Test-1 | Comments |
|---|---|---|---|---|---|
| SSB Configuration | | Config 1 | | SSB.1 RedCap FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | | Config 2 | | SSB.1 FR1 | |
| Number of SSBs per SS-burst | | | | 2 | Different from the definition in A.3 |
| SS/PBCH block index | | | | 0, 1 | Different from the definition in A.3 |
| Duplex Mode for Cell 1 | | Config 1 | | TDD | |
| | | Config 2 | | HD-FDD | |
| TDD Configuration | | Config 1 | | TDDConf.2.1 | |
| CSI-RS for tracking | | Config 1 | | TRS. 1.2 TDD | |
| | | Config 2 | | TRS. 1.1 FDD | |
| OCNG Pattern Note 1 | | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | | Config 1 | | SR.2.1 TDD | As defined in A.1.1 |
| | | Config 2 | | SR.1.1 FDD | |
| RMSI CORESET Reference Channel | | Config 1 | | CR.2.1 TDD | |
| | | Config 2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.2.1 TDD | |
| | | Config 2 | | CCR.1.1 FDD | |
| NR RF Channel Number | | | | 1 | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | | dB | 4.55 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15 kHz | -101 | |
| | | Config 2 | | -98 | |

| | | | | | |
|---|---|---|---|---|---|
| | $\hat{E}_s/N_{oc}$ | | dB | 4.55 | |
| | SS-RSRP Note 3 | | dBm/SCS | -93.45 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1 | dBm/15 kHz | -101 | |
| | | Config 2 | | -98 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 3 | | dBm/SCS | -115 | |
| Io Note 2 | | Config 1 | dBm | -94.19/9.36 MHz | For symbols without SSB index 1 |
| | | Config 2 | | -64.27/18.36 MHz | |
| *ss-PBCH-BlockPower* | | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ($P_{CMAX,\ f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | | MsgA.2 FR1 | As defined in A.7A.1 |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105 dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

**Table 16.3.2.2.7.5-2 Absolute power tolerance Test requirements**

| Conditions | Tolerance |
|---|---|
| Normal | ± 20.1 dB |

## 16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE

### 16.3.2.2.8.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

### 16.3.2.2.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx and 2-step RACH from Release 17 onwards.

### 16.3.2.2.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.8.

### 16.3.2.2.8.4 Test description

#### 16.3.2.2.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.3.2.2.4.4.1 with following exceptions:

- Table 6.3.2.2.4.4.1-1 is replaced by Table 16.3.2.2.8.4.1-1.
- Table 6.3.2.2.4.4.1-2 is replaced by Table 16.3.2.2.8.4.1-2.

**Table 16.3.2.2.8.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.3.2.2.8-1 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.2.8-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 16.3.2.2.8.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

#### 16.3.2.2.8.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.4.4.2.

#### 16.3.2.2.8.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.4.4.3.

**Table 16.3.2.2.8.4.3-1: *BWP-UplinkCommon* (Void)**

#### 16.3.2.2.8.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.4.4.2 with following exceptions:

- Table 6.3.2.2.4.5-1 is replaced by Table 16.3.2.2.8.5-1.
- The check on the power of the first MsgA PUSCH in Test 1, Test 2 and Test 3 is replaced as follows:
  - The power of the first MsgA PUSCH transmission shall be -22 dBm for test configuration 16.3.2.2.8-1 and -25 dBm for test configuration 16.3.2.2.8-2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

**Table 16.3.2.2.8.5-1: General test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 RedCap FR1 | As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below |
| | Config 2 | | SSB.1 FR1 | |
| Number of SSBs per SS-burst | | | 2 | Different from the definition in A.3 |
| SS/PBCH block index | | | 0, 1 | Different from the definition in A.3 |

| | | | | |
|---|---|---|---|---|
| Duplex Mode for Cell 1 | Config 1 | | TDD | |
| | Config 2 | | HD-FDD | |
| TDD Configuration | Config 1 | | TDDConf.2.1 | |
| CSI-RS for tracking | Config 1 | | TRS.1.2 TDD | |
| | Config 2 | | TRS.1.1 FDD | |
| OCNG Pattern Note 1 | | | OP.1 | As defined in A.2.1 |
| PDSCH parameters Note 4 | Config 1 | | SR.2.1 TDD | As defined in A.1.1 |
| | Config 2 | | SR.1.1 FDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.2.1 TDD | |
| | Config 2 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.2.1 TDD | |
| | Config 2 | | CCR.1.1 FDD | |
| NR RF Channel Number | | | 1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| SSB with index 0 | $\hat{E}_s / I_{ot}$ | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ Config 1 | dBm/15 kHz | -101 | |
| | $N_{oc}$ Config 2 | | -98 | |
| | $\hat{E}_s / N_{oc}$ | dB | 3 | |
| | SS-RSRP Note 3 Config 1, 2, 4 | dBm/15 kHz | -95 | |
| | SS-RSRP Note 3 Config 3 | | -98 | |
| | SS-RSRP Note 3 | dBm/SCS | -95 | |
| SSB with index 1 | $\hat{E}_s / I_{ot}$ | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ Config 1 | dBm/15 kHz | -101 | |
| | $N_{oc}$ Config 2 | | -98 | |
| | $\hat{E}_s / N_{oc}$ | dB | -17 | |
| | SS-RSRP Note 3 Config 1, 2, 4 | dBm/15 kHz | -115 | |
| | SS-RSRP Note 3 Config 3 | | -118 | |
| | SS-RSRP Note 3 | dBm/SCS | -115 | |
| Io Note 2 | Config 1 | dBm | -65.3/9.36 MHz | For symbols without SSB index 1 |
| | Config 2 | | -65.38/18.36 MHz | |
| *ss-PBCH-BlockPower* | | dBm/SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [13]. |
| Configured UE transmitted power ( $P_{\mathrm{CMAX},\ f,c}$ ) | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1 [2]. |
| MsgA Configuration | | | MsgA.2 FR1 | As defined in A.7A.1 |
| *msgA-RSRP-ThresholdSSB* | | | RSRP_51 | The actual value of the threshold is -105 dBm, as defined in TS 38.331 [13]. |
| Propagation Condition | | - | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

| Note 3: | The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. |
|---|---|

## 16.3.2.3 RRC connection release with redirection for RedCap

### 16.3.2.3.0 Minimum conformance requirements

#### 16.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

The requirements in clause 6.3.2.3.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.3.2.3.0.1 shall apply except that:

- $T_{identify-NR}$ as specified in Table 16.3.2.3.0.1-1.

**Table 16.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| FR of target NR cell | $T_{identify-NR}$ |
|---|---|
| FR1 | MAX (680 ms, [12] x $T_{rs}$) |
| Note: If the UE has been provided with higher layer signalling of *smtc2* specified in TS 38.331 [13] prior to the redirection command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |

The HD-FDD UE shall meet the RRC connection release with redirection requirements provided that SSB is available at the UE once every SMTC period during $T_{search}$.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3A.2.1.

#### 16.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

The requirements in clause 6.3.2.3.0.2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3A.2.2.

### 16.3.2.3.1 NR SA FR1-FR1 RRC connection release with redirection for 1 Rx UE

#### 16.3.2.3.1.1 Test purpose

To verify RRC connection release with redirection from NR to NR requirements specified in TS 38.133 [6] clause 6.2.3A.2.1.

#### 16.3.2.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.1.

#### 16.3.2.3.1.4 Test description

##### 16.3.2.3.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.1.4.1 with following exceptions:

- Table 6.3.2.3.1.4.1-1 is replaced by Table 16.3.2.3.1.4.1-1.

- Table 6.3.2.3.1.4.1-2 is replaced by Table 16.3.2.3.1.4.1-2.
- Table 6.3.2.3.1.4.1-3 is replaced by Table 16.3.2.3.1.4.1-3.

**Table 16.3.2.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.3.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.3.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.3.2.3.1-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.3.1-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.3.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 16.3.2.3.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.1.4.2.

### 16.3.2.3.1.4.3 Message contents

Same as the message contents given in clause 6.3.2.3.1.4.3 with following exceptions.

- Table 6.3.2.3.1.4.3-1 is replaced by Table 16.3.2.3.1.4.3-1.

**Table 16.3.2.3.1.4.3-1: *RRCRelease* (Test procedure, Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |

| | | | |
|---|---|---|---|
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR of Cell 2 | | |
| ssbSubcarrierSpacing | kHz15 | | Config 1, 2, 4 |
| | kHz30 | | Config 3 |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |
| | sf5 | | SMTC.2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

16.3.2.3.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.1.5 with following exceptions:

- Table 6.3.2.3.1.5-1 is replaced by Table 16.3.2.3.1.5-1.

**Table 16.3.2.3.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| | Config 4 | | SR.1.1 FDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| | Config 4 | | CR.1.1 FDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | Config 1, 2, 4 | | SMTC.1 FR1 | | | |
| | Config 3 | | SMTC.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io Note3 | Config 1, 2, 4 | dBm/ 9.36 MHz | -64.59 | -64.59 | -70.05 | -64.59 |
| | Config 3 | dBm/ 18.36 MHz | -61.66 | -61.66 | -67.12 | -61.66 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### 16.3.2.3.2 NR SA FR1-FR1 RRC connection release with redirection for 2 Rx UE

#### 16.3.2.3.2.1 Test purpose

To verify RRC connection release with redirection from NR to NR requirements specified in TS 38.133 [6] clause 6.2.3A.2.1.

#### 16.3.2.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.3.2.

#### 16.3.2.3.2.4 Test description

##### 16.3.2.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.3.2.3.1.4.1 with following exceptions:

- Table 6.3.2.3.1.4.1-1 is replaced by Table 16.3.2.3.2.4.1-1.
- Table 6.3.2.3.1.4.1-2 is replaced by Table 16.3.2.3.2.4.1-2.
- Table 6.3.2.3.1.4.1-3 is replaced by Table 16.3.2.3.2.4.1-3.

**Table 16.3.2.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.3.2-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.3.2.3.2-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 16.3.2.3.2-3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.3.2.3.2-4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.3.2.3.2.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 16.3.2.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.3.1.4.2.

### 16.3.2.3.2.4.3 Message contents

Same as the message contents given in clause 6.3.2.3.1.4.3 with following exceptions.

- Table 6.3.2.3.1.4.2-1 is replaced by Table 16.3.2.3.2.4.3-1.

**Table 16.3.2.3.2.4.3-1: *RRCRelease* (Test procedure, Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR of Cell 2 | | |
| ssbSubcarrierSpacing | kHz15 | | Config 1, 2, 4 |
| | kHz30 | | Config 3 |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |
| | sf5 | | SMTC.2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

16.3.2.3.2.5 Test requirement

Same as the test requirements given in clause 6.3.2.3.1.5 with following exceptions:

- Table 6.3.2.3.1.5-1 is replaced by Table 16.3.2.3.2.5-1.

**Table 16.3.2.3.2.5-1: Cell specific test parameter**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | Config 1, 2, 4 | | SMTC.1 FR1 | | | |
| | Config 3 | | SMTC.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| PRACH configuration | | | PRACH.1 FR1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io[Note3] | Config 1, 2, 4 | dBm/ 9.36 MHz | -64.59 | -64.59 | -70.05 | -64.59 |
| | Config 3 | dBm/ 18.36 MHz | -61.66 | -61.66 | -67.12 | -61.66 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### 16.3.2.3.3 NR SA FR1 - E-UTRA RRC connection release with redirection for 1 Rx UE

#### 16.3.2.3.3.1 Test purpose

To verify RRC connection release with redirection from NR to E-UTRAN requirements specified in TS 38.133 [4] clause 6.2.3A.2.2.

#### 16.3.2.3.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.3.2.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.3.

#### 16.3.2.3.3.4 Test description

##### 16.3.2.3.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.2.4.1 with following exceptions:

- Table 6.3.2.3.2.4.1-1 is replaced by Table 16.3.2.3.3.4.1-1.
- Table 6.3.2.3.2.4.1-2 is replaced by Table 16.3.2.3.3.4.1-2.
- Table 6.3.2.3.2.4.1-3 is replaced by Table 16.3.2.3.3.4.1-3.

**Table 16.3.2.3.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.3.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.3.2.3.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.2.3.3-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.2.3.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.2.3.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.2.3.3-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.2.3.3-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.3.2.3.3-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.3.3.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.3.3.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

### 16.3.2.3.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.2.4.2.

### 16.3.2.3.3.4.3 Message contents

Same as the message contents given in clause 6.3.2.3.2.4.3.

### 16.3.2.3.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.2.5 with following exceptions:

- Table 6.3.2.3.2.5-1 is replaced by Table 16.3.2.3.3.5-1.
- Table 6.3.2.3.2.5-2 is replaced by Table 16.3.2.3.3.5-2.

**Table 16.3.2.3.3.5-1: Cell specific test parameters for NR Cell (Cell 1)**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| | Config 7, 8 | | HD-FDD | |
| SSB Configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| TDD configuration | Config 1, 4, 7, 8 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 | |
| BWP BW | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1, 4, 7, 8 | | SR.1.1 FDD | |
| | Config 2, 5 | | SR.1.1 TDD | |
| | Config 3, 6 | | SR.2.1 TDD | |
| CORESET Reference | Config 1, 4, 7, 8 | | CR.1.1 FDD | |

| | | | | |
|---|---|---|---|---|
| Channel | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1, 2, 4, 5, 7, 8 | | SMTC.1 FR1 | |
| | Config 3, 6 | | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5, 7, 8 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4, 5, 7, 8 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH configuration | | | PRACH.1 FR1 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | |
| $N_{oc}$ Note2 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -98 | |
| | Config 3, 6 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 |
| Io Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/ 9.36 MHz | -64.59 | -64.59 |
| | Config 3, 6 | dBm/ 18.36 MHz | -61.66 | -61.66 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.3.2.3.3.5-2: Cell specific test parameters for E-UTRAN Cell (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration Note1 | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration Note1 | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration Note2 | | 1, 2, 3, 7 | 4 | |
| | | 4, 5, 6, 8 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note3 | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD | |

| | | | | |
|---|---|---|---|---|
| | | | 20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 4 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 4 |
| RSRP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -94 |
| SCH_RP[Note6] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -94 |
| Io[Note6] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -70.22 | -64.76 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

### 16.3.2.3.4 NR SA FR1 - E-UTRA RRC connection release with redirection for 2 Rx UE

#### 16.3.2.3.4.1 Test purpose

To verify RRC connection release with redirection from NR to E-UTRAN requirements specified in TS 38.133 [4] clause 6.2.3A.2.2.

#### 16.3.2.3.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.3.2.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.4.

### 16.3.2.3.4.4 Test description

#### 16.3.2.3.4.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.2.4.1 with following exceptions:

- Table 6.3.2.3.2.4.1-1 is replaced by Table 16.3.2.3.4.4.1-1.
- Table 6.3.2.3.2.4.1-2 is replaced by Table 16.3.2.3.4.4.1-2.
- Table 6.3.2.3.2.4.1-3 is replaced by Table 16.3.2.3.4.4.1-3.

**Table 16.3.2.3.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.3.2.3.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.3.2.3.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.2.3.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.3.2.3.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.3.2.3.4-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.2.3.4-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.3.2.3.4-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.3.2.3.4-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.3.2.3.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.3.2.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

**Table 16.3.2.3.4.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 µs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

#### 16.3.2.3.4.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.2.4.2.

#### 16.3.2.3.4.4.3 Message contents

Same as the message contents given in clause 6.3.2.3.2.4.3.

### 16.3.2.3.4.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.2.5 with following exceptions:

- Table 6.3.2.3.2.5-1 is replaced by Table 16.3.2.3.4.5-1.
- Table 6.3.2.3.2.5-2 is replaced by Table 16.3.2.3.4.5-2.

**Table 16.3.2.3.4.5-1: Cell specific test parameters for NR Cell (Cell 1)**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1, 4 | | FDD | |
| | Config 2, 3, 5, 6 | | TDD | |
| | Config 7, 8 | | HD-FDD | |
| SSB Configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD | |
| | Config 2, 5 | | TRS.1.1 TDD | |
| | Config 3, 6 | | TRS.1.2 TDD | |
| TDD configuration | Config 1, 4, 7, 8 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 | |
| BWP BW | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1, 4, 7, 8 | | SR.1.1 FDD | |
| | Config 2, 5 | | SR.1.1 TDD | |
| | Config 3, 6 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1, 4, 7, 8 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1, 2, 4, 5, 7, 8 | | SMTC.1 FR1 | |
| | Config 3, 6 | | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5, 7, 8 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4, 5, 7, 8 | kHz | 15 | |
| | Config 3, 6 | | 30 | |
| PRACH configuration | | | PRACH.1 FR1 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | |
| $N_{oc}$ Note2 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -98 | |
| | Config 3, 6 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 |
| Io[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/ 9.36 MHz | -64.59 | -64.59 |
| | Config 3, 6 | dBm/ 18.36 MHz | -61.66 | -61.66 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.3.2.3.4.5-2: Cell specific test parameters for E-UTRAN Cell (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration[Note2] | | 1, 2, 3, 7 | 4 | |
| | | 4, 5, 6, 8 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -98 | |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 4 |
| $\hat{E}_s/I_{ot}$ Note6 | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 4 |
| RSRP Note6 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -94 |
| SCH_RP Note6 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -94 |
| Io Note6 | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -70.22 | -64.76 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

# 16.4 Timing for RedCap

## 16.4.1 UE transmit timing for RedCap

### 16.4.1.0 Minimum conformance requirements

#### 16.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 16.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS, or it is the PRACH transmission, or it is the msgA transmission.

The UE shall meet the $T_e$ requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE during the last 160 ms on the condition that:

the SSB is within the UE's active BWP, or

the SSB is not within the UE's active BWP, and the measurement gap is configured

The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_c$. The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at UE antenna. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_c$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3A was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 16.4.1.0.1-2.

**Table 16.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 1 | 15 | 15 | $12*64*T_c$ |

| | | | |
|---|---|---|---|
| | | 30 | 10*64*$T_c$ |
| | | 60 | 10*64*$T_c$ |
| | 30 | 15 | 8*64*$T_c$ |
| | | 30 | 8*64*$T_c$ |
| | | 60 | 7*64*$T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

**Table 16.4.1.0.1-2: The Value of $N_{\text{TA offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\text{TA offset}}$ (Unit: $T_c$) |
|---|---|
| FR1 FDD or TDD band with neither E-UTRA–NR nor NB-IoT–NR coexistence case | 25600 (Note 1) |
| FR1 FDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case | 0 (Note 1) |
| FR1 TDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| Note 1: The UE identifies $N_{\text{TA offset}}$ based on the information *n-TimingAdvanceOffset* as specified in TS 38.331 [13]. If UE is not provided with the information *n-TimingAdvanceOffset*, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band.<br>Note 2: Void | |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3A is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$ then the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.

2) The minimum aggregate adjustment rate shall be $T_p$ per second.

3) The maximum aggregate adjustment rate shall be $T_q$ per 200 ms.

   where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 16.4.1.0.1-3.

**Table 16.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 1 | 15 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 30 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| | 60 | 5.5*64*$T_c$ | 5.5*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7] | | | |

The normative reference for this requirement is TS.38.133 [6] clause 7.1A.

## 16.4.1.1 NR SA FR1 NR UE Transmit Timing accuracy for 1 Rx UE

### 16.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNode-B and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1A.2.

#### 16.4.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.16.4.1.1.

#### 16.4.1.1.4 Test Description

##### 16.4.1.1.4.1 Initial Conditions

Same as the initial conditions given in clause 6.4.1.1.4.1 with following exceptions:

- Table 6.4.1.1.4.1-1 is replaced by Table 16.4.1.1.4.1-1.
- Table 6.4.1.1.4.1-2 is replaced by Table 16.4.1.1.4.1-2

**Table 16.4.1.1.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 16.4.1.1-1 | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 16.4.1.1-2 | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 16.4.1.1-3 | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz |
| 16.4.1.1-4 | NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.4.1.1.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

##### 16.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.4.1.1.4.2.

##### 16.4.1.1.4.3 Message contents

Same as the message contents given in clause 6.4.1.1.4.3.

#### 16.4.1.1.5 Test Requirements

Same as the test Requirements given in clause 6.4.1.1.5 with following exceptions:

- Table 6.4.1.1.5-1 is replaced by Table 16.4.1.1.5-1.

**Table 16.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test 1 | Test 2 |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| SSB ARFCN | | 1, 2, 3 | Freq1 | Freq1 |
| TDD configuration | | 1, 4 | Not Applicable | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4 | 10: $N_{RB,c}$ = 52 | |
| | | 3 | 20: $N_{RB,c}$ = 51 | |
| Initial BWP Configuration | | 1, 2, 3, 4 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1, 2, 3, 4 | DLBWP.1.1<br>ULBWP.1.1 | |
| DRX Cycle | ms | 1, 2, 3, 4 | N/A | DRX.8 Note5 |
| PDSCH Reference measurement channel | | 1, 4 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1, 4 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC Configuration | | 1, 2, 4 | SMTC.1 | |
| | | 3 | SMTC.2 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | |
| | | 2 | TRS.1.1 TDD | |
| | | 3 | TRS.1.2 TDD | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | -98 |
| | | 3 | -95 | -95 |
| $\hat{E}_s / I_{ot}$ | | 1, 2, 3, 4 | 3.3 | 3.3 |
| $\hat{E}_s / N_{oc}$ | | 1, 2, 3, 4 | 3.3 Note 7 | 3.3 Note 7 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94.7 | -94.7 |
| | | 3 | -91.7 | -91.7 |
| Io Note3 | dBm/9.36 MHz | 1, 2, 4 | -65.08 | -65.08 |
| | dBm/18.36 MHz | 3 | -62.16 | -62.16 |
| Propagation condition | | 1, 2, 3, 4 | AWGN | |
| SRS Config | | 1, 2, 4 | SRSConf.1 Note6 | SRSConf.3 Note6 |
| | | 3 | SRSConf.1 Note6 | SRSConf.2 Note6 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

| | |
|---|---|
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | DRX related parameters are given in Table A.5-1. |
| Note 6: | SRS configs are given in Table 16.4.1.1.5-2. |
| Note 7: | With the test tolerance given in Annex F. |

**Table 16.4.1.1.5-2: SRS Configuration for Timing Accuracy Test**

| | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
|---|---|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 | |
| | srs-ResourceIdList | 0 | 0 | 0 | |
| | resourceType | Periodic | Periodic | Periodic | |
| | Usage | Codebook | Codebook | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | 0 | 0 | |
| | nrofSRS-Ports | Port1 | Port1 | Port1 | |
| | transmissionComb | n2 | n2 | n2 | |
| | combOffset-n2 | 0 | 0 | 0 | |
| | cyclicShift-n2 | 0 | 0 | 0 | |
| | resourceMapping startPosition | 0 | 0 | 0 | |
| | resourceMapping nrofSymbols | n1 | n1 | n1 | |
| | resourceMapping repetitionFactor | n1 | n1 | n1 | |
| | freqDomainPosition | 0 | 0 | 0 | |
| | freqDomainShift | 0 | 0 | 0 | |
| | freqHopping c-SRS | 12 for test configuration 1, 2, 3 | 12 | 12 | |
| | freqHopping b-SRS | 0 | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | Neither | |
| | resourceType | Periodic | Periodic | Periodic | |
| | periodicityAndOffset-p | sl1, 0 | sl640, 5 | sl320, 3 | Offset to align with DRx periodicity |
| | sequenceId | 0 | 0 | 0 | Any 10 bit number |

## 16.4.1.2 NR SA FR1 NR UE Transmit Timing accuracy for 2 Rx UE

### 16.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNode-B and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1A.2.

### 16.4.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.16.4.1.2.

### 16.4.1.2.4 Test Description

#### 16.4.1.2.4.1 Initial Conditions

Same as the initial conditions given in clause 6.4.1.1.4.1 with following exceptions:

- Table 6.4.1.1.4.1-1 is replaced by Table 16.4.1.2.4.1-1.
- Table 6.4.1.1.4.1-2 is replaced by Table 16.4.1.2.4.1-2.

**Table 16.4.1.2.4.1-1: Supported test configurations for FR1 PCell**

| Configuration | Description |
|---|---|
| 16.4.1.2-1 | NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 16.4.1.2-2 | NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 16.4.1.2-3 | NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz |
| 16.4.1.2-4 | NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.4.1.2.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | Without LTE link | | |

### 16.4.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.4.1.1.4.2.

### 16.4.1.2.4.3 Message contents

Same as the message contents given in clause 6.4.1.1.4.3.

### 16.4.1.2.5 Test Requirements

Same as the test Requirements given in clause 6.4.1.1.5 with following exceptions:

- Table 6.4.1.1.5-1 is replaced by Table 16.4.1.2.5-1.

**Table 16.4.1.2.5-1: Cell Specific Test Parameters for UL Transmit Timing test**

| Parameter | Unit | Config | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB ARFCN | | 1, 2, 3, 4 | Freq1 | Freq1 |
| TDD configuration | | 1, 4 | Not Applicable | |
| | | 2 | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | |
| $BW_{channel}$ | MHz | 1, 2, 4 | 10: $N_{RB,c}$ = 52 | |
| | | 3 | 20: $N_{RB,c}$ = 51 | |
| Initial BWP Configuration | | 1, 2, 3, 4 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1, 2, 3, 4 | DLBWP.1.1<br>ULBWP.1.1 | |
| DRX Cycle | ms | 1, 2, 3, 4 | N/A | DRX.8[Note5] |

| | | | | |
|---|---|---|---|---|
| PDSCH Reference measurement channel | | 1, 4 | SR.1.1 FDD | |
| | | 2 | SR.1.1 TDD | |
| | | 3 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1, 4 | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC Configuration | | 1, 2, 4 | SMTC.1 | |
| | | 3 | SMTC.2 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | |
| | | 2 | TRS.1.1 TDD | |
| | | 3 | TRS.1.2 TDD | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | -98 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2, 4 | -98 | -98 |
| | | 3 | -95 | -95 |
| $\hat{E}_s / I_{ot}$ | | 1, 2, 3, 4 | 3.3 | 3.3 |
| $\hat{E}_s / N_{oc}$ | | 1, 2, 3, 4 | 3.3 Note 7 | 3.3 Note 7 |
| SS-RSRP Note3 | dBm/SCS | 1, 2, 4 | -94.7 | -94.7 |
| | | 3 | -91.7 | -91.7 |
| Io Note3 | dBm/9.36 MHz | 1, 2, 4 | -65.08 | -65.08 |
| | dBm/18.36 MHz | 3 | -62.16 | -62.16 |
| Propagation condition | | 1, 2, 3, 4 | AWGN | |
| SRS Config | | 1, 2, 4 | SRSConf.1 Note6 | SRSConf.3 Note6 |
| | | 3 | SRSConf.1 Note6 | SRSConf.2 Note6 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRX related parameters are given in Table A.5-1.

Note 6: SRS configs are given in Table 16.4.1.1.5-2.

Note 7: With the test tolerance given in Annex F.

# 16.4.2

# 16.4.3 Timing advance for RedCap

## 16.4.3.0 Minimum conformance requirement

The timing advance is initiated from gNB to UE configured with only PCell, with MAC message that implies the adjustment of the timing advance, as defined in TS 38.321 [12] clause 5.2.

UE shall adjust the timing of its uplink transmission at time slot n+k+1 for a timing advance command received in time slot n, and the value of k is defined in TS 38.213 [8] clause 4.2. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 16.4.3.0-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

**Table 16.4.3.0-1: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing (kHz) | 15 | 30 |
|---|---|---|
| UE Timing Advance adjustment accuracy | ±256 $T_c$ | ±256 $T_c$ |

## 16.4.3.1 NR SA FR1 timing advance adjustment accuracy for 1 Rx UE

### 16.4.3.1.1 Test purpose

To verify UE timing advance adjustment delay and accuracy requirement defined in TS 38.133 [6] clause 7.3A.

### 16.4.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.4.3.1.

### 16.4.3.1.4 Test description

#### 16.4.3.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.4.3.1.4.1 with following exceptions:

- Table 6.4.3.1.4.1-1 is replaced by Table 16.4.3.1.4.1-1.
- Table 6.4.3.1.4.1-2 is replaced by Table 16.4.3.1.4.1-2.
- Table 6.4.3.1.4.1-3 is replaced by Table 16.4.3.1.4.1-3.

**Table 16.4.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.4.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.4.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.4.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.4.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.4.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | Without LTE link | | |

**Table 16.4.3.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For SCS = 15 kHz : $N_{TA_new} = N_{TA_old} + 8192*T_c$<br>For SCS = 30 kHz : $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | s | 5 | |
| T2 | s | 5 | |

### 16.4.3.1.4.2 Test Procedure

Same as the test procedure given in sub-clause 6.4.3.1.4.2.

### 16.4.3.1.4.3 Message Contents

Same as the message contents specified in sub-clause 6.4.3.1.4.3.

### 16.4.3.1.5 Test Requirement

Same as the test requirements given in sub-clause 6.4.3.1.5 with following exceptions:

- Table 6.4.3.1.5-1 is replaced by Table 16.4.3.1.5-1.
- Table 6.4.3.1.5-2 is replaced by Table 16.4.3.1.5-2.
- Table 6.4.3.1.5-3 is replaced by Table 16.4.3.1.5-3.

**Table 16.4.3.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |

| | | | |
|---|---|---|---|
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| BWP BW | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| DRX Cycle | | ms | Not Applicable |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC configuration | Config 1, 2, 4 | | SMTC.1 FR1 |
| | Config 3 | | SMTC.2 FR1 |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 |
| | Config 3 | | 30 |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 |
| | Config 3 | | 30 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 |
| | Config 3 | | -95 |
| $\hat{E}_s / I_{ot}$ | | dB | 3 |
| $\hat{E}_s / N_{oc}$ | | dB | 3 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -67.57 |
| | Config 3 | dBm/18.36 MHz | -65.76 |
| Propagation condition | | | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.4.3.1.5-2: Sounding Reference Symbol Configuration**

| Field | | Value | Comment |
|---|---|---|---|
| *c-SRS* | | 12 | Frequency hopping is disabled |
| *b-SRS* | | 0 | |
| *b-hop* | | 0 | |
| *freqDomainPosition* | | 0 | Frequency domain position of SRS |
| *freqDomainShift* | | 0 | |
| *groupOrSequenceHopping* | | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | Config 1, 2, 4 | sl5=2 | Once every 5 slots |
| | Config 3 | sl5=4 | |
| *pathlossReferenceRS* | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| *usage* | | Codebook | Codebook based UL transmission |
| *startPosition* | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | | n1 | |
| *repetitionFactor* | | n1 | |
| *combOffset-n2* | | 0 | transmissionComb setting |
| *cyclicShift-n2* | | 0 | |
| *nrofSRS-Ports* | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

**Table 16.4.3.1.5-3: UE Timing Advance adjustment accuracy**

| **Sub Carrier Spacing, SCS (kHz)** | **15** | **30** |
|---|---|---|
| **UE Timing Advance adjustment accuracy** | ±344 $T_c$ | ±344 $T_c$ |

## 16.4.3.2 NR SA FR1 timing advance adjustment accuracy for 2 Rx UE

### 16.4.3.2.1 Test purpose

To verify UE timing advance adjustment delay and accuracy requirement defined in TS 38.133 [6] clause 7.3A.

### 16.4.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.4.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.4.3.2.

### 16.4.3.2.4 Test description

#### 16.4.3.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.4.3.1.4.1 with following exceptions:

- Table 6.4.3.1.4.1-1 is replaced by Table 16.4.3.2.4.1-1.
- Table 6.4.3.1.4.1-2 is replaced by Table 16.4.3.2.4.1-2.
- Table 6.4.3.1.4.1-3 is replaced by Table 16.4.3.2.4.1-3.

**Table 16.4.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.4.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.4.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.4.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.4.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.4.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.4.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.1 | |
| Exceptions to connection diagram | Without LTE link | | |

**Table 16.4.3.2.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For SCS = 15 kHz : $N_{TA_new} = N_{TA_old} + 8192*T_c$<br>For SCS = 30 kHz : $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | s | 5 | |
| T2 | s | 5 | |

### 16.4.3.2.4.2 Test Procedure

Same as the test procedure given in sub-clause 6.4.3.1.4.2.

### 16.4.3.2.4.3 Message Contents

Same as the message contents specified in sub-clause 6.4.3.1.4.3.

### 16.4.3.2.5 Test Requirement

Same as the test requirements given in sub-clause 6.4.3.1.5 with following exceptions:

- Table 6.4.3.1.5-1 is replaced by Table 16.4.3.2.5-1.
- Table 6.4.3.1.5-2 is replaced by Table 16.4.3.2.5-2.
- Table 6.4.3.1.5-3 is replaced by Table 16.4.3.2.5-3.

**Table 16.4.3.2.5-1: Cell specific test parameters**

| Parameter | | Unit | Test1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| BWP BW | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | |
| | Config 2 | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1, 2, 4 | | SMTC.1 FR1 | |
| | Config 3 | | SMTC.2 FR1 | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | |
| | Config 3 | | SSB.1 RedCap FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | |
| | Config 3 | | 30 | |
| PUCCH/PUSCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | |
| | Config 3 | | 30 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -98 | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -98 | |
| | Config 3 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | 3 | |
| $\hat{E}_s / N_{oc}$ | | dB | 3 | |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -67.57 | |
| | Config 3 | dBm/18.36 MHz | -65.76 | |
| Propagation condition | | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

| | |
|---|---|
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

**Table 16.4.3.2.5-2: Sounding Reference Symbol Configuration**

| Field | | Value | Comment |
|---|---|---|---|
| *c-SRS* | | 12 | Frequency hopping is disabled |
| *b-SRS* | | 0 | |
| *b-hop* | | 0 | |
| *freqDomainPosition* | | 0 | Frequency domain position of SRS |
| *freqDomainShift* | | 0 | |
| *groupOrSequenceHopping* | | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | Config 1,2,4 | sl5=2 | Once every 5 slots |
| | Config 3 | sl5=4 | |
| *pathlossReferenceRS* | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| *usage* | | Codebook | Codebook based UL transmission |
| *startPosition* | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | | n1 | |
| *repetitionFactor* | | n1 | |
| *combOffset-n2* | | 0 | transmissionComb setting |
| *cyclicShift-n2* | | 0 | |
| *nrofSRS-Ports* | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

**Table 16.4.3.2.5-3: UE Timing Advance adjustment accuracy**

| Sub Carrier Spacing, SCS (kHz) | 15 | 30 |
|---|---|---|
| UE Timing Advance adjustment accuracy | ±344 $T_c$ | ±344 $T_c$ |

# 16.5 Signalling characteristics for RedCap

## 16.5.1 Radio link monitoring for RedCap

### 16.5.1.0 Minimum requirements

#### 16.5.1.0.1 General

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 16.5.1.0.1-1. For SSB based radio link monitoring, $Q_{out_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-2. For CSI-RS based radio link monitoring, $Q_{out_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-4.

The threshold $Q_{in}$ is defined as the level at which the downlink radio link quality can be significantly more reliably received than at $Q_{out}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 16.5.1.0.1-1. For SSB based radio link monitoring, $Q_{in_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-3. For CSI-RS based radio link monitoring, $Q_{in_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-5.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 16.5.1.0.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 16.5.1.0.1-1.

**Table 16.5.1.0.1-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out}$ | $BLER_{in}$ |
|---|---|---|
| 0 | 10% | 2% |

UE shall be able to monitor up to $N_{RLM}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number $L_{max}$ of SSBs per half frame according to TS 38.213 [8], where $N_{RLM}$ is specified in Table 16.5.1.0.1-6 according TS 38.213 [8], and meet the requirements as specified in TS 38.133 [6] clause 8.1B. UE is not required to meet the requirements in TS 38.133 [6] clause 8.1B if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 16.5.1.0.1-2: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16; for RedCap UE with 1 Rx branch.<br>8; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 4 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4 dB |
| Bandwidth (PRBs) | 48; for RedCap UE with 1 Rx branch.<br>24; for RedCap UE with 2 Rx branch. |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 16.5.1.0.1-3: PDCCH transmission parameters for in-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8; for RedCap UE with 1 Rx branch.<br>4; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0 dB |
| Bandwidth (PRBs) | 48; for RedCap UE with 1 Rx branch.<br>24; for RedCap UE with 2 Rx branch. |

| | |
|---|---|
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 16.5.1.0.1-4: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16; for RedCap UE with 1 Rx branch.<br>8; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 4 dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4 dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 16.5.1.0.1-5: PDCCH transmission parameters for in-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8; for RedCap UE with 1 Rx branch.<br>4; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0 dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 16.5.1.0.1-6: Maximum number of RLM-RS resources $X_{RLM-RS}$**

| Carrier frequency range of PCell | $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|---|---|---|
| FR1, ≤ 3 GHz[Note] | 4 | 2 |
| FR1, > 3 GHz[Note] | 8 | 4 |
| FR2 | 64 | 8 |
| NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3 GHz is replaced by 1.88 GHz, as specified in clause 4.1 in TS 38.213 [8]. | | |

When the UE transitions between RLM CD-SSB resource and RLM NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each RLM-RS resource.

The requirements in TS 38.133 [6] clause 8.1.4 shall also apply except the scenarios described above.

The requirements in TS 38.133 [6] clause 8.1.5 shall apply.

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in,RedCap}$, layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval,RedCap}$.

When DRX is not used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in clause TS 38.133 [6] 8.1B.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in TS 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS.

In case DRX is used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM\text{-}RS,M}$)) if DRX cycle_length is less than or equal to 320 ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320 ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

When DRX is not used for HD-FDD RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in TS 38.133 [6] clause 8.1B.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in TS 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS, under the following condition

- For each RLM-RS configuration, at least one RLM-RS sample must fall with DL occasion within an indication period.

In case DRX is used for HD-FDD RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM\text{-}RS,M}$)) if DRX cycle_length is less than or equal to 320 ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320 ms, under the following condition

- For each RLM-RS configuration, at least one RLM-RS sample must fall with DL occasion within an indication period.

The requirements in TS 38.133 [6] clause 8.1.7 shall apply.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.1, 8.1B.2, 8.1B.3, 8.1B.4, 8.1B.5, 8.1B.6 and 8.1B.7.

#### 16.5.1.0.2 Minimum conformance requirements for SSB-based RLM

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,RedCap}$ ms period becomes worse than the threshold $Q_{out_SSB,RedCap}$ within $T_{Evaluate_out_SSB,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,RedCap}$ ms period becomes better than the threshold $Q_{in_SSB,RedCap}$ within $T_{Evaluate_in_SSB,RedCap}$ ms evaluation period.

$T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ are defined in Table 16.5.1.0.2-1 and Table 16.5.1.0.2-2 for FR1 for UE with 2 Rx RedCap and 1 Rx RedCap, respectively.

**Table 16.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR1 for 2 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_SSB,RedCap}$ (ms) | $T_{Evaluate_in_SSB,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil(10 × P) × $T_{SSB}$) | Max(100, Ceil(5 × P) × $T_{SSB}$) |
| DRX cycle ≤320 ms | Max(200, Ceil(15 × P) × Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320 ms | Ceil(10 × P) × $T_{DRX}$ | Ceil(5 × P) × $T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

**Table 16.5.1.0.2-2: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR1 for 1 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_SSB,RedCap}$ (ms) | $T_{Evaluate_in_SSB,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(400, Ceil(20 × P) × $T_{SSB}$) | Max(100, Ceil(5 × P) × $T_{SSB}$) |
| DRX cycle ≤ 320 ms | Max(400, Ceil(30 × P) × Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320 ms | Ceil(20 × P) × $T_{DRX}$ | Ceil(5 × P) × $T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.2.

#### 16.5.1.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS,RedCap}$ ms period becomes worse than the threshold $Q_{out_CSI-RS,RedCap}$ within $T_{Evaluate_out_CSI-RS,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS,RedCap}$ ms period becomes better than the threshold $Q_{in_CSI-RS,RedCap}$ within $T_{Evaluate_in_CSI-RS,RedCap}$ ms evaluation period.

$T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ are defined in Table 16.5.1.0.3-1 and Table 16.5.1.0.3-2 for FR1 for RedCap 2 Rx RedCap and 1 Rx RedCap, respectively.

**Table 16.5.1.0.3-1: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR1 for 2 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_CSI-RS,RedCap}$ (ms) | $T_{Evaluate_in_CSI-RS,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil($M_{out,RedCap}$×P)×$T_{CSI-RS}$) | Max(100, Ceil($M_{in,RedCap}$×P) × $T_{CSI-RS}$) |
| DRX ≤ 320 ms | Max(200, Ceil(1.5×$M_{out,RedCap}$ ×P)× Max($T_{DRX}$, $T_{CSI-RS}$)) | Max(100, Ceil(1.5×$M_{in,RedCap}$×P)× Max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX > 320 ms | Ceil($M_{out,RedCap}$ ×P) × $T_{DRX}$ | Ceil($M_{in,RedCap}$ ×P) × $T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | | |

**Table 16.5.1.0.3-2: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR1 for 1 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_CSI-RS,RedCap}$ (ms) | $T_{Evaluate_in_CSI-RS,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(400, Ceil($M_{out,RedCap}$×P)×$T_{CSI-RS}$) | Max(100, Ceil($M_{in,RedCap}$×P) × $T_{CSI-RS}$) |
| DRX ≤ 320 ms | Max(400, Ceil(1.5×$M_{out,RedCap}$ ×P)× Max($T_{DRX}$, $T_{CSI-RS}$)) | Max(100, Ceil(1.5×$M_{in,RedCap}$×P)× Max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX > 320 ms | Ceil($M_{out,RedCap}$ ×P) × $T_{DRX}$ | Ceil($M_{in,RedCap}$ ×P) × $T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | | |

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS for RLM measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.3.

## 16.5.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE

### 16.5.1.1.1 Test purpose

To verify that the 1 Rx RedCap UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell for 1 Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.2.

### 16.5.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.1.

### 16.5.1.1.4 Test description

Same as the test description given in clause 6.5.1.1.4.

#### 16.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.1.4.1 with following exceptions:

- Table 6.5.1.1.4.1-1 is replaced by Table 16.5.1.1.4.1-1.
- Table 6.5.1.1.4.1-2 is replaced by Table 16.5.1.1.4.1-2.
- Table 6.5.1.1.4.1-4 is replaced by Table 16.5.1.1.4.1-3.

**Table 16.5.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.1-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.1-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.1-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.1-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.1.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2, 3 | | TDD |
| | | Config 4 | | HD-FDD |
| $BW_{channel}$ | | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20: $N_{RB,c}$ = 51 |
| DL initial BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.3.2 FDD |
| | | Config 2 | | CCR.4.2 TDD |
| | | Config 3 | | CCR.5.2 TDD |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz |
| | | Config 3 | | 30 kHz |
| PRACH Configuration | | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x1 low |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |

| | | | |
|---|---|---|---|
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.88 |
| T3 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 16.5.1.1.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.1.4.2.

#### 16.5.1.1.4.3 Message Contents

Same as the message contents given in clause 6.5.1.1.4.3 with the following exceptions.

**Table 16.5.1.1.4.3-1: PDCCH *Search Space***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel16 | n1 | | |
| } | | | |
| } | | | |

#### 16.5.1.1.5 Test Requirement

Same as the test requirements given in clause 6.5.1.1.5 with following exceptions:

- Table 6.5.1.1.5-1 is replaced by Table 16.5.1.1.5-1.

**Table 16.5.1.1.5-1: Cell specific test parameters (Cell 1)**

| **Parameter** | | **Unit** | **Test 1** | | |
|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 | | |

| | | | |
|---|---|---|---|
| | Config 3 | | -95 |
| Propagation condition | | | TDL-C 300 ns 100 Hz |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1. | | | |

## 16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

### 16.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell for 2 Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.2.

### 16.5.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.2.

### 16.5.1.2.4 Test description

Same as the test description given in clause 6.5.1.1.4.

#### 16.5.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.1.4.1 with following exceptions:

- Table 6.5.1.1.4.1-1 is replaced by Table 16.5.1.2.4.1-1.
- Table 6.5.1.1.4.1-2 is replaced by Table 16.5.1.2.4.1-2.
- Table 6.5.1.1.4.1-4 is replaced by Table 16.5.1.2.4.1-3.

**Table 16.5.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.2-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.2-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.2-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.2-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.2.4.1-1 | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.2.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2, 3 | | TDD |
| | | Config 4 | | HD-FDD |
| $BW_{channel}$ | | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20: $N_{RB,c}$ = 51 |
| DL initial BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.3 FDD |
| | | Config 2 | | CCR.1.3 TDD |
| | | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz |
| | | Config 3 | | 30 kHz |
| PRACH Configuration | | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | | 0 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x2 low |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | gp0 |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 0 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |

| | | | |
|---|---|---|---|
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.2.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.1.4.2.

### 16.5.1.2.4.3 Message Contents

Same as the message contents given in clause 6.5.1.1.4.3.

### 16.5.1.2.5 Test Requirement

Same as the test requirements given in clause 6.5.1.1.5 with following exceptions:

- Table 6.5.1.1.5-1 is replaced by Table 16.5.1.2.5-1.

**Table 16.5.1.2.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 Note 5 | -6.2 Note 5 | -15.8 Note 5 |
| | Config 3 | | 1.8 Note 5 | -6.2 Note 5 | -15.8 Note 5 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 | | |
| | Config 3 | | -95 | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.<br>Note 5: Including the test tolerance given in Annex F. | | | | | |

## 16.5.1.3 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE

### 16.5.1.3.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 16.5.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.3.

### 16.5.1.3.4 Test description

Same as the test description given in clause 6.5.1.2.4.

#### 16.5.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.2.4.1 with following exceptions:

- Table 6.5.1.2.4.1-1 is replaced by Table 16.5.1.3.4.1-1.
- Table 6.5.1.2.4.1-2 is replaced by Table 16.5.1.3.4.1-2.
- Table 6.5.1.2.4.1-4 is replaced by Table 16.5.1.3.4.1-3.

**Table 16.5.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.3-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.3-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.3-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.3-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.3.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| Active PCell | | Cell 1 |

| | | | |
|---|---|---|---|
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: NRB,c = 51 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.3.1 FDD |
| | Config 2 | | CCR.4.1 TDD |
| | Config 3 | | CCR.5.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |

| | | | |
|---|---|---|---|
| DRX | | | OFF |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.3.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.2.4.2.

### 16.5.1.3.4.3 Message Contents

Same as the message contents given in clause 6.5.1.2.4.3.

### 16.5.1.3.5 Test Requirement

Same as the test requirements given in clause 6.5.1.2.5 with following exceptions:

- Table 6.5.1.2.5-1 is replaced by Table 16.5.1.3.5-1.

**Table 16.5.1.3.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | | | |
| | Config 3 | | -98 | | | | |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 | | | | |
| | Config 3 | | -95 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.1-1. | | | | | | | |

## 16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

### 16.5.1.4.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 16.5.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.4.

### 16.5.1.4.4 Test description

Same as the test description given in clause 6.5.1.2.4.

#### 16.5.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.2.4.1 with following exceptions:

- Table 6.5.1.2.4.1-1 is replaced by Table 16.5.1.4.4.1-1.
- Table 6.5.1.2.4.1-2 is replaced by Table 16.5.1.4.4.1-2.
- Table 6.5.1.2.4.1-4 is replaced by Table 16.5.1.4.4.1-3.

**Table 16.5.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.4-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.4-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.4-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.4-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.4.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.4.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|

| | | | Test 1 |
|---|---|---|---|
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: NRB,c = 51 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |

| | | | |
|---|---|---|---|
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.4.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.2.4.2.

### 16.5.1.4.4.3 Message Contents

Same as the message contents given in clause 6.5.1.2.4.3.

### 16.5.1.4.5 Test Requirement

Same as the test requirements given in clause 6.5.1.2.5 with following exceptions:

- Table 6.5.1.2.5-1 is replaced by Table 16.5.1.4.5-1.

**Table 16.5.1.4.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 Note 6 | -6.2 Note 6 | -15.8 Note 6 | -5.3 Note 6 | 1.8 Note 6 |
| | Config 3 | | 1.8 Note 6 | -6.2 Note 6 | -15.8 Note 6 | -5.3 Note 6 | 1.8 Note 6 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | | | |
| | Config 3 | | -98 | | | | |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 | | | | |
| | Config 3 | | -95 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 4: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.1-1. |
| Note 5: | The SNR values are specified for testing a UE which supports 2 Rx on at least one band. |
| Note 6: | Including the test tolerance given in Annex F. |

## 16.5.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 Rx UE

### 16.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used for 1 Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 16.5.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.5.1.5.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.5.

### 16.5.1.5.4 Test description

Same as the test description given in clause 6.5.1.3.4.

#### 16.5.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.3.4.1 with following exceptions:

- Table 6.5.1.3.4.1-1 is replaced by Table 16.5.1.5.4.1-1.
- Table 6.5.1.3.4.1-2 is replaced by Table 16.5.1.5.4.1-2.
- Table 6.5.1.3.4.1-4 is replaced by Table 16.5.1.5.4.1-3.

**Table 16.5.1.5.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.1.5-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.5-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.5-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.5-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.5.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.5.4.1-1 | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.5.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| | Config 4 | | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| | Config 4 | | Not Applicable |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.3.2 FDD |
| | Config 2 | | CCR.4.2 TDD |
| | Config 3 | | CCR.5.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 4 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 4 | | Table A.7.1, PRACH.1 FR1 |
| | Config 3 | | Table A.7.1, PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |

| | | | |
|---|---|---|---|
| Correlation Matrix and Antenna Configuration | | | 2x1 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.5.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.3.4.2.

### 16.5.1.5.4.3 Message Contents

Same as the message contents given in clause 6.5.1.3.4.3 with the following exceptions.

**Table 16.5.1.5.4.3-1: PDCCH *Search Space***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel16 | n1 | | |
| } | | | |
| } | | | |

#### 16.5.1.5.5 Test Requirement

Same as the test requirements given in clause 6.5.1.3.5 with following exceptions:

- Table 6.5.1.3.5-1 is replaced by Table 16.5.1.5.5-1.

**Table 16.5.1.5.5-1: Cell specific test parameters (Cell 1) for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1, 4 | dBm/SCS | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -95 | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.3.4-1.

### 16.5.1.6 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE

#### 16.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used for 2 Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

#### 16.5.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.5.1.6.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.6.

#### 16.5.1.6.4 Test description

Same as the test description given in clause 6.5.1.3.4.

#### 16.5.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.3.4.1 with following exceptions:

- Table 6.5.1.3.4.1-1 is replaced by Table 16.5.1.6.4.1-1.
- Table 6.5.1.3.4.1-2 is replaced by Table 16.5.1.6.4.1-2.
- Table 6.5.1.3.4.1-4 is replaced by Table 16.5.1.6.4.1-3.

**Table 16.5.1.6.4.1-1: Supported test configurations for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.1.6-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.6-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.6-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.6-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.6.4.1-2: Initial conditions for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.6.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.6.4.1-3: General test parameters for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2 | | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| | Config 4 | | 10: $N_{RB,c}$ = 52 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| | Config 4 | | Not Applicable |

| | | | |
|---|---|---|---|
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 4 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 4 | | Table A.7.1, PRACH.1 FR1 |
| | Config 3 | | Table A.7.1, PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |

| | | |
|---|---|---|
| T1 | s | 0.2 |
| T2 | s | 0.68 |
| T3 | s | 0.68 |
| D1 | s | 0.64 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | |

### 16.5.1.6.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.3.4.2.

### 16.5.1.6.4.3 Message Contents

Same as the message contents given in clause 6.5.1.3.4.3.

### 16.5.1.6.5 Test Requirement

Same as the test requirements given in clause 6.5.1.3.5 with following exceptions:

- Table 6.5.1.3.5-1 is replaced by Table 16.5.1.6.5-1.

**Table 16.5.1.6.5-1: Cell specific test parameters (Cell 1) for NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1.8 | -6.2 | -15.8 |
| | Config 2 | | 1.8 | -6.2 | -15.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -98 | | |
| $N_{oc}$ | Config 1, 4 | dBm/SCS | -98 | | |
| | Config 2 | | -98 | | |
| | Config 3 | | -95 | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS Res.<br>Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.3.4-1.<br>Note 5: The SNR values are specified for testing a UE which supports 2 Rx on at least one band. | | | | | |

## 16.5.1.7 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 Rx UE

### 16.5.1.7.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 16.5.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting long DRX cycle.

### 16.5.1.7.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.7.

### 16.5.1.7.4 Test description

Same as the test description given in clause 6.5.1.4.4.

#### 16.5.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.4.4.1 with following exceptions:

- Table 6.5.1.4.4.1-1 is replaced by Table 16.5.1.7.4.1-1.
- Table 6.5.1.4.4.1-2 is replaced by Table 16.5.1.7.4.1-2.
- Table 6.5.1.4.4.1-4 is replaced by Table 16.5.1.7.4.1-3.

**Table 16.5.1.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.7-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.7-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.7-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.7-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.7.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.7.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| Active PCell | | Cell 1 |

| | | | |
|---|---|---|---|
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: NRB,c = 51 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.3.1 FDD |
| | Config 2 | | CCR.4.1 TDD |
| | Config 3 | | CCR.5.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |

| | | | |
|---|---|---|---|
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.7.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.4.4.2.

### 16.5.1.7.4.3 Message Contents

Same as the message contents given in clause 6.5.1.4.4.3.

### 16.5.1.7.5 Test Requirement

Same as the test requirements given in clause 6.5.1.4.5 with following exceptions:

- Table 6.5.1.4.5-1 is replaced by Table 16.5.1.7.5-1.

**Table 16.5.1.7.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| | Config 3 | | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | | | |
| | Config 3 | | -98 | | | | |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 | | | | |
| | Config 3 | | -95 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 3: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 4: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.1-1. |

## 16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE

### 16.5.1.8.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 16.5.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.5.1.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.8.

### 16.5.1.8.4 Test description

Same as the test description given in clause 6.5.1.4.4.

#### 16.5.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.4.4.1 with following exceptions:

- Table 6.5.1.4.4.1-1 is replaced by Table 16.5.1.8.4.1-1.
- Table 6.5.1.4.4.1-2 is replaced by Table 16.5.1.8.4.1-2.
- Table 6.5.1.4.4.1-4 is replaced by Table 16.5.1.8.4.1-3.

**Table 16.5.1.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.8-1 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD |
| 16.5.1.8-2 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD |
| 16.5.1.8-3 | SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD |
| 16.5.1.8-4 | SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.8.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

**Table 16.5.1.8.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | Config 1, 2, 3, 4 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.1 FR1 |
| SSB index assigned as RLM-RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy | dB | 4 |

| | | | |
|---|---|---|---|
| | to average SSS RE energy | | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.64 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.8.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.4.4.2.

### 16.5.1.8.4.3 Message Contents

Same as the message contents given in clause 6.5.1.4.4.3.

### 16.5.1.8.5 Test Requirement

Same as the test requirements given in clause 6.5.1.4.5 with following exceptions:

- Table 6.5.1.4.5-1 is replaced by Table 16.5.1.8.5-1.

**Table 16.5.1.8.5-1: Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 2, 4 | dB | 1.8 Note 6 | -6.2 Note 6 | -15.8 Note 6 | -5.3 Note 6 | 1.8 Note 6 |
| | Config 3 | | 1.8 Note 6 | -6.2 Note 6 | -15.8 Note 6 | -5.3 Note 6 | 1.8 Note 6 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/15 kHz | -98 | | | | |

| | | | |
|---|---|---|---|
| | Config 3 | | -98 |
| $N_{oc}$ | Config 1, 2, 4 | dBm/SCS | -98 |
| | Config 3 | | -95 |
| Propagation condition | | | TDL-C 300 ns 100 Hz |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.1-1.<br>Note 5: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.<br>Note 6: Including the test tolerance given in Annex F. | | | |

## 16.5.1.9 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE

### 16.5.1.9.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used for 1 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM.

### 16.5.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.9.

### 16.5.1.9.4 Test description

Same as the test description given in clause 6.5.1.5.4.

#### 16.5.1.9.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.5.4.1 with following exceptions:

- Table 6.5.1.5.4.1-1 is replaced by Table 16.5.1.9.4.1-1.
- Table 6.5.1.5.4.1-2 is replaced by Table 16.5.1.9.4.1-2.
- Table 6.5.1.5.4.1-3 is replaced by Table 16.5.1.9.4.1-3.

**Table 16.5.1.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.9-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.9-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.9-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.9-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.9.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.9.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2, 3 | | TDD |
| | | Config 4 | | HD-FDD |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | | DLBWP.1.1 |
| UL initial BWP configuration | | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.3.2 FDD |
| | | Config 2 | | CCR.4.2 TDD |
| | | Config 3 | | CCR.5.2 TDD |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz |
| | | Config 3 | | 30 kHz |
| TRS configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | | TCI.State.2 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x1 Low |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | gp0 |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 0 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |

| | | | |
|---|---|---|---|
| CSI-RS configuration | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.88 |
| T3 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.9.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.5.4.2.

### 16.5.1.9.4.3 Message contents

Same as the message contents given in clause 6.5.1.5.4.3 with the following exceptions.

**Table 16.5.1.9.4.3-1: PDCCH *Search Space***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel16 | n1 | | |
| } | | | |
| } | | | |

### 16.5.1.9.5 Test requirement

Same as the test requirements given in clause 6.5.1.5.5 with following exceptions:

- Table 6.5.1.5.5-1 is replaced by Table 16.5.1.9.5-1.

**Table 16.5.1.9.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.

## 16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

### 16.5.1.10.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used for 2 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM.

### 16.5.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.10.

### 16.5.1.10.4 Test description

Same as the test description given in clause 6.5.1.5.4.

#### 16.5.1.10.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.5.4.1 with following exceptions:

- Table 6.5.1.5.4.1-1 is replaced by Table 16.5.1.10.4.1-1.
- Table 6.5.1.5.4.1-2 is replaced by Table 16.5.1.10.4.1-2.
- Table 6.5.1.5.4.1-3 is replaced by Table 16.5.1.10.4.1-3.

**Table 16.5.1.10.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.10-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.10-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.10-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.10-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.10.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.10.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |

| | | | |
|---|---|---|---|
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| SSB index assigned as BFD-RS | | | 0 |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.10.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.5.4.2.

#### 16.5.1.10.4.3 Message contents

Same as the message contents given in clause 6.5.1.5.4.3.

### 16.5.1.10.5 Test requirement

Same as the test requirements given in clause 6.5.1.5.5 with following exceptions:

- Table 6.5.1.5.5-1 is replaced by Table 16.5.1.10.5-1.

**Table 16.5.1.10.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.1.11 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE

### 16.5.1.11.1 Test purpose

To verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.11.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM.

### 16.5.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.11.

### 16.5.1.11.4 Test description

Same as the test description given in clause 6.5.1.6.4.

#### 16.5.1.11.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.6.4.1 with following exceptions:

- Table 6.5.1.6.4.1-1 is replaced by Table 16.5.1.11.4.1-1.
- Table 6.5.1.6.4.1-2 is replaced by Table 16.5.1.11.4.1-2.
- Table 6.5.1.6.4.1-3 is replaced by Table 16.5.1.11.4.1-3.

**Table 16.5.1.11.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.11-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.11-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.11-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.11-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.11.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.11.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.11.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.3.1 FDD |
| | Config 2 | | CCR.4.1 TDD |
| | Config 3 | | CCR.5.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |

| | | | | |
|---|---|---|---|---|
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | | TCI.State.2 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x1 Low |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | N.A |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 2000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration | | Config 1, 4 | | CSI-RS.1.1 FDD |
| | | Config 2 | | CSI-RS.1.1 TDD |
| | | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.488 |
| T4 | | | s | 0.2 |
| T5 | | | s | 1.88 |
| T6 | | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.1.11.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.6.4.2.

### 16.5.1.11.4.3 Message contents

Same as the message contents given in clause 6.5.1.6.4.3.

### 16.5.1.11.5 Test requirement

Same as the test requirements given in clause 6.5.1.6.5 with following exceptions:

- Table 6.5.1.6.5-1 is replaced by Table 16.5.1.11.5-1.

**Table 16.5.1.11.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. | | | | | | |
| Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. | | | | | | |
| Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | | |
| Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | |
| Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | | |
| Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1. | | | | | | |

## 16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

### 16.5.1.12.1 Test purpose

To verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.12.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM.

### 16.5.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.12.

### 16.5.1.12.4 Test description

Same as the test description given in clause 6.5.1.6.4.

#### 16.5.1.12.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.6.4.1 with following exceptions:

- Table 6.5.1.6.4.1-1 is replaced by Table 16.5.1.12.4.1-1.
- Table 6.5.1.6.4.1-2 is replaced by Table 16.5.1.12.4.1-2.
- Table 6.5.1.6.4.1-3 is replaced by Table 16.5.1.12.4.1-3.

**Table 16.5.1.12.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.12-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.12-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |

| | |
|---|---|
| 16.5.1.12-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.12-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.12.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.12.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.12.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| SSB index assigned as BFD-RS | | | 0 |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |

| | | | | |
|---|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | N.A |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration | | Config 1, 4 | | CSI-RS.1.1 FDD |
| | | Config 2 | | CSI-RS.1.1 TDD |
| | | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.44 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| T6 | | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.1.12.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.6.4.2.

### 16.5.1.12.4.3 Message contents

Same as the message contents given in clause 6.5.1.6.4.3.

### 16.5.1.12.5 Test requirement

Same as the test requirements given in clause 6.5.1.6.5 with following exceptions:

- Table 6.5.1.6.5-1 is replaced by Table 16.5.1.12.5-1.

**Table 16.5.1.12.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2 Rx on at least one band. |

## 16.5.1.13 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE

### 16.5.1.13.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used for 1 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.13.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

### 16.5.1.13.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.13.

### 16.5.1.13.4 Test description

Same as the test description given in clause 6.5.1.7.4.

#### 16.5.1.13.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.7.4.1 with following exceptions:

- Table 6.5.1.7.4.1-1 is replaced by Table 16.5.1.13.4.1-1.
- Table 6.5.1.7.4.1-2 is replaced by Table 16.5.1.13.4.1-2.
- Table 6.5.1.7.4.1-3 is replaced by Table 16.5.1.13.4.1-3.

**Table 16.5.1.13.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.13-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.13-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.13-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.13-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.13.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.13.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.13.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2, 3 | | TDD |
| | | Config 4 | | HD-FDD |
| TDD Configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | | DLBWP.1.1 |
| UL initial BWP configuration | | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.3.2 FDD |
| | | Config 2 | | CCR.4.2 TDD |
| | | Config 3 | | CCR.5.2 TDD |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz |
| | | Config 3 | | 30 kHz |
| TRS configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | | TCI.State.2 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| Correlation Matrix and Antenna Configuration | | | | 2x1 Low |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | DRX.3 |
| Gap pattern ID | | | | N.A |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 0 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |

| | | | |
|---|---|---|---|
| CSI-RS configuration | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 2.48 |
| T3 | | s | 2.48 |
| D1 | | s | 2.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.13.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.7.4.2.

### 16.5.1.13.4.3 Message contents

Same as the message contents given in clause 6.5.1.7.4.3 with the following exceptions.

**Table 16.5.1.13.4.3-1: PDCCH *Search Space***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-162 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel16 | n1 | | |
| } | | | |
| } | | | |

### 16.5.1.13.5 Test requirement

Same as the test requirements given in clause 6.5.1.7.5 with following exceptions:

- Table 6.5.1.7.5-1 is replaced by Table 16.5.1.13.5-1.

**Table 16.5.1.13.5-1: Cell specific test parameters**

| **Parameter** | **Unit** | **Test 1** | | |
|---|---|---|---|---|
| | | **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.7.4-1.

## 16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

### 16.5.1.14.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used for 2 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.14.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

### 16.5.1.14.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.14.

### 16.5.1.14.4 Test description

Same as the test description given in clause 6.5.1.7.4.

#### 16.5.1.14.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.7.4.1 with following exceptions:

- Table 6.5.1.7.4.1-1 is replaced by Table 16.5.1.14.4.1-1.
- Table 6.5.1.7.4.1-2 is replaced by Table 16.5.1.14.4.1-2.
- Table 6.5.1.7.4.1-3 is replaced by Table 16.5.1.14.4.1-3.

**Table 16.5.1.14.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.14-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.14-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.14-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.14-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.14.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.14.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.14.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|

| | | | Test 1 |
|---|---|---|---|
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| SSB index assigned as BFD-RS | | | 0 |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.14.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.7.4.2.

#### 16.5.1.14.4.3 Message contents

Same as the message contents given in clause 6.5.1.7.4.3.

### 16.5.1.14.5 Test requirement

Same as the test requirements given in clause 6.5.1.7.5 with following exceptions:

- Table 6.5.1.7.5-1 is replaced by Table 16.5.1.14.5-1.

**Table 16.5.1.14.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | |
| SNR on RLM-RS Config 1,2,3,4 | dB | 1.8 | -6.2 | -15.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.1.15 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE

### 16.5.1.15.1 Test purpose

To verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.15.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

### 16.5.1.15.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.15.

### 16.5.1.15.4 Test description

Same as the test description given in clause 6.5.1.8.4.

#### 16.5.1.15.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.8.4.1 with following exceptions:

- Table 6.5.1.8.4.1-1 is replaced by Table 16.5.1.15.4.1-1.
- Table 6.5.1.8.4.1-2 is replaced by Table 16.5.1.15.4.1-2.
- Table 6.5.1.8.4.1-3 is replaced by Table 16.5.1.15.4.1-3.

**Table 16.5.1.15.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.15-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.15-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.15-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.15-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.15.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.15.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.15.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.3.1 FDD |
| | Config 2 | | CCR.4.1 TDD |
| | Config 3 | | CCR.5.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |

| | | | |
|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 16 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 4000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 2.44 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| T6 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.1.15.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.8.4.2.

### 16.5.1.15.4.3 Message contents

Same as the message contents given in clause 6.5.1.8.4.3.

### 16.5.1.15.5 Test requirement

Same as the test requirements given in clause 6.5.1.8.5 with following exceptions:

- Table 6.5.1.8.5-1 is replaced by Table 16.5.1.15.5-1.

**Table 16.5.1.15.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |
| $N_{oc}$ | dBm/15 kHz | -98 | | | | |
| Propagation condition | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.

## 16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

### 16.5.1.16.1 Test purpose

To verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 16.5.1.16.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

### 16.5.1.16.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.16.

### 16.5.1.16.4 Test description

Same as the test description given in clause 6.5.1.8.4.

#### 16.5.1.16.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.8.4.1 with following exceptions:

- Table 6.5.1.8.4.1-1 is replaced by Table 16.5.1.16.4.1-1.
- Table 6.5.1.8.4.1-2 is replaced by Table 16.5.1.16.4.1-2.
- Table 6.5.1.8.4.1-3 is replaced by Table 16.5.1.16.4.1-3.

**Table 16.5.1.16.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.1.16-1 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.1.16-2 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.1.16-3 | 30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.1.16-4 | 15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.1.16.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.1.16.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.1.16.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| SSB index assigned as BFD-RS | | | 0 |
| TCI configuration for PDCCH/PDSCH | | | TCI.State.2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |

| | | | | |
|---|---|---|---|---|
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | DRX.3 |
| Gap pattern ID | | | | gp0 |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 2000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS configuration | | Config 1, 4 | | CSI-RS.1.1 FDD |
| | | Config 2 | | CSI-RS.1.1 TDD |
| | | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 1.24 |
| T4 | | | s | 0.2 |
| T5 | | | s | 1.88 |
| T6 | | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.1.16.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.8.4.2.

### 16.5.1.16.4.3 Message contents

Same as the message contents given in clause 6.5.1.8.4.3.

### 16.5.1.16.5 Test requirement

Same as the test requirements given in clause 6.5.1.8.5 with following exceptions:

- Table 6.5.1.8.5-1 is replaced by Table 16.5.1.16.5-1.

**Table 16.5.1.16.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR on RLM-RS | dB | 1.8 | -6.2 | -15.8 | -5.3 | 1.8 |

| | | |
|---|---|---|
| $N_{oc}$ | dBm/15 kHz | -98 |
| Propagation condition | | TDL-C 300 ns 100 Hz |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.2 Beam Failure Detection and Link recovery procedures for RedCap

### 16.5.2.0 Minimum requirements

#### 16.5.2.0.1 General

The Redcap UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set $\overline{q}_0$ as specified in TS 38.213 [8] in order to detect beam failure on PCell in SA. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

The RS resource configurations in the set $\overline{q}_0$ on PCell can be periodic CSI-RS resources and/or SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in TS 38.133 [6] clauses 8.5B.2 and 8.5B.3 if UE does not have set $\overline{q}_0$ .

On each RS resource configuration in the set $\overline{q}_0$ , the UE shall estimate the radio link quality and compare it to the threshold $Q_{out_LR_Redcap}$ for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold $Q_{out_LR_Redcap}$ is defined as the level at which the downlink radio level link of a given resource configuration on set $\overline{q}_0$ cannot be reliably received and shall correspond to the $BLER_{out}$ = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.2.0.1-1. For CSI-RS based beam failure detection, $Q_{out_LR_CSI-RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.2.0.1-2.

**Table 16.5.2.0.1-1: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16 for 1 Rx UE; 8 for 2 Rx UE |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0 dB |
| Bandwidth (PRBs) | 48 for 1 Rx UE; 24 for 2 Rx UE |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

| Note 1 : Note: SCS = 60 kHz is not applicable for FR1. |
|---|

**Table 16.5.2.0.1-2: PDCCH transmission parameters for beam failure instance**

| Attribute | Value for BLER |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16 for 1 Rx UE; 8 for 2 Rx UE |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0 dB |
| Bandwidth (PRBs) | 48 for 1 Rx UE; 24 for 2 Rx UE |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note 1 : Note: SCS = 60 kHz is not applicable for FR1 | |

Upon request the UE shall deliver configuration indexes from the set $\bar{q}$ as specified in TS 38.213 [8] to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold $Q_{in_LR_RedCap}$ , which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the $Q_{in_LR_RedCap}$ threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the $Q_{in_LR_RedCap}$ threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter *powerControlOffsetSS*. The RS resource configurations in the set $\bar{q}$ can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources. UE is not required to perform candidate beam detection outside the active DL BWP.

When the radio link quality on all the RS resources in set $\bar{q}_0$ is worse than $Q_{out_LR_Redcap}$, layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set $\bar{q}_0$ shall be performed as specified in TS 38.213 [8] clause 6. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval_BFD_Redcap}$.

When DRX is not used, $T_{Indication_interval_BFD_Redcap}$ is max(2 ms, $T_{SSB\text{-}RS,M}$) ) or max(2 ms, $T_{CSI\text{-}RS,M}$), where $T_{SSB\text{-}RS,M}$ and $T_{CSI\text{-}RS,M}$ is the shortest periodicity of all RS resources in set $\bar{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\bar{q}_0$ or CSI-RS resource in the set $\bar{q}_0$ .

When DRX is used, for SSB based link quality measurement,

- $T_{Indication_interval_BFD_Redcap}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{SSB\text{-}RS,M}$), if DRX_cycle_length ≤ 320 ms,
- $T_{Indication_interval_BFD_Redcap}$ = DRX_cycle_length, if DRX_cycle_length > 320 ms.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication_interval_BFD_Redcap}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{CSI\text{-}RS,M}$), if DRX_cycle_length ≤ 320 ms,
- $T_{Indication_interval_BFD_Redcap}$ = DRX_cycle_length, if DRX_cycle_length > 320 ms.

For HD-FDD UE, the above conditions and requirements $T_{Indication_interval_BFD_Redcap}$ apply given that for each BFD-RS configuration, at least one BFD-RS sample must fall with DL occasion within an indication period.

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [13] there are no restrictions on scheduling availability due to beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [14] the following restrictions apply due to beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [13] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [13] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When the UE transitions between BFD CD-SSB resource and BFD NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each BFD-RS resource.

The requirements in TS 38.133 [6] clause 8.5.10 shall also apply except the scenarios described above.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.1, 8.5B.2, 8.5B.3, 8.5B.4, 8.5B.6, 8.5B.8 and 8.5B.9.

#### 16.5.2.0.2 Minimum conformance requirements for SSB-based BFD and CBD

The requirements in this clause apply for each SSB resource in the set $\overline{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.2-1.

The requirements in this clause apply for each SSB resource in the set $\overline{q}_1$ configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.2-2.

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB_Redcap}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB_Redcap}$ ms period.

The value of $T_{Evaluate_BFD_SSB_Redcap}$ is defined in Table 16.5.2.0.2-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 16.5.2.0.2-1: Evaluation period $T_{Evaluate_BFD_SSB_Redcap}$ for FR1**

| Configuration | $T_{Evaluate_BFD_SSB_Redcap}$ (ms) for Redcap UE with 2 Rx | $T_{Evaluate_BFD_SSB_Redcap}$ (ms) for 1 Rx Redcap |
|---|---|---|
| no DRX | Max(50, Ceil(5 × P) × $T_{SSB}$) | [ Max(50, Ceil(10 × P) × $T_{SSB}$)] |
| DRX cycle ≤ 320 ms | Max(50, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) | [ Max(50, Ceil(15 × P) × Max($T_{DRX}$,$T_{SSB}$)) ] |
| DRX cycle > 320 ms | Ceil(5 × P) × $T_{DRX}$ | [ Ceil(10 × P) × $T_{DRX}$] |
| Note: $T_{SSB}$ is the periodicity of SSB in the set $\overline{q}_0$ . $T_{DRX}$ is the DRX cycle length. | | |

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The UE shall monitor the configured SSB resources using the evaluation period in Table 16.5.2.0.2-2 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320 ms.

The value of $T_{Evaluate_CBD_SSB_Redcap}$ is defined in Table 16.5.2.0.2-2 for FR1.

where,

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB,
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise, $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $P_{CBD}$ used in Table 16.5.2.0.2-2 are defined as

For each SSB resource in the set $\overline{q}_1$ configured for PCell

- $P_{CBD}$ = 1.

**Table 16.5.2.0.2-2: Evaluation period $T_{Evaluate_CBD_SSB_Redcap}$ for FR1**

| Configuration | $T_{Evaluate_CBD_SSB_Redcap}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320 ms | Max(25, Ceil(3 × P × $P_{CBD}$) × $T_{SSB}$) |
| DRX cycle > 320 ms | Ceil(3 × P × $P_{CBD}$) × $T_{DRX}$ |
| Note: $T_{SSB}$ is the periodicity of SSB in the set $\overline{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.2 and 8.5B.5.

### 16.5.2.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_0$ of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set $\overline{q}_0$ for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.3-1.

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.3-2.

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS_Redcap}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS_Redcap}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS_Redcap}$ is defined in Table 16.5.2.0.3-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{BFD}$ used in Table 16.5.2.0.3-1 are defined as

- $M_{BFD}$ = 10, if the CSI-RS resource(s) in set $\overline{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{BFD}$ used in Table 16.5.2.0.3-1 are defined as

For each CSI-RS resource in the set $\bar{q}_0$ configured for PCell

- $P_{BFD} = 1$.

**Table 16.5.2.0.3-1: Evaluation period $T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ for FR1**

| Configuration | $T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ (ms) for Redcap UE with 2 Rx | $T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ (ms) for 1 Rx Redcap |
|---|---|---|
| no DRX | Max(50, Ceil($M_{BFD} \times P \times P_{BFD}$) × $T_{CSI\text{-}RS}$) | Max(50, Ceil(2×$M_{BFD} \times P \times P_{BFD}$) × $T_{CSI\text{-}RS}$) |
| DRX cycle ≤ 320 ms | Max(50, Ceil(1.5 × $M_{BFD} \times P \times P_{BFD}$) × Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) | Max(50, Ceil(2×1.5 × $M_{BFD} \times P \times P_{BFD}$) × Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) |
| DRX cycle > 320 ms | Ceil($M_{BFD} \times P \times P_{BFD}$) × $T_{DRX}$ | Ceil(2×$M_{BFD} \times P \times P_{BFD}$) × $T_{DRX}$ |
| Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$. $T_{DRX}$ is the DRX cycle length. | | |

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following scenarios.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ ms period becomes better than the threshold $Q_{in_LR_RedCap}$ within $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ ms period provided CSI-RS Ês/Iot is according to TS 38.133 [6] Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 16.5.2.0.3-2 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320 ms.

The value of $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ is defined in Table 16.5.2.0.3-2 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise, $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.5.6.3.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of $M_{CBD}$ used in Table 16.5.2.0.3-2 are defined as

- $M_{CBD}$ = 3, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of $P_{CBD}$ used in Table 16.5.2.0.3-2 are defined as

For each CSI-RS resource in the set $\bar{q}_1$ configured for PCell

- $P_{CBD}$ = 1.

**Table 16.5.2.0.3-2: Evaluation period $T_{Evaluate_CBD_CSI-RS_Redcap}$ for FR1**

| Configuration | $T_{EvaluateC_CBD_CSI-RS_Redcap}$ (ms) |
|---|---|
| non-DRX, DRX cycle ≤ 320 ms | $Max(25, Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{CSI-RS})$ |
| DRX cycle > 320 ms | $Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{DRX}$ |
| Note: $T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$. $T_{DRX}$ is the DRX cycle length. | |

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.3 and 8.5B.6.

## 16.5.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE

### 16.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.

### 16.5.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting link recovery.

### 16.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.1.

### 16.5.2.1.4 Test description

Same as the test description given in clause 6.5.5.1.4.

16.5.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.1.4.1 with following exceptions:

- Table 6.5.5.1.4.1-1 is replaced by Table 16.5.2.1.4.1-1.
- Table 6.5.5.1.4.1-2 is replaced by Table 16.5.2.1.4.1-2.
- Table 6.5.5.1.4.1-3 is replaced by Table 16.5.2.1.4.1-3.

**Table 16.5.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| SSB Configuration | Config 1, 4 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |
| | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | Config 1, 2, 4 | | SMTC.1 RedCap | |
| | Config 3 | | SMTC.1 RedCap | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |

| | | | | |
|---|---|---|---|---|
| | Config 3 | | 30 kHz | |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 16 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | gp0 | |
| *gapOffset* | | | 0 | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/ SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0, 1 | |
| T310 Timer | ms | | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.44 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.14 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.1.4.2.

### 16.5.2.1.4.3 Message contents

Same as the message contents given in clause 6.5.5.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

**Table 16.5.2.1.4.3-1: PDCCH *Search Space* for BFR**

| Derivation Path: Table 6.5.5.1.4.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel8 | n0 | | |
| aggregationLevel16 | n1 | AL16 | |
| } | | | |
| } | | | |

**Table 16.5.2.1.4.3-2: *ControlResourceSet* for BFR**

| Derivation Path: Table 6.5.5.1.4.3-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| frequencyDomainResources | 11111111 00000000 00000000 00000000 00000000 00000 | CORESET to use the least significant 48 RBs of the BWP | |
| } | | | |

16.5.2.1.5 Test requirement

Same as the test requirements given in clause 6.5.5.1.5 with following exceptions:

- Table 6.5.5.1.5-1 is replaced by Table 16.5.2.1.5-1.

**Table 16.5.2.1.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 2, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1, 2, 4 | dB | -13.25 | -13.25 | 13.25 | 13.25 | 13.25 |
| | Config 3 | | -13.25 | -13.25 | 13.25 | 13.25 | 13.25 |
| SSB_RP of set $q_1$ | Config 1, 2, 4 | dBm/SCS | -111.25 | -111.25 | -84.75 | -84.75 | -84.75 |
| | Config 3 | | -108.25 | -108.25 | -81.75 | -81.75 | -81.75 |
| $N_{oc}$ | Config 1, 2, 3, 4 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1. |

## 16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE

### 16.5.2.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.

### 16.5.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting link recovery.

### 16.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.2.

### 16.5.2.2.4 Test description

Same as the test description given in clause 6.5.5.1.4.

#### 16.5.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.1.4.1 with following exceptions:

- Table 6.5.5.1.4.1-1 is replaced by Table 16.5.2.2.4.1-1.
- Table 6.5.5.1.4.1-2 is replaced by Table 16.5.2.2.4.1-2.
- Table 6.5.5.1.4.1-3 is replaced by Table 16.5.2.2.4.1-3.

**Table 16.5.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.5.2.2.4.1-3: General test parameters**

| Parameter | | | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | Test 1 | |
| Active PCell | | | | Cell 1 | |
| RF Channel Number | | | | 1 | |
| Duplex mode | | Config 1 | | FDD | |
| | | Config 2, 3 | | TDD | |
| | | Config 4 | | HD-FDD | |
| $BW_{channel}$ | | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | | Config 3 | | 20: $N_{RB,c}$ = 51 | |
| DL initial BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4 | | DLBWP.1.1 | |
| UL initial BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4 | | ULBWP.1.1 | |
| TDD Configuration | | Config 1, 4 | | Not Applicable | |
| | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| SSB Configuration | | Config 1, 4 | | SSB.3 FR1 | |
| | | Config 2 | | SSB.3 FR1 | |
| | | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | | Config 1, 2, 4 | | SMTC.1 RedCap | |
| | | Config 3 | | SMTC.1 RedCap | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz | |
| | | Config 3 | | 30 kHz | |
| PRACH Configuration | | Config 1, 2, 3, 4 | | PRACH.2 FR1 | |
| SSB Index assigned as BFD RS ($q_0$) | | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | | 1 | |
| OCNG parameters | | | | OP.1 | |
| CP length | | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | | 1-0 | |
| | Number of Control OFDM symbols | | | 2 | |
| | Aggregation level | | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 | |
| | DMRS precoder granularity | | | REG bundle size | |
| | REG bundle size | | | 6 | |
| DRX | | | | OFF | |
| Gap pattern ID | | | | gp0 | |

| | | | | |
|---|---|---|---|---|
| *gapOffset* | | | 0 | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/ SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0, 1 | |
| T310 Timer | ms | | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.37 | |
| T3 | | s | 0.24 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.14 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 16.5.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.1.4.2.

#### 16.5.2.2.4.3 Message contents

Same as the message contents given in clause 6.5.5.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

### 16.5.2.2.5 Test requirement

Same as the test requirements given in clause 6.5.5.1.5 with following exceptions:

- Table 6.5.5.1.5-1 is replaced by Table 16.5.2.2.5-1.

**Table 16.5.2.2.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1, 2, 4 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1, 2, 4 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1, 2, 4 | dBm/ SCS | -108.2 | -108.2 | -88.2 | -88.2 | -88.2 |
| | Config 3 | | -105.2 | -105.2 | -85.2 | -85.2 | -85.2 |
| $N_{oc}$ | Config 1, 2, 3, 4 | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 1 Rx UE

### 16.5.2.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.2.

### 16.5.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting link recovery and long DRX cycle.

### 16.5.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.3.

### 16.5.2.3.4 Test description

Same as the test description given in clause 6.5.5.2.4.

#### 16.5.2.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.2.4.1 with following exceptions:

- Table 6.5.5.2.4.1-1 is replaced by Table 16.5.2.3.4.1-1.
- Table 6.5.5.2.4.1-2 is replaced by Table 16.5.2.3.4.1-2.
- Table 6.5.5.2.4.1-3 is replaced by Table 16.5.2.3.4.1-3.

**Table 16.5.2.3.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.2.3-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 16.5.2.3-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 16.5.2.3-3 | TDD duplex mode, 30 kHz SSB SCS, 20 MHz bandwidth |
| 16.5.2.3-4 | HD-FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.3.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1and and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.3.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 1 Rx UE**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: NRB,c = 52 | |
| | Config 3 | | 20: NRB,c = 51 | |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 2, 4 | | SSB.3 FR1 | |
| | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | Config 1, 2, 3, 4 | | SMTC.1 | |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | |
| | Config 3 | | 30 | |
| PRACH Configuration | Config 1, 2, 3, 4 | | PRACH.1 | Table A.7-1 |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 16 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | A.5 |
| Gap pattern ID | | | N.A. | |
| *rlmInSyncOutOfSyncThreshold* | | | Absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/ SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| SSB Index assigned as RLM-RS | | | 0, 1 | |

| | | | | |
|---|---|---|---|---|
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 5.17 | |
| T3 | | s | 6.44 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.2.3.4.2 Test Procedure

Same as the test procedure given in clause 6.5.5.2.4.2.

### 16.5.2.3.4.3 Message Contents

Same as the message contents given in clause 6.5.5.2.4.3 with following exceptions:

**Table 16.5.2.3.4.3-1: PDCCH *Search Space* for BFR**

| Derivation Path: Table 6.5.5.2.4.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel8 | n0 | | |
| aggregationLevel16 | n1 | AL16 | |
| } | | | |
| } | | | |

**Table 16.5.2.3.4.3-2: *ControlResourceSet* for BFR**

| Derivation Path: Table 6.5.5.2.4.3-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| frequencyDomainResources | 11111111 00000000 00000000 00000000 00000000 00000 | CORESET to use the least significant 48 RBs of the BWP | |
| } | | | |

### 16.5.2.3.5 Test Requirement

Same as the test requirements given in clause 6.5.5.2.5 with following exceptions:

- Table 6.5.5.2.5-1 is replaced by Table 16.5.2.3.5-1.

**Table 16.5.2.3.5-1: Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 1 Rx UE**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | | dB | -13.25 | -13.25 | 13.25 | 13.25 | 13.25 |
| SSB_RP of set $q_1$ | Config 1, 2, 4 | dBm/ SCS | -111.25 | -111.25 | -84.75 | -84.75 | -84.75 |
| | Config 3 | | -108.25 | -108.25 | -81.75 | -81.75 | -81.75 |
| $N_{oc}$ | | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS Res.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.

## 16.5.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE

### 16.5.2.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.2.

### 16.5.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting link recovery and long DRX cycle.

### 16.5.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.4.

### 16.5.2.4.4 Test description

Same as the test description given in clause 6.5.5.2.4.

#### 16.5.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.2.4.1 with following exceptions:

- Table 6.5.5.2.4.1-1 is replaced by Table 16.5.2.4.4.1-1.
- Table 6.5.5.2.4.1-2 is replaced by Table 16.5.2.4.4.1-2.
- Table 6.5.5.2.4.1-3 is replaced by Table 16.5.2.4.4.1-3.

**Table 16.5.2.4.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.2.4-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 16.5.2.4-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 16.5.2.4-3 | TDD duplex mode, 30 kHz SSB SCS, 20 MHz bandwidth |
| 16.5.2.4-4 | HD-FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.5.2.4.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.4.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 2 Rx UE**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| Bwchannel | Config 1 | MHz | 10: NRB,c = 52 | |
| | Config 2 | | 10: NRB,c = 52 | |
| | Config 3 | | 20: NRB,c = 51 | |
| | Config 4 | | 10: NRB,c = 52 | |
| DL initial BWP configuration | Config 1, 2, 3, 4 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 | |
| UL initial BWP configuration | Config 1, 2, 3, 4 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 | |
| TDD Configuration | Config 1 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| | Config 4 | | Not Applicable | |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| | Config 4 | | CR.1.1 FDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| | Config 4 | | CCR.1.1 FDD | |
| SSB Configuration | Config 1 | | SSB.3 FR1 | |
| | Config 2 | | SSB.3 FR1 | |

| | | | | |
|---|---|---|---|---|
| | Config 3 | | SSB.2 RedCap FR1 | |
| | Config 4 | | SSB.3 FR1 | |
| SMTC Configuration | Config 1, 2 | | SMTC.1 | |
| | Config 3 | | SMTC.1 | |
| | Config 4 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| | Config 4 | | 15 kHz | |
| PRACH Configuration | Config 1, 2 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 3 | | PRACH.2 FR1 | Table A.7.1-1 |
| | Config 4 | | PRACH.2 FR1 | Table A.7.1-1 |
| SSB Index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | A.5 |
| Gap pattern ID | | | N.A. | |
| *rlmInSyncOutOfSyncThreshold* | | | Absent | When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | Config 1, 2 | dBm/ SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | | -95 | |
| | Config 4 | | -98 | |
| *beamFailureInstanceMaxCount* | | | n1 | see clause 5.17 of TS 38.321 [12] |
| *beamFailureDetectionTimer* | | | pbfd4 | see clause 5.17 of TS 38.321 [12] |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| | Config 4 | | CSI-RS.1.1 FDD | |
| | Config 1 | | TRS.1.1 FDD | |

| | | | | |
|---|---|---|---|---|
| CSI-RS for tracking | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| | Config 4 | | TRS.1.1 FDD | |
| SSB Index assigned as RLM-RS | | | 0, 1 | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 5.17 | |
| T3 | | s | 3.24 | |
| T4 | | s | 0 | |
| T5 | | s | 1.97 | |
| D1 | | s | 1.94 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.2.4.4.2 Test Procedure

Same as the test procedure given in clause 6.5.5.2.4.2.

### 16.5.2.4.4.3 Message Contents

Same as the message contents given in clause 6.5.5.2.4.3.

### 16.5.2.4.5 Test Requirement

Same as the test requirements given in clause 6.5.5.2.5 with following exceptions:

- Table 6.5.5.2.5-1 is replaced by Table 16.5.2.4.5-1.

**Table 16.5.2.4.5-1: Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 2 Rx UE**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | Config 1 | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 2 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 3 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| | Config 4 | | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_SSB of set $q_1$ | Config 1 | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 2 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 3 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| | Config 4 | | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 2 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 3 | | -105.2 | -105.2 | −84.8 | −84.8 | −84.8 |
| | Config 4 | | -108.2 | -108.2 | −87.8 | −87.8 | −87.8 |
| | Config 1 | dBm/15 kHz | -98 | | | | |
| | Config 2 | | -98 | | | | |

| | | | |
|---|---|---|---|
| $N_{oc}$ | Config 3 | | -98 |
| | Config 4 | | -98 |
| Propagation condition | | | TDL-C 300 ns 100 Hz |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS Res.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.2.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.2.5 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE

### 16.5.2.5.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.3.

### 16.5.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and link recovery.

### 16.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.5.

### 16.5.2.5.4 Test description

Same as the test description given in clause 6.5.5.3.4.

#### 16.5.2.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.3.4.1 with following exceptions:

- Table 6.5.5.3.4.1-1 is replaced by Table 16.5.2.5.4.1-1.
- Table 6.5.5.3.4.1-2 is replaced by Table 16.5.2.5.4.1-2.
- Table 6.5.5.3.4.1-3 is replaced by Table 16.5.2.5.4.1-3.

**Table 16.5.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.5.4.1-3: General test parameters**

| Parameter | | | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | Test 1 | |
| Active PCell | | | | Cell 1 | |
| RF Channel Number | | | | 1 | |
| Duplex mode | | Config 1 | | FDD | |
| | | Config 2, 3 | | TDD | |
| | | Config 4 | | HD-FDD | |
| TDD Configuration | | Config 1, 4 | | Not Applicable | |
| | | Config 2 | | TDDConf.1.1 | |
| | | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | |
| | | Config 2 | | CR.1.1 TDD | |
| | | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD | |
| | | Config 2 | | CCR.1.1 TDD | |
| | | Config 3 | | CCR.2.1 TDD | |
| SSB Configuration | | Config 1, 2, 4 | | SSB.3 FR1 | |
| | | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | | 15 kHz | |
| | | Config 3 | | 30 kHz | |
| PRACH Configuration | | | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | | 0 | |
| OCNG parameters | | | | OP.1 | |
| CP length | | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | | 2x1 Low | |
| Beam failure detection transmission parameters | DCI format | | | 1-0 | |
| | Number of Control OFDM symbols | | | 2 | |
| | Aggregation level | | CCE | 16 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 | |
| | DMRS precoder granularity | | | REG bundle size | |
| | REG bundle size | | | 6 | |
| DRX | | | | OFF | |
| Gap pattern ID | | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | | 1 | |
| *rlmInSyncOutOfSyncThreshold* | | | | absent | When the field is absent, the UE applies the value 0. |

| | | | | |
|---|---|---|---|---|
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], section 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM-RS | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.27 | |
| T4 | | s | 0 | |
| T5 | | s | 0.08 | |
| D1 | | s | 0.05 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 16.5.2.5.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.3.4.2.

### 16.5.2.5.4.3 Message contents

Same as the message contents given in clause 6.5.5.3.4.3 with following exceptions:

**Table 16.5.2.5.4.3-1: PDCCH *Search Space* for BFR**

| Derivation Path: Table 6.5.5.3.4.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel8 | n0 | | |
| aggregationLevel16 | n1 | AL16 | |
| } | | | |
| } | | | |

**Table 16.5.2.5.4.3-2: *ControlResourceSet* for BFR**

| Derivation Path: Table 6.5.5.3.4.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| frequencyDomainResources | 11111111 00000000 00000000 00000000 00000000 00000 | CORESET to use the least | |

| | | | |
|---|---|---|---|
| | | significant 48 RBs of the BWP | |
| } | | | |

16.5.2.5.5 Test requirement

Same as the test requirements given in clause 6.5.5.3.5 with following exceptions:

- Table 6.5.5.3.5-1 is replaced by Table 16.5.2.5.5-1.

**Table 16.5.2.5.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | | dB | -13.25 | -13.25 | 13.25 | 13.25 | 13.25 |
| CSI-RS_RP of set $q_1$ | Config 1, 2, 4 | dBm/SCS | -111.25 | -111.25 | -84.75 | -84.75 | -84.75 |
| | Config 3 | | -108.25 | -108.25 | -81.75 | -81.75 | -81.75 |
| $N_{oc}$ | | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.

## 16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE

16.5.2.6.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.3.

16.5.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and link recovery.

#### 16.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.6.

#### 16.5.2.6.4 Test description

Same as the test description given in clause 6.5.5.3.4.

##### 16.5.2.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.3.4.1 with following exceptions:

- Table 6.5.5.3.4.1-1 is replaced by Table 16.5.2.6.4.1-1.
- Table 6.5.5.3.4.1-2 is replaced by Table 16.5.2.6.4.1-2.
- Table 6.5.5.3.4.1-3 is replaced by Table 16.5.2.6.4.1-3.

**Table 16.5.2.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.6.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |

| | | | | |
|---|---|---|---|---|
| SSB Configuration | Config 1, 2, 4 | | SSB.3 FR1 | |
| | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | OFF | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. |
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], section 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM-RS | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 0.2 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | s | 0.18 | |
| T3 | | s | 0.14 | |
| T4 | | s | 0 | |
| T5 | | s | 0.08 | |
| D1 | | s | 0.05 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 16.5.2.6.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.3.4.2.

#### 16.5.2.6.4.3 Message contents

Same as the message contents given in clause 6.5.5.3.4.3.

### 16.5.2.6.5 Test requirement

Same as the test requirements given in clause 6.5.5.3.5 with following exceptions:

- Table 6.5.5.3.5-1 is replaced by Table 16.5.2.6.5-1.

**Table 16.5.2.6.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1, 2, 4 | dBm/SCS | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3 | | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.

## 16.5.2.7 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE

### 16.5.2.7.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink

monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.3.

#### 16.5.2.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM, long DRX cycle and link recovery.

#### 16.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.7.

#### 16.5.2.7.4 Test description

Same as the test description given in clause 6.5.5.4.4.

##### 16.5.2.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.4.4.1 with following exceptions:

- Table 6.5.5.4.4.1-1 is replaced by Table 16.5.2.7.4.1-1.
- Table 6.5.5.4.4.1-2 is replaced by Table 16.5.2.7.4.1-2.
- Table 6.5.5.4.4.1-3 is replaced by Table 16.5.2.7.4.1-3.

**Table 16.5.2.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.7-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.7-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.7.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |

| | | | | |
|---|---|---|---|---|
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 2, 4 | | SSB.3 FR1 | |
| | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x1 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 16 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| DRX | | | DRX.7 | |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | When the field is absent, the UE applies the value 0. |
| *rsrp-ThresholdSSB* | Config 1, 2, 4 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 3 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], section 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | Config 2 | | CSI-RS.1.1 TDD | |
| | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM-RS | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | Config 2 | | CSI-RS.1.2 TDD | |
| | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |

| | | | |
|---|---|---|---|
| T1 | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | s | 8.37 | |
| T3 | s | 12.24 | |
| T4 | s | 0 | |
| T5 | s | 1.97 | |
| D1 | s | 1.94 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 16.5.2.7.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.4.4.2.

### 16.5.2.7.4.3 Message contents

Same as the message contents given in clause 6.5.5.4.4.3 with following exceptions:

**Table 16.5.2.7.4.3-1: PDCCH *Search Space* for BFR**

| Derivation Path: Table 6.5.5.4.4.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SearchSpace ::= SEQUENCE { | | | |
| nrofCandidates SEQUENCE { | | | |
| aggregationLevel8 | n0 | | |
| aggregationLevel16 | n1 | AL16 | |
| } | | | |
| } | | | |

**Table 16.5.2.7.4.3-2: *ControlResourceSet* for BFR**

| Derivation Path: Table 6.5.5.4.4.3-7 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ControlResourceSet ::= SEQUENCE { | | | |
| frequencyDomainResources | 11111111 00000000 00000000 00000000 00000000 00000 | CORESET to use the least significant 48 RBs of the BWP | |
| } | | | |

### 16.5.2.7.5 Test requirement

Same as the test requirements given in clause 6.5.5.4.5 with following exceptions:

- Table 6.5.5.4.5-1 is replaced by Table 16.5.2.7.5-1.

**Table 16.5.2.7.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | dB | | | 0 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | | dB | -13.25 | -13.25 | 13.25 | 13.25 | 13.25 |
| CSI-RS_RP of set $q_1$ | Config 1, 2, 4 | dBm/SCS | -111.25 | -111.25 | -84.75 | -84.75 | -84.75 |
| | Config 3 | | -108.25 | -108.25 | -81.75 | -81.75 | -81.75 |
| $N_{oc}$ | | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1.

## 16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE

### 16.5.2.8.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5B.3.

### 16.5.2.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM, long DRX cycle and link recovery.

### 16.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.8.

### 16.5.2.8.4 Test description

Same as the test description given in clause 6.5.5.4.4.

#### 16.5.2.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.4.4.1 with following exceptions:

- Table 6.5.5.4.4.1-1 is replaced by Table 16.5.2.8.4.1-1.
- Table 6.5.5.4.4.1-2 is replaced by Table 16.5.2.8.4.1-2.
- Table 6.5.5.4.4.1-3 is replaced by Table 16.5.2.8.4.1-3.

**Table 16.5.2.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.2.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.2.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.2.8-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.2.8-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.2.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.2.8.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1 | | FDD | |
| | Config 2, 3 | | TDD | |
| | Config 4 | | HD-FDD | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD | |
| | Config 2 | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | |
| SSB Configuration | Config 1, 2, 4 | | SSB.3 FR1 | |
| | Config 3 | | SSB.2 RedCap FR1 | |
| SMTC Configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | 15 kHz | |
| | Config 3 | | 30 kHz | |
| PRACH Configuration | | | PRACH.4 FR1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 | |
| | DMRS precoder granularity | | | REG bundle size | |
| | REG bundle size | | | 6 | |
| DRX | | | | DRX.7 | |
| Gap pattern ID | | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | | 1 | |
| *rlmInSyncOutOfSyncThreshold* | | | | absent | When the field is absent, the UE applies the value 0. |
| *rsrp-ThresholdSSB* | | Config 1, 2, 4 | dBm/SCS | -98 | Threshold used for $Q_{in_LR_SSB}$ |
| | | Config 3 | dBm/SCS | -95 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | | n1 | see TS 38.321 [12], section 5.17 |
| *beamFailureDetectionTimer* | | | | pbfd4 | see TS 38.321 [12], section 5.17 |
| CSI-RS configuration for $q_0$ and $q_1$ | | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | | Config 2 | | CSI-RS.1.2 TDD | |
| | | Config 3 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | | Config 1, 4 | | CSI-RS.1.1 FDD | |
| | | Config 2 | | CSI-RS.1.1 TDD | |
| | | Config 3 | | CSI-RS.2.1 TDD | |
| TRS configuration | | Config 1, 4 | | TRS.1.1 FDD | |
| | | Config 2 | | TRS.1.1 TDD | |
| | | Config 3 | | TRS.1.2 TDD | |
| CSI-RS-Index assigned as RLM-RS | | Config 1, 4 | | CSI-RS.1.2 FDD | |
| | | Config 2 | | CSI-RS.1.2 TDD | |
| | | Config 3 | | CSI-RS.2.2 TDD | |
| T310 Timer | | | ms | 1000 | |
| N310 | | | | 2 | |
| T1 | | | s | 1 | During this time the UE shall be fully synchronized to Cell 1 |
| T2 | | | s | 8.37 | |
| T3 | | | s | 6.44 | |
| T4 | | | s | 0 | |
| T5 | | | s | 1.97 | |
| D1 | | | s | 1.94 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

### 16.5.2.8.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.4.4.2.

### 16.5.2.8.4.3 Message contents

Same as the message contents given in clause 6.5.5.4.4.3.

### 16.5.2.8.5 Test requirement

Same as the test requirements given in clause 6.5.5.4.5 with following exceptions:

- Table 6.5.5.4.5-1 is replaced by Table 16.5.2.8.5-1.

**Table 16.5.2.8.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 |
|---|---|---|

| | | | T1 | T2 | T3 | T4 | T5 |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | | dB | 5.8 | -2.2 | -12.8 | -12.8 | -12.8 |
| SNR_CSI-RS of set $q_1$ | | dB | -10.2 | -10.2 | 10.2 | 10.2 | 10.2 |
| CSI-RS_RP of set $q_1$ | Config 1, 2, 4 | dBm/SCS | -108.2 | -108.2 | -87.8 | -87.8 | -87.8 |
| | Config 3 | | -105.2 | -105.2 | -84.8 | -84.8 | -84.8 |
| $N_{oc}$ | | dBm/15 kHz | -98 | | | | |
| Propagation condition | | | TDL-C 300 ns 100 Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | | | |
| Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. | | | | | | | |
| Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | | | |
| Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | | |
| Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. | | | | | | | |
| Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1. | | | | | | | |
| Note 8: The SNR values are specified for testing a UE which supports 2 Rx on at least one band. | | | | | | | |

## 16.5.3 Active BWP switch delay for RedCap

### 16.5.3.1 DCI-based and timer-based active BWP switch for RedCap

#### 16.5.3.1.0 Minimum conformance requirements

##### 16.5.3.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch for RedCap

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n. Where,

- Y = 0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.

- Y equals to the length of 1 slot, if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell. In this scenario, $T_{BWPswitchDelay}$ + Y shall follow the smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit

PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* defined in TS 38.331 [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* defined in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 16.5.3.1.0.1-1.

**Table 16.5.3.1.0.1-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within or outside DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP defined in TS 38.321 [12], UE shall be able to complete active BWP switching within the time duration of

- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X$, provided that the dormancy indication is received in any of the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, or
- $T_{dormantBWPswitchDelay} = T_{BWPswitchDelay} + X + Z$, provided that the dormancy indication is received after the first 3 OFDM symbols of a slot in the serving cell where DCI for dormancy indication is received, where
- $T_{BWPswitchDelay}$ is defined in Table 16.5.3.1.0.1-1 corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- X equals to the length of 1 slot corresponding to the smallest value among the SCS of the serving cell where UE receives dormancy indication and the SCSs of the dormant BWP and the active BWP immediately before or after switching the BWP of the serving cell where BWP switching occurs.
- Z equals to the length of 1 slot corresponding to the SCS of the serving cell where UE receives dormancy indication.

For DCI-based BWP switch, if the new BWP is a dormant BWP, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive CSI-RS (for DL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL slot occurs right after a time duration of $T_{dormantBWPswitchDelay}$ which starts from the beginning of DL slot n.

The normative reference for this requirement is TS 38.133 [6] clause 8.6A.2.

### 16.5.3.1.1 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE

#### 16.5.3.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for 1 Rx RedCap defined in TS 38.133 [6] clause 8.6A.

#### 16.5.3.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 16.5.3.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.3.1.1.

#### 16.5.3.1.1.4 Test description

Same as the test description given in clause 6.5.6.1.2.4.

##### 16.5.3.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.6.1.2.4.1 with following exceptions:

- Table 6.5.6.1.2.4.1-1 is replaced by Table 16.5.3.1.1.4.1-1.
- Table 6.5.6.1.2.4.1-2 is replaced by Table 16.5.3.1.1.4.1-2.
- Table 6.5.6.1.2.4.1-3 is replaced by Table 16.5.3.1.1.4.1-3.

**Table 16.5.3.1.1.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.3.1.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.3.1.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.3.1.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.3.1.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.5.3.1.1.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.5.3.1.1.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell 1 on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 16.5.3.1.1.4.2 Test Procedure

Same as the test procedure given in clause 6.5.6.1.2.4.2.

### 16.5.3.1.1.4.3 Message Contents

Same as the message contents given in clause 6.5.6.1.2.4.3 with following exceptions:

- Table 6.5.6.1.2.4.3-3 is replaced by Table 16.5.3.1.1.4.3-1.
- Table 6.5.6.1.2.4.3-4 is replaced by Table 16.5.3.1.1.4.3-2.

**Table 16.5.3.1.1.4.3-1: *BWP-Downlink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 RedCap | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 6.5.6.1.2.4.3-8 | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.5.3.1.1.4.3-2: *BWP-Uplink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 RedCap | BWP-2 | BWP2 |
| } | | | |
| } | | | |

16.5.3.1.1.5 Test Requirement

Tables 16.5.3.1.1.4.1-3 and 16.5.3.1.1.5-1 define the primary level settings including test tolerances.

**Table 16.5.3.1.1.5-1: Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3 | | TDD |
| TDD configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| | Config 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1, 2, 3, 4 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 RedCap Note 4 |
| Initial UL BWP Configuration | Config 1, 2, 3, 4 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | Config 1, 4 | | N/A |
| | Config 2, 3 | | ULBWP.1.1 RedCap Note 4 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1, 4 | | CCR.1.2 FDD |
| | Config 2 | | CCR.1.2 TDD |
| | Config 3 | | CCR.2.4 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x1 Low |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |

| | | | |
|---|---|---|---|
| | Config 3 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1, 2, 4 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | Config 1, 2, 4 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | Config 3 | dBm/38.16 MHz | -52.86 |
| Propagation Condition | | | AWGN |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.1 RedCap is linked with ULBWP.1.1 RedCap defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, $k1$ is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

Depending on UE capability *bwp-SwitchingDelay* as specified in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 16.5.3.1.0.1-1.

All of the above test requirements shall be fulfilled in order for the observed Cell 1 active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 16.5.3.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE

#### 16.5.3.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for 2 Rx RedCap defined in TS 38.133 [6] clause 8.6A.

#### 16.5.3.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 16.5.3.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.3.1.2.

#### 16.5.3.1.2.4 Test description

Same as the test description given in clause 6.5.6.1.2.4.

##### 16.5.3.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.6.1.2.4.1 with following exceptions:

- Table 6.5.6.1.2.4.1-1 is replaced by Table 16.5.3.1.2.4.1-1.
- Table 6.5.6.1.2.4.1-2 is replaced by Table 16.5.3.1.2.4.1-2.
- Table 6.5.6.1.2.4.1-3 is replaced by Table 16.5.3.1.2.4.1-3.

**Table 16.5.3.1.2.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.3.1.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.3.1.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.3.1.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.3.1.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.5.3.1.2.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.3.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.3.1.2.4.1-3: General test parameters for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell 1 on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |

| | | | |
|---|---|---|---|
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

#### 16.5.3.1.2.4.2 Test Procedure

Same as the test procedure given in clause 6.5.6.1.2.4.2.

#### 16.5.3.1.2.4.3 Message Contents

Same as the message contents given in clause 6.5.6.1.2.4.3 with following exceptions:

- Table 6.5.6.1.2.4.3-3 is replaced by Table 16.5.3.1.2.4.3-1.
- Table 6.5.6.1.2.4.3-4 is replaced by Table 16.5.3.1.2.4.3-2.

**Table 16.5.3.1.2.4.3-1: *BWP-Downlink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 RedCap | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 6.5.6.1.2.4.3-8 | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.5.3.1.2.4.3-2: *BWP-Uplink* (Table 6.5.6.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 RedCap | BWP-2 | BWP2 |
| } | | | |
| } | | | |

#### 16.5.3.1.2.5 Test Requirement

Tables 16.5.3.1.2.4.1-3 and 16.5.3.1.2.5-1 define the primary level settings including test tolerances.

**Table 16.5.3.1.2.5-1: Cell specific test parameters for NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3 | | TDD |
| TDD configuration | Config 1, 4 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| | Config 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| Active BWP ID | | | 1, 2 |
| Initial DL BWP Configuration | Config 1, 2, 3, 4 | | DLBWP.0.2 Note 4 |
| Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 Note 4 |
| Active DL BWP-2 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 RedCap Note 4 |
| Initial UL BWP Configuration | Config 1, 2, 3, 4 | | ULBWP.0.2 Note 4 |
| Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 Note 4 |
| Active UL BWP-2 Configuration | Config 1, 4 | | N/A |
| | Config 2, 3 | | ULBWP.1.1 RedCap Note 4 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1, 4 | | CCR.1.2 FDD |
| | Config 2 | | CCR.1.2 TDD |
| | Config 3 | | CCR.2.4 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | Config 1, 2, 4 | | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | SMTC.1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1, 2, 4 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | Config 1, 2, 4 | dBm/SCS | -87 |
| | Config 3 | | -84 |

| | | | |
|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $Io^{Note3}$ | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | Config 3 | dBm/38.16 MHz | -52.86 |
| Propagation Condition | | | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |
| Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.1 RedCap is linked with ULBWP.1.1 RedCap defined in clause 12 of TS 38.213 [8]. | | | |

During T1, the UE shall start to send the ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

Depending on UE capability *bwp-SwitchingDelay* as specified in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 16.5.3.1.0.1-1.

All of the above test requirements shall be fulfilled in order for the observed Cell 1 active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 16.5.3.2 RRC-based active BWP switch for RedCap

### 16.5.3.2.0 Minimum conformance requirements

#### 16.5.3.2.0.1 Minimum conformance requirements for RRC-based active BWP switch for RedCap

For RRC-based BWP switch, after the UE receives *RRCreconfiguration* involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$NR\ Slot\ length$ is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6\ ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.6A.3.

### 16.5.3.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE

#### 16.5.3.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6A.

#### 16.5.3.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting BWP adaptation of at least 2 BWPs.

#### 16.5.3.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.3.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.3.2.1.

#### 16.5.3.2.1.4 Test description

Same as the test description given in clause 6.5.6.2.1.4.

##### 16.5.3.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.6.1.2.4.1 with following exceptions:

- Table 6.5.6.2.1.4.1-1 is replaced by Table 16.5.3.2.1.4.1-1.
- Table 6.5.6.2.1.4.1-2 is replaced by Table 16.5.3.2.1.4.1-2.
- Table 6.5.6.2.1.4.1-3 is replaced by Table 16.5.3.2.1.4.1-3.

**Table 16.5.3.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.3.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.3.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.3.2.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.3.2.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.5.3.2.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

**Table 16.5.3.2.1.4.1-3: General test parameters for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |

### 16.5.3.2.1.4.2 Test Procedure

Same as the test procedure given in clause 6.5.6.2.1.4.2.

### 16.5.3.2.1.4.3 Message Contents

Same as the message contents given in clause 6.5.6.2.1.4.3 with following exceptions:

- Table 6.5.6.2.1.4.3-1F is replaced by Table 16.5.3.2.1.4.3-1.
- Table 6.5.6.2.1.4.3-1G is replaced by Table 16.5.3.2.1.4.3-2.

**Table 16.5.3.2.1.4.3-1: *BWP-Downlink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 RedCap | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 16.5.3.2.1.4.3-2: *BWP-Uplink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 RedCap | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

16.5.3.2.1.5 Test Requirement

Tables 16.5.3.2.1.4.1-3 and 16.5.3.2.1.5-1 define the primary level settings including test tolerances.

**Table 16.5.3.2.1.5-1: Cell specific test parameters for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1, 4 | | FDD |
| | | Config 2, 3 | | TDD |
| TDD configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1, 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1, 2, 3, 4 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2, 3, 4 | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 RedCap |
| | Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 RedCap |
| Final Condition | Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1, 4 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1, 4 | | CCR.1.2 FDD |
| | | Config 2 | | CCR.1.2 TDD |
| | | Config 3 | | CCR.2.4 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x1 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | |
| $N_{oc}$ Note 2 | Config 1, 2, 4 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| SS-RSRP Note 3 | Config 1, 2 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | Config 3 | dBm/38.16 MHz | -52.86 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.1 RedCap is linked with ULBWP.1.1 RedCap defined in clause 12 of TS 38.213 [8].

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

### 16.5.3.2.2 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE

#### 16.5.3.2.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6A.

#### 16.5.3.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting BWP adaptation of at least 2 BWPs.

#### 16.5.3.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.3.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.3.2.2.

#### 16.5.3.2.2.4 Test description

Same as the test description given in clause 6.5.6.2.1.4.

#### 16.5.3.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.6.2.1.4.1 with following exceptions:

- Table 6.5.6.2.1.4.1-1 is replaced by Table 16.5.3.2.2.4.1-1.
- Table 6.5.6.2.1.4.1-2 is replaced by Table 16.5.3.2.2.4.1-2.
- Table 6.5.6.2.1.4.1-3 is replaced by Table 16.5.3.2.2.4.1-3.

**Table 16.5.3.2.2.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE**

| Configuration | Description |
|---|---|
| 16.5.3.2.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.3.2.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.3.2.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.3.2.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.5.3.2.2.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.3.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.5.3.2.2.4.1-3: General test parameters for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| PDCCH and PDSCH maximum number of HARQ transmission | | 1 | |
| T1 | s | 0.2 | |

#### 16.5.3.2.2.4.2 Test Procedure

Same as the test procedure given in clause 6.5.6.2.1.4.2.

#### 16.5.3.2.2.4.3 Message Contents

Same as the message contents given in clause 6.5.6.2.1.4.3 with following exceptions:

- Table 6.5.6.2.1.4.3-1F is replaced by Table 16.5.3.2.2.4.3-1.
- Table 6.5.6.2.1.4.3-1G is replaced by Table 16.5.3.2.2.4.3-2.

**Table 16.5.3.2.2.4.3-1: *BWP-Downlink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 RedCap | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 16.5.3.2.2.4.3-2: *BWP-Uplink* (Table 6.5.6.2.1.4.3-1E)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 RedCap | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

16.5.3.2.2.5 Test Requirement

Tables 16.5.3.2.2.4.1-3 and 16.5.3.2.2.5-1 define the primary level settings including test tolerances.

**Table 16.5.3.2.2.5-1: Cell specific test parameters for NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE**

| **Parameter** | | | **Unit** | **Cell 1** |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1, 4 | | FDD |
| | | Config 2, 3 | | TDD |
| TDD configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1, 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| Active BWP ID | | | | 1 |
| Initial DL BWP Configuration | | Config 1, 2, 3, 4 | | DLBWP.0.2 |
| Initial UL BWP Configuration | | Config 1, 2, 3, 4 | | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 RedCap |
| | Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 RedCap |

| | | | | |
|---|---|---|---|---|
| Final Condition | Active DL BWP-1 Configuration | Config 1, 2, 3, 4 | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | Config 1, 2, 3, 4 | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | Config 1, 4 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1, 4 | | CCR.1.2 FDD |
| | | Config 2 | | CCR.1.2 TDD |
| | | Config 3 | | CCR.2.4 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 |
| TRS Configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 Low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | | |
| $N_{oc}$ Note 2 | | Config 1, 2, 4 | dBm/SCS | -104 |
| | | Config 3 | | -101 |
| SS-RSRP Note 3 | | Config 1, 2, 4 | dBm/SCS | -87 |
| | | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |
| Io Note3 | | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | | Config 3 | dBm/38.16 MHz | -52.86 |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.2 RedCap is linked with ULBWP.1.1 RedCap defined in clause 12 of TS 38.213 [8].

During T1, the UE shall be ready for the reception of uplink grant for the Cell from the first DL slot that occurs right after the beginning of slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.321 [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 16.5.4 UE specific CBW change for RedCap

### 16.5.4.0 Minimum conformance requirements

#### 16.5.4.0.1 Minimum conformance requirements for UE specific CBW change

The requirements in this clause apply for a RedCap UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives *RRCreconfiguration* involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

- DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and
- $T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in TS 36.331 [29] clause 11.2 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in TS 38.331 [13] clause 12, and
- $T_{CBWchangeDelayRRC} = 6\,ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.13A.1 and 8.13A.2.

### 16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE

#### 16.5.4.1.1 Test purpose

To verify the UE specific CBW change delay requirement defined in TS 38.133 [6] clause 8.13A.

#### 16.5.4.1.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards.

#### 16.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.4.1.

#### 16.5.4.1.4 Test description

Same as the test description given in clause 6.5.8.1.

##### 16.5.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.8.1 with following exceptions:

- Table 6.5.8.1.4.1-1 is replaced by Table 16.5.4.1.4.1-1.
- Table 6.5.8.1.4.1-2 is replaced by Table 16.5.4.1.4.1-2.
- Table 6.5.8.1.4.1-3 is replaced by Table 16.5.4.1.4.1-3.

**Table 16.5.4.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.4.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.4.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.4.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.4.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.5.4.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

### 16.5.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.5.8.1.4.2.

### 16.5.4.1.4.3 Message contents

Same as the message contents given in clause 6.5.8.1.4.2.

### 16.5.4.1.5 Test requirement

Same as the test requirements given in clause 6.5.8.1.5 with followings exceptions:

- Table 6.5.8.1.5-1 is replaced by Table 16.5.4.1.5-1.

**Table 16.5.4.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |

| | | | | |
|---|---|---|---|---|
| | | Config 4 | | HD-FDD |
| TDD configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1, 2, 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| Active DL BWP ID | | | | 0 |
| Initial DL BWP Configuration (BWP-1) | | | | DLBWP.0.2 |
| Initial UL BWP Configuration (BWP-1) | | | | ULBWP.0.2 |
| Initial Condition | Active DL CBW Configuration (CBW-1) | | | DLCBW.1.1 |
| | Active UL CBW Configuration (CBW-1) | | | ULCBW.1.1 |
| Final Condition | Active DL CBW Configuration (CBW-2) | | | DLCBW.1.2 |
| | Active UL CBW Configuration (CBW-2) | | | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1, 4 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1, 4 | | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 RedCap FR1 |
| TRS Configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x1 |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | | |
| $N_{oc}$Note 2 | | Config 1, 2, 4 | dBm/SCS | -104 |
| | | Config 3 | | -101 |
| SS-RSRP Note 3 | | Config 1, 2, 4 | dBm/SCS | -87 |
| | | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | | dB | 17 |
| Io Note3 | | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | | Config 3 | dBm/18.36 MHz | -56.04 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [8].

## 16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE

### 16.5.4.2.1 Test purpose

To verify the UE specific CBW change delay requirement defined in TS 38.133 [6] clause 8.13A.

### 16.5.4.2.2 Test applicability

This test applies to all types of NR RedCap UEs with 2 Rx from Release 17 onwards.

### 16.5.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.4.2.

### 16.5.4.2.4 Test description

Same as the test description given in clause 6.5.8.1.

#### 16.5.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.8.1 with following exceptions:

- Table 6.5.8.1.4.1-1 is replaced by Table 16.5.4.2.4.1-1.
- Table 6.5.8.1.4.1-2 is replaced by Table 16.5.4.2.4.1-2.
- Table 6.5.8.1.4.1-3 is replaced by Table 16.5.4.2.4.1-3.

**Table 16.5.4.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.5.4.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.5.4.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.5.4.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.5.4.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.5.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.5.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.5.4.2.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |

| | | | |
|---|---|---|---|
| DRX | | OFF | |
| T1 | s | 0.2 | |

### 16.5.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.5.8.1.4.2.

### 16.5.4.2.4.3 Message contents

Same as the message contents given in clause 6.5.8.1.4.2

### 16.5.4.2.5 Test requirement

Same as the test requirements given in clause 6.5.8.1.5 with followings exceptions:

- Table 6.5.8.1.5-1 is replaced by Table 16.5.4.2.5-1.

**Table 16.5.4.2.5-1: NR Cell specific test parameters**

| Parameter | | | Unit | Cell 1 |
|---|---|---|---|---|
| Frequency Range | | | | FR1 |
| Duplex mode | | Config 1 | | FDD |
| | | Config 2, 3 | | TDD |
| | | Config 4 | | HD-FDD |
| TDD configuration | | Config 1, 4 | | Not Applicable |
| | | Config 2 | | TDDConf.1.1 |
| | | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | | Config 1, 2, 4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3 | | 20 MHz: $N_{RB,c}$ = 51 |
| Active DL BWP ID | | | | 0 |
| Initial DL BWP Configuration (BWP-1) | | | | DLBWP.0.2 |
| Initial UL BWP Configuration (BWP-1) | | | | ULBWP.0.2 |
| Initial Condition | Active DL CBW Configuration (CBW-1) | | | DLCBW.1.1 |
| | Active UL CBW Configuration (CBW-1) | | | ULCBW.1.1 |
| Final Condition | Active DL CBW Configuration (CBW-2) | | | DLCBW.1.2 |
| | Active UL CBW Configuration (CBW-2) | | | ULCBW.1.2 |
| PDSCH Reference measurement channel | | Config 1, 4 | | SR.1.1 FDD |
| | | Config 2 | | SR.1.1 TDD |
| | | Config 3 | | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1, 4 | | CR.1.1 FDD |
| | | Config 2 | | CR.1.1 TDD |
| | | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1, 4 | | CCR.1.1 FDD |
| | | Config 2 | | CCR.1.1 TDD |
| | | Config 3 | | CCR.2.1 TDD |
| OCNG Patterns | | | | OP.1 |
| SSB Configuration | | Config 1, 2, 4 | | SSB.1 FR1 |
| | | Config 3 | | SSB.1 RedCap FR1 |
| SMTC Configuration | | | | SMTC.1 RedCap FR1 |
| TRS Configuration | | Config 1, 4 | | TRS.1.1 FDD |
| | | Config 2 | | TRS.1.1 TDD |
| | | Config 3 | | TRS.1.2 TDD |
| Antenna Configuration | | | | 1x2 low |
| Propagation Condition | | | | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS(Note 1) | | | |
| $N_{oc}$Note 2 | Config 1, 2, 4 | dBm/SCS | -104 |
| | Config 3 | | -101 |
| SS-RSRP Note 3 | Config 1, 2, 4 | dBm/SCS | -87 |
| | Config 3 | | -84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -58.96 |
| | Config 3 | dBm/18.36 MHz | -56.04 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [8].

# 16.6 Measurement procedures for RedCap

## 16.6.1 Intra-frequency measurements for RedCap

### 16.6.1.0 Minimum conformance requirements

#### 16.6.1.0.1 General

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP as specified in TS 38.213 [8].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in TS 38.133 [6] clause 9.2B.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5 ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5 ms for frequency range 1.

The requirements in this clause apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- For 2 Rx RedCap:
  - SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1A.2 and 10.1A.3 for FR1 and FR2, respectively, for a corresponding band,
  - SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1A.6 and 10.1A.7 for FR1 and FR2, respectively, for a corresponding band,
  - SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1A.10 and 10.1A.11 for FR1 and FR2, respectively, for a corresponding band,
  - SSB_RP and SSB Ês/Iot according to Annex B.2.7 for a corresponding band.
- For 1 Rx RedCap:
  - SS-RSRP related side conditions given in clauses TS 38.133 [6] clauses 10.1A.2 and 10.1A.3 for FR1 and FR2, respectively, for a corresponding band,
  - SS-RSRQ related side conditions given in clauses TS 38.133 [6] clauses 10.1A.6 and 10.1A.7 for FR1 and FR2, respectively, for a corresponding band,
  - SS-SINR related side conditions given in clauses TS 38.133 [6] clauses 10.1A.10 and 10.1A.11 for FR1 and FR2, respectively, for a corresponding band,
  - SSB_RP and SSB Ês/Iot according to Annex B.2.7 for a corresponding band.

For 2 Rx RedCap: The requirements in TS 38.133 [6] clause 9.2B.4.3 shall apply.

For 1 Rx RedCap: Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1A.2.1 (RSRP for FR1), 10.1A.6.1 (RSRQ for FR1), 10.1A.10.1 (RS-SINR for FR1).

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index_RedCap}$ or $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 16.6.1.0.2 or clause 16.6.1.0.3. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index_RedCap}$ or $T_{identify_intra_with_index_RedCap}$ as defined in clause 16.6.1.0.2 or clause 16.6.1.0.3. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index_RedCap}$ or $T_{identify\ intra\ with\ index_RedCap}$ defined in clause 16.6.1.0.2 or clause 16.6.1.0.3 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ $T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.1 and 9.2B.4.3.

### 16.6.1.0.2 Minimum conformance requirements for event-triggered measurement without gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the

serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_with_index_RedCap}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD.

$$T_{identify_intra_without_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap})\ ms$$

$$T_{identify_intra_with_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} + T_{SSB_time_index_intra_RedCap})\ ms$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 16.6.1.0.2-1 for 2 Rx RedCap and Table 16.6.1.0.2-2 for 1 Rx RedCap.

$T_{SSB_time_index_intra_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 16.6.1.0.2-3 for 2 Rx RedCap and Table 16.6.1.0.2-4 for 1 Rx RedCap.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 16.6.1.0.2-5 for 2 Rx RedCap and Table 16.6.1.0.2-6 for 1 Rx RedCap.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps, Kp=1.

**Table 16.6.1.0.2-1: Time period for PSS/SSS detection, (Frequency range 1) for 2 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, ceil(5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle >320 ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.1.0.2-2: Time period for PSS/SSS detection, (Frequency range 1) for 1 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, ceil(7 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x 7 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle >320 ms | ceil(7 x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.1.0.2-3: Time period for time index detection (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_intra_RedCap}$ |
|---|---|
| No DRX | max(120 ms, ceil(3 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(120 ms, ceil (1.5 x 3 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.1.0.2-4: Time period for time index detection (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_intra_RedCap}$ |
|---|---|
| No DRX | max(160 ms, ceil(6 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(160 ms, ceil(1.5 x 6 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | Ceil(6 x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.1.0.2-5: Measurement period for intra-frequency measurements without gaps (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max(200 ms, ceil(5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(200 ms, ceil(1.5 x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.1.0.2-6: Measurement period for intra-frequency measurements without gaps (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max([200] ms, ceil([5] x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max([200] ms, ceil(1.5 x [5] x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | ceil([5] x $K_p$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*. Otherwise, SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*. Otherwise, the SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a HD-FDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise, SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a HD-FDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*. Otherwise, the SMTC periodicity follows *smtc1*.

The normative reference for this requirement is TS 38.133 [6] clause 9.2B.5.

### 16.6.1.0.3 Minimum conformance requirements for event-triggered measurement with gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise, UE shall be able to identify a new detectable

intra-frequency cell within $T_{identify_intra_with_index_RedCap}$. The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD.

$$T_{identify_intra_without_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} \text{ ms}$$

$$T_{identify_intra_with_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} + T_{SSB_time_index_intra_RedCap} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 16.6.1.0.3-1 for 2 Rx RedCap or Table 16.6.1.0.3-2 for 1 Rx RedCap.

$T_{SSB_time_index_intra_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 16.6.1.0.3-3 for 2 Rx RedCap or Table 16.6.1.0.3-4 for 1 Rx RedCap.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 16.6.1.0.3-5 for 2 Rx RedCap or Table 16.6.1.0.3-6 for 1 Rx RedCap.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps.

**Table 16.6.1.0.3-1: Time period for PSS/SSS detection (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 16.6.1.0.3-2: Time period for PSS/SSS detection (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, 7 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x 7) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | 7 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 16.6.1.0.3-3: Time period for time index detection (Frequency range 1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_intra_RedCap}$ |
|---|---|
| No DRX | max(120 ms, 3 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(120 ms, ceil(1.5 x 3) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra_RedCap}$) |
| DRX cycle > 320 ms | 3 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 16.6.1.0.3-4: Time period for time index detection (Frequency range 1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_intra_RedCap}$ |
|---|---|
| No DRX | max(160 ms, 6 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(160 ms, ceil(1.5 x 6) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra_RedCap}$) |
| DRX cycle > 320 ms | 6 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 16.6.1.0.3-5: Measurement period for intra-frequency measurements with gaps (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max(200 ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(200 ms, ceil(1.5 x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | 5 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 16.6.1.0.3-6: Measurement period for intra-frequency measurements with gaps (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max([200] ms, [5] x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max([200] ms, ceil(1.5 x [5]) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | [5] x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

The normative reference for this requirement is TS 38.133 [6] clause 9.2B.6.

## 16.6.1.1 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE

### 16.6.1.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.1.

### 16.6.1.1.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.1.1.4.1-3 and Table 16.6.1.1.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.1.4.1-1.

**Table 16.6.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.1.4.1-2.

**Table 16.6.1.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2 |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.1.4.1-3 below.

2. Message contents are defined in clause 16.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.1.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active cell | | | Cell 1 | |
| Neighbour cell | | | Cell 2 | Cell to be identified. |
| RF Channel Number | | | 1: Cell 1 and Cell 2 | |
| CD-SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | |
| | Config 3 | | SSB.1 RedCap FR1 | |
| NCD-SSB configuration | Config 1, 2, 4 | | SSB.6 RedCap FR1 Note 1 | |
| | Config 3 | | SSB.7 RedCap FR1 Note 1 | |
| SMTC configuration for NCD-SSB | Config 1, 4 | | SMTC.4 RedCap | |
| | Config 2, 3 | | SMTC.2 RedCap | |
| *A3-Offset* | | dB | -4.5 | |
| CP length | | | Normal | |
| *Hysteresis* | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | N/A | OFF |
| Time offset between serving and neighbour cells | Config 1, 4 | ms | 3 | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | Config 2, 3 | µs | 3 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 5 | |
| Note 1: NCD-SSB is configured within dedicated RedCap DL BWP. | | | | |

### 16.6.1.1.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 16.6.1.1.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered reporting and dedicated BWP-1, which contains NCD-SSB configuration, as specified in clause 16.6.1.1.4.3. RedCap-specific dedicated BWP-1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;

- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta \mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.
6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.1.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.
7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.1.5, otherwise the SS increases the number of failure tests by one.
8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:
   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.
9. Depending on the choice in step 8, the SS shall,
   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.
10. Repeat steps 1-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with *A3-offset* = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM |

**Table 16.6.1.1.4.3-2: *MeasObjectNR* (step 4, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of NCD-SSB | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table | SMTC.4 RedCap | Config 1, 4 |

| | | | |
|---|---|---|---|
| | 7.3.1-3 with condition SMTC.4 RedCap | | |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | SMTC.2 RedCap | Config 2, 3 |
| } | | | |

**Table 16.6.1.1.4.3-3: *ServingCellConfig* (step 1, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList | Not present | | |
| firstActiveDownlinkBWP-Id | Not present | | |
| uplinkConfig | Not present | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.1.4.3-3A: *ServingCellConfig* (step 4, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1 Table 16.6.1.1.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP | Not present | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 16.6.1.1.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| pusch-ServingCellConfig | Not present | | |
| } | | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.1.4.3-4: *BWP-Downlink* (Table 16.6.1.1.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| servingCellMO-r17 | 1 | MeasObjectId associated to NCD-SSB | |
| } | | | |
| } | | | |

**Table 16.6.1.1.4.3-5: *BWP-Uplink* (Table 16.6.1.1.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| } | | | |

16.6.1.1.5 Test requirement

Table 16.6.1.1.4.1-3 and Table 16.6.1.1.5-1 define the primary level settings including test tolerances.

**Table 16.6.1.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | Config 1, 4 | | N/A | | N/A | |
| | Config 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | Config 1, 4 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | Config 1, 4 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | Config 1, 4 | | CCR.1.1 FDD | | N/A | |
| | Config 2 | | CCR.1.1 TDD | | | |
| | Config 3 | | CCR.2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | OP.1 | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | | N/A | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| Initial DL BWP configuration | | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | | ULBWP.0.1 | | ULBWP.0.1 | |
| Active DL BWP configuration | | | DLBWP.1.3 RedCap | | DLBWP.1.3 RedCap | |
| Active UL BWP configuration | | | ULBWP.1.3 RedCap | | ULBWP.1.3 RedCap | |
| RLM-RS | | | SSB | | SSB | |
| $N_{oc}$ Note 2 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SS-RSRP Note 3 | Config 1, 2, 4 | dBm/SCS | -94 | -94 | -Infinity | -94 |
| | Config 3 | | -91 | -91 | -Infinity | -91 |
| Io | Config 1, 2, 4 | dBm/9.36 MHz | -64.60 | -62.25 | -64.60 | -62.25 |
| | Config 3 | dBm/18.36 MHz | -61.68 | -59.34 | -61.68 | -59.34 |
| Propagation Condition | | | AWGN | | | |
| Antenna Configuration | | | 1x1 | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delay specified in TS 38.133 [6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_without_index}$ + 2 x $TTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 1000 ms, is the time for intra-frequency cell identification specified in TS 38.133 [6] clause 9.2B.5.1,
- $TTI_{DCCH}$ = 1 ms.

Which gives a total of 1002 ms.

The UE is not required to read the neighbour cell SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE

### 16.6.1.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.2.

### 16.6.1.2.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.1.2.4.1-3 and Table 16.6.1.2.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.2.4.1-1.

**Table 16.6.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.2.4.1-2.

**Table 16.6.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.2.4.1-3 below.
2. Message contents are defined in clause 16.6.1.2.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.1.2.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Active cell | | | Cell 1 | |
| Neighbour cell | | | Cell 2 | Cell to be identified. |
| RF Channel Number | | | 1: Cell 1 and Cell 2 | |
| CD-SSB configuration | Config 1, 2 ,4 | | SSB.1 FR1 | |
| | Config 3 | | SSB.1 RedCap FR1 | |
| NCD-SSB configuration | Config 1, 2, 4 | | SSB.6 RedCap FR1 Note 1 | |
| | Config 3 | | SSB.7 RedCap FR1 Note 1 | |
| SMTC configuration for NCD-SSB | Config 1, 4 | | SMTC.4 RedCap | |
| | Config 2, 3 | | SMTC.2 RedCap | |
| *A3-Offset* | | dB | -4.5 | |
| CP length | | | Normal | |
| *Hysteresis* | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | N/A | OFF |
| Time offset between serving and neighbour cells | Config 1, 4 | ms | 3 | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | Config 2, 3 | µs | 3 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 5 | |
| Note 1: NCD-SSB is configured within dedicated RedCap DL BWP. | | | | |

## 16.6.1.2.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 16.6.1.2.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered reporting and dedicated BWP-1, which contains NCD-SSB configuration, as specified in clause 16.6.1.2.4.3. RedCap-specific dedicated BWP-1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.2.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.2.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Repeat steps 1-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 16.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with *A3-offset* = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition SSB RLM |

**Table 16.6.1.2.4.3-2: *MeasObjectNR* (step 4, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of NCD-SSB | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | SMTC.2 RedCap | Config 2, 3 |
| | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap | SMTC.4 RedCap | Config 1, 4 |
| } | | | |

**Table 16.6.1.2.4.3-3: *ServingCellConfig* (step 1, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList | Not present | | |
| firstActiveDownlinkBWP-Id | Not present | | |
| uplinkConfig | Not present | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.2.4.3-3A: *ServingCellConfig* (step 4, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 16.6.1.2.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP | Not present | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 16.6.1.2.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |

| | | | |
|---|---|---|---|
| pusch-ServingCellConfig | Not present | | |
| } | | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.2.4.3-4: *BWP-Downlink* (Table 16.6.1.2.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| servingCellMO-r17 | 1 | MeasObjectId associated with NCD-SSB | |
| } | | | |
| } | | | |

**Table 16.6.1.2.4.3-5: *BWP-Uplink* (Table 16.6.1.2.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| } | | | |

16.6.1.2.5 Test requirement

Table 16.6.1.2.4.1-3 and Table 16.6.1.2.5-1 define the primary level settings including test tolerances.

**Table 16.6.1.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX**

| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|---|---|---|---|---|---|---|
| | | | **T1** | **T2** | **T1** | **T2** |
| TDD configuration | Config 1, 4 | | N/A | | N/A | |
| | Config 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | Config 1, 4 | | SR.1.1 FDD | | N/A | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | Config 1, 4 | | CR.1.1 FDD | | N/A | |
| | Config 2 | | CR.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | Config 1, 4 | | CCR.1.1 FDD | | N/A | |
| | Config 2 | | CCR.1.1 TDD | | | |
| | Config 3 | | CCR.2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | OP.1 | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | | N/A | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| Initial DL BWP configuration | | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | | ULBWP.0.1 | | ULBWP.0.1 | |
| Active DL BWP configuration | | | DLBWP.1.3 RedCap | | DLBWP.1.3 RedCap | |
| Active UL BWP configuration | | | ULBWP.1.3 RedCap | | ULBWP.1.3 RedCap | |
| RLM-RS | | | SSB | | SSB | |
| $N_{oc}$ Note 2 | Config 1, 2, 4 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | Config 1, 2, 4 | dBm/SCS | -94 | -94 | -Infinity | -94 |
| | Config 3 | | -91 | -91 | -Infinity | -91 |
| Io | Config 1, 2, 4 | dBm/9.36 MHz | -64.60 | -62.25 | -64.60 | -62.25 |
| | Config 3 | dBm/18.36 MHz | -61.68 | -59.34 | -61.68 | -59.34 |
| Propagation Condition | | | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delay specified in TS 38.133 [6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_without_index}$ + 2 x $TTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 1000 ms, is the time for intra-frequency cell identification specified in TS 38.133 [6] clause 9.2B.5.1,
- $TTI_{DCCH}$ = 1 ms.

Which gives a total of 1002 ms.

The UE is not required to read the neighbour cell SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 16.6.1.3 NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE

### 16.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting long DRX cycle.

#### 16.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.3.

#### 16.6.1.3.4 Test description

##### 16.6.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.2.4.1 with following exceptions:

- Table 6.6.1.2.4.1-1 is replaced by Table 16.6.1.3.4.1-1.
- Table 6.6.1.2.4.1-2 is replaced by Table 16.6.1.3.4.1-2.
- Table 6.6.1.2.4.1-3 is replaced by Table 16.6.1.3.4.1-3.

**Table 16.6.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.3-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.3-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.1.3.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3, 4 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | | |
| | | 3 | SSB.1 RedCap FR1 | | |
| SMTC configuration | | 1, 4 | SMTC.2 | | |
| | | 2, 3 | SMTC.1 | | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | | |
| CP length | | 1, 2, 3, 4 | Normal | | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | DRX.1 | DRX.7 | |

| | | | | | |
|---|---|---|---|---|---|
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| | | 2, 3 | 3 us | | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | | |
| T2 | s | 1, 2, 3, 4 | 5 | 10 | |

### 16.6.1.3.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.2.4.2 with following exceptions:

- Step 6 in clause 6.6.1.2.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 7682 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

### 16.6.1.3.4.3 Message contents

Same as the message contents given in clause 6.6.1.2.4.3.

### 16.6.1.3.5 Test requirement

Same as the test requirement given in clause 6.6.1.2.5 with following exceptions:

- Table 6.6.1.2.5-1 is replaced by Table 16.6.1.3.5-1.
- The overall delay measured is expressed as:

  Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

  - $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 4480 ms for Test 2;
  - $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
  - TTI insertion uncertainty = 2 ms

  As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 7682 ms respectively.

**Table 16.6.1.3.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | N/A | |
| | | 2 | CCR.1.1 TDD | | | |
| | | 3 | CCR.2.1 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

## 16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE

### 16.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting long DRX cycle.

### 16.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.4.

### 16.6.1.4.4 Test description

#### 16.6.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.2.4.1 with following exceptions:

- Table 6.6.1.2.4.1-1 is replaced by Table 16.6.1.4.4.1-1.
- Table 6.6.1.2.4.1-2 is replaced by Table 16.6.1.4.4.1-2.
- Table 6.6.1.2.4.1-3 is replaced by Table 16.6.1.4.4.1-3.

**Table 16.6.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.4-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.4-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.6.1.4.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3, 4 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | | |
| | | 3 | SSB.1 RedCap FR1 | | |
| SMTC configuration | | 1, 4 | SMTC.2 | | |
| | | 2, 3 | SMTC.1 | | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | | |
| CP length | | 1, 2, 3, 4 | Normal | | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| | | 2, 3 | 3 us | | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | | |
| T2 | s | 1, 2, 3, 4 | 5 | 10 | |

### 16.6.1.4.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.2.4.2.

### 16.6.1.4.4.3 Message contents

Same as the message contents given in clause 6.6.1.2.4.3.

### 16.6.1.4.5 Test requirement

Same as the test requirement given in clause 6.6.1.2.5 with following exceptions:

- Table 6.6.1.2.5-1 is replaced by Table 16.6.1.4.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2;
- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 6402 ms respectively.

**Table 16.6.1.4.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | N/A | |
| | | 2 | CCR.1.1 TDD | | | |
| | | 3 | CCR.2.1 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.1.5 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE

### 16.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

### 16.6.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

### 16.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.5.

### 16.6.1.5.4 Test description

#### 16.6.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.3.4.1 with following exceptions:

- Table 6.6.1.3.4.1-1 is replaced by Table 16.6.1.5.4.1-1.
- Table 6.6.1.3.4.1-2 is replaced by Table 16.6.1.5.4.1-2.
- Table 6.6.1.3.4.1-3 is replaced by Table 16.6.1.5.4.1-3.

**Table 16.6.1.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.1.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | | |

**Table 16.6.1.5.4.1-3: General test parameters**

| Parameter | Unit | Test config. | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4 | Cell 1 | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2, 3, 4 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2, 3, 4 | 40 | |
| Measurement gap length | ms | 1, 2, 3, 4 | 6 | |
| Measurement gap offset | ms | 1, 2, 3, 4 | 39 | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3 | SMTC.1 | |
| CSI-RS parameters | | 1, 4 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | |
| CP length | | 1, 2, 3, 4 | Normal | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | N/A | OFF |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2, 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | |
| T2 | s | 1, 2, 3, 4 | 5 | |

### 16.6.1.5.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.3.4.2.

### 16.6.1.5.4.3 Message contents

Same as the message contents given in clause 6.6.1.3.4.3 with the following exception:

- For test configurations 16.6.1.5-1 and 16.6.1.5-4,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO.
  - Table 7.3.1-3 specified in TS 38.508-1 [14] is used with condition SMTC.2.

- For test configurations 16.6.1.5-2 and 16.6.1.5-3,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO and Synchronous cells.
  - Table 7.3.1-3 specified in TS 38.508-1 [14] is used with condition SMTC.1.

### 16.6.1.5.5 Test requirement

Same as the test requirements given in clause 6.6.1.3.5 with following exceptions:

- Table 6.6.1.3.5-1 is replaced by Table 16.6.1.5.5-1.

**Table 16.6.1.5.5-1: Cell specific test parameters**

| Parameter | Unit | Test config. | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.2 FDD | | N/A | |
| | | 2 | CCR.1.2 TDD | | | |
| | | 3 | CCR.2.3 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | -61.68 | -59.34 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE

### 16.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

### 16.6.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

### 16.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.6.

### 16.6.1.6.4 Test description

#### 16.6.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.3.4.1 with following exceptions:

- Table 6.6.1.3.4.1-1 is replaced by Table 16.6.1.6.4.1-1.
- Table 6.6.1.3.4.1-2 is replaced by Table 16.6.1.6.4.1-2.
- Table 6.6.1.3.4.1-3 is replaced by Table 16.6.1.6.4.1-3.

**Table 16.6.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.1.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

**Table 16.6.1.6.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4 | Cell 1 | |

| | | | | |
|---|---|---|---|---|
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2, 3, 4 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2, 3, 4 | 40 | |
| Measurement gap length | ms | 1, 2, 3, 4 | 6 | |
| Measurement gap offset | ms | 1, 2, 3, 4 | 39 | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2, 3 | SMTC.1 | |
| CSI-RS parameters | | 1, 4 | CSI-RS.1.2 FDD resource #0 | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | |
| CP length | | 1, 2, 3, 4 | Normal | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | N/A | OFF |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2, 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | |
| T2 | s | 1, 2, 3, 4 | 5 | |

#### 16.6.1.6.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.3.4.2.

#### 16.6.1.6.4.3 Message contents

Same as the message contents given in clause 6.6.1.3.4.3 with the following exception:

- For test configurations 16.6.1.6-1 and 16.6.1.6-4,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO.
  - Table 7.3.1-3 specified in TS 38.508-1 [14] is used with condition SMTC.2.
- For test configurations 16.6.1.6-2 and 16.6.1.6-3,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO and Synchronous cells.
  - Table 7.3.1-3 specified in TS 38.508-1 [14] is used with condition SMTC.1.

### 16.6.1.6.5 Test requirement

Same as the test requirements given in clause 6.6.1.3.5 with following exceptions:

- Table 6.6.1.3.5-1 is replaced by Table 16.6.1.6.5-1.

**Table 16.6.1.6.5-1: Cell specific test parameters**

| Parameter | Unit | Test config. | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.2 FDD | | N/A | |
| | | 2 | CCR.1.2 TDD | | | |
| | | 3 | CCR.2.3 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | -61.68 | -59.34 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.1.7 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE

### 16.6.1.7.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

#### 16.6.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

#### 16.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.7.

#### 16.6.1.7.4 Test description

##### 16.6.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.4.4.1 with following exceptions:

- Table 6.6.1.4.4.1-1 is replaced by Table 16.6.1.7.4.1-1.
- Table 6.6.1.4.4.1-2 is replaced by Table 16.6.1.7.4.1-2.
- Table 6.6.1.4.4.1-3 is replaced by Table 16.6.1.7.4.1-3.

**Table 16.6.1.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.7-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.7-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.1.7.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3, 4 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | | |
| Measurement gap type | | 1, 2, 3, 4, | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1, 2, 3, 4 | 40 | | |
| Measurement gap length | ms | 1, 2, 3, 4 | 6 | | |
| Measurement gap offset | ms | 1, 2, 3, 4 | 39 | | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | | |
| | | 3 | SSB.1 RedCap FR1 | | |

| | | | | | |
|---|---|---|---|---|---|
| SMTC configuration | | 1, 4 | SMTC.**2** | | |
| | | 2, 3 | SMTC.1 | | |
| CSI-RS parameters | | 1, 4 | CSI-RS.1.2 FDD resource #0 | | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | | |
| CP length | | 1, 2, 3, 4 | Normal | | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| | | 2, 3 | 3 us | | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | | |
| T2 | s | 1, 2, 3, 4 | 5 | 10 | |

### 16.6.1.7.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.4.4.2 with following exceptions:

- Step 6 in clause 6.6.1.4.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 7682 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

### 16.6.1.7.4.3 Message contents

Same as the message contents given in clause 6.6.1.4.4.3.

### 16.6.1.7.5 Test requirement

Same as the test requirement given in clause 6.6.1.4.5 with following exceptions:

- Table 6.6.1.4.5-1 is replaced by Table 16.6.1.7.5-1.
- The overall delay measured is expressed as:

  Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

  - $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 4480 ms for Test 2;
  - $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
  - TTI insertion uncertainty = 2 ms

  As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 7682 ms respectively.

**Table 16.6.1.7.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.2 FDD | | N/A | |
| | | 2 | CCR.1.2 TDD | | | |
| | | 3 | CCR.2.3 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.1.8 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE

### 16.6.1.8.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

### 16.6.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

### 16.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.8.

16.6.1.8.4 Test description

16.6.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.4.4.1 with following exceptions:

- Table 6.6.1.4.4.1-1 is replaced by Table 16.6.1.8.4.1-1.
- Table 6.6.1.4.4.1-2 is replaced by Table 16.6.1.8.4.1-2.
- Table 6.6.1.4.4.1-3 is replaced by Table 16.6.1.8.4.1-3.

**Table 16.6.1.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.1.8-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.1.8-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.6.1.8.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| Active cell | | 1, 2, 3, 4 | Cell 1 | | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | | |
| Measurement gap type | | 1, 2, 3, 4, | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 1, 2, 3, 4 | 40 | | |
| Measurement gap length | ms | 1, 2, 3, 4 | 6 | | |
| Measurement gap offset | ms | 1, 2, 3, 4 | 39 | | |
| SSB configuration | | 1, 2, 4 | SSB.1 FR1 | | |
| | | 3 | SSB.1 RedCap FR1 | | |
| SMTC configuration | | 1, 4 | SMTC.2 | | |
| | | 2, 3 | SMTC.1 | | |
| CSI-RS parameters | | 1, 4 | CSI-RS.1.2 FDD resource #0 | | |
| | | 2 | CSI-RS.1.2 TDD resource #0 | | |
| | | 3 | CSI-RS.2.2 TDD resource #0 | | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | | |
| CP length | | 1, 2, 3, 4 | Normal | | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | | |

| | | | | | |
|---|---|---|---|---|---|
| Filter coefficient | | 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | ms | 1, 2, 3, 4 | DRX.1 | DRX.7 | |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| | | 2, 3 | 3 us | | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | | |
| T2 | s | 1, 2, 3, 4 | 5 | 10 | |

### 16.6.1.8.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.4.4.2.

### 16.6.1.8.4.3 Message contents

Same as the message contents given in clause 6.6.1.4.4.3.

### 16.6.1.8.5 Test requirement

Same as the test requirement given in clause 6.6.1.4.5 with following exceptions:

- Table 6.6.1.4.5-1 is replaced by Table 16.6.1.8.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2;
- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 6402 ms respectively.

**Table 16.6.1.8.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | N/A | |
| | | 2 | CR.1.1 TDD | | | |
| | | 3 | CR.2.1 TDD | | | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.2 FDD | | N/A | |
| | | 2 | CCR.1.2 TDD | | | |
| | | 3 | CCR.2.3 TDD | | | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | | |
| | | 3 | TRS.1.2 TDD | | | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| RLM-RS | | 1, 2, 3, 4 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2, 4 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2, 3, 4 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2, 4 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 2, 4 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| | dBm/18.36 MHz | 3 | -61.68 | -59.34 | | |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

## 16.6.1.9 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 1 Rx UE

### 16.6.1.9.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.9.

### 16.6.1.9.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for FDD PCell and neighbour cell are given in Table 16.6.1.9.4.1-3 and Table 16.6.1.9.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.9.4.1-1.

**Table 16.6.1.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.9-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.9-2 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.9.4.1-2.

**Table 16.6.1.9.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.9.4.1-3 below.

2. Message contents are defined in clause 16.6.1.9.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.1.9.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | Cell 1 | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | |
| CD-SSB configuration | | SSB.1 FR1 | |
| NCD-SSB configuration | | SSB.6 RedCap FR1 Note 1 | |
| SMTC configuration for CD-SSB | | SMTC.2 | |
| SMTC configuration for NCD-SSB | | SMTC.4 RedCap | |
| *A3-Offset* | dB | -4.5 | |
| CP length | | Normal | |
| *Hysteresis* | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | N/A | OFF |
| Time offset between serving and neighbour cells | ms | 3 | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: NCD-SSB is configured within dedicated RedCap DL BWP. | | | |

### 16.6.1.9.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 16.6.1.9.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered reporting and dedicated BWP-1, which contains NCD-SSB configuration, as specified in clause 16.6.1.9.4.3. RedCap-specific dedicated BWP-

1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.
6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.9.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.
7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.9.5, otherwise the SS increases the number of failure tests by one.
8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:
   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.
9. Depending on the choice in step 8, the SS shall,
   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.
10. Repeat steps 1-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 16.6.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.1.9.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with condition SSB Index and *A3-offset* = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with Condition SSB RLM |

**Table 16.6.1.9.4.3-2: *MeasObjectNR* (step 4, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of NCD-SSB | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap | SMTC.4 RedCap | |
| } | | | |

**Table 16.6.1.9.4.3-3: *ServingCellConfig* (step 1, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList | Not present | | |
| firstActiveDownlinkBWP-Id | Not present | | |
| uplinkConfig | Not present | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.9.4.3-3A: *ServingCellConfig* (step 4, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1 Table 16.6.1.9.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP | Not present | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 16.6.1.9.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| pusch-ServingCellConfig | Not present | | |
| } | | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.9.4.3-4: *BWP-Downlink* (Table 16.6.1.9.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| servingCellMO-r17 | 1 | MeasObjectID associated with NCD-SSB | |
| } | | | |
| } | | | |

**Table 16.6.1.9.4.3-5: *BWP-Uplink* (Table 16.6.1.9.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| } | | | |

16.6.1.9.5 Test requirement

Table 16.6.1.9.4.1-3 and Table 16.6.1.9.5-1 define the primary level settings including test tolerances.

**Table 16.6.1.9.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| TDD configuration | | N/A | | N/A | |
| PDSCH RMC configuration | | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | OP.1 | | OP.1 | |
| TRS Configuration | | TRS.1.1 FDD | | N/A | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| Active DL BWP configuration | | DLBWP.1.3 RedCap Note 4 | | DLBWP.1.3 RedCap Note 4 | |
| Active UL BWP configuration | | ULBWP.1.3 RedCap Note 5 | | ULBWP.1.3 RedCap Note 5 | |
| RLM-RS | | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition | | AWGN | | | |
| Antenna Configuration | | 1x1 | | | |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of time period T2. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index. |
| Note 5: | The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2. |

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delay specified in TS 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_with_index}$ + 2 x $TTI_{DCCH}$, where

- $T_{identify_intra_with_index}$ = 1480 ms, is the time for intra-frequency cell identification specified in TS 38.133 [6] clause 9.2B.5.1,
- $TTI_{DCCH}$ = 1 ms.

Which gives a total of 1482 ms.

The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE

### 16.6.1.10.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 16.6.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.10.

### 16.6.1.10.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for FDD PCell and neighbour cell are given in Table 16.6.1.10.4.1-3 and Table 16.6.1.10.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.1.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.10.4.1-1.

**Table 16.6.1.10.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.10-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.10-2 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.10.4.1-2.

**Table 16.6.1.10.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.10.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.10.4.1-3 below.

2. Message contents are defined in clause 16.6.1.10.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.1.10.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | Cell 1 | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | |
| CD-SSB configuration | | SSB.1 FR1 | |
| NCD-SSB configuration | | SSB.6 RedCap FR1 Note 1 | |
| SMTC configuration for CD-SSB | | SMTC.2 | |
| SMTC configuration for NCD-SSB | | SMTC.4 RedCap | |
| *A3-Offset* | dB | -4.5 | |
| CP length | | Normal | |
| *Hysteresis* | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | N/A | OFF |
| Time offset between serving and neighbour cells | ms | 3 | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: NCD-SSB is configured within dedicated RedCap DL BWP. | | | |

### 16.6.1.10.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T1 in Table 16.6.1.10.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered reporting and dedicated BWP-1, which contains NCD-SSB configuration, as specified in clause 16.6.1.10.4.3. RedCap-specific dedicated BWP-1 is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value and aligned with channel raster) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta\mathrm{F}_{\mathrm{Global}}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-1 [2] clause 5.4.2.1;
- $\mathrm{SCS}_{\mathrm{SSB}}$ is the subcarrier spacing of SSB (in kHz);
- $N_{\mathrm{SC}}^{\mathrm{RB}} = 12$, is the number of subcarriers in an RB;
- $N_{\mathrm{SC}}^{\mathrm{SSB}} = 240$, is the number of subcarriers in an SSB.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.10.5-1. T2 starts. The SS also transmits NCD-SSB on Cell 2 with an absolute frequency of $f_{\mathrm{NCDSSB}}$ calculated above.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.10.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Repeat steps 1-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 16.6.1.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.1.10.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

| | |
|---|---|
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with condition SSB Index and *A3-offset* = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with Condition SSB RLM |

**Table 16.6.1.10.4.3-2: *MeasObjectNR* (step 4, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of NCD-SSB | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap | SMTC.4 RedCap | |
| } | | | |

**Table 16.6.1.10.4.3-3: *ServingCellConfig* (step 1, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList | Not present | | |
| firstActiveDownlinkBWP-Id | Not present | | |
| uplinkConfig | Not present | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.10.4.3-3A: *ServingCellConfig* (step 4, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 16.6.1.10.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP | Not present | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 16.6.1.10.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| pusch-ServingCellConfig | Not present | | |
| } | | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 16.6.1.10.4.3-4: *BWP-Downlink* (Table 16.6.1.10.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| servingCellMO-r17 | 1 | MeasObjectId associated with NCD-SSB | |
| } | | | |
| } | | | |

**Table 16.6.1.10.4.3-5: *BWP-Uplink* (Table 16.6.1.10.4.3-3A)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| } | | | |

16.6.1.10.5 Test requirement

Table 16.6.1.10.4.1-3 and Table 16.6.1.10.5-1 define the primary level settings including test tolerances.

**Table 16.6.1.10.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| TDD configuration | | N/A | | N/A | |
| PDSCH RMC configuration | | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | CCR.1.1 FDD | | N/A | |
| OCNG Patterns | | OP.1 | | OP.1 | |
| TRS Configuration | | TRS.1.1 FDD | | N/A | |
| Initial DL BWP configuration | | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | | ULBWP.0.1 | |
| Active DL BWP configuration | | DLBWP.1.3 RedCap Note 4 | | DLBWP.1.3 RedCap Note 4 | |
| Active UL BWP configuration | | ULBWP.1.3 RedCap Note 5 | | ULBWP.1.3 RedCap Note 5 | |
| RLM-RS | | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | -94 | -94 | -Infinity | -94 |

| | | | | | |
|---|---|---|---|---|---|
| Io | dBm/9.36 MHz | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition | | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index.
Note 5: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delay specified in TS 38.133 [6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_with_index}$ + 2 x $TTI_{DCCH}$, where

- $T_{identify_intra_with_index}$ = 1240 ms, is the time for intra-frequency cell identification specified in TS 38.133 [6] clause 9.2B.5.1,
- $TTI_{DCCH}$ = 1 ms.

Which gives a total of 1242 ms.

The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

## 16.6.1.11 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE

### 16.6.1.11.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

### 16.6.1.11.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting CSI-RS-based RLM and BWP operation without bandwidth restriction.

### 16.6.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.11.

### 16.6.1.11.4 Test description

#### 16.6.1.11.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.6.4.1 with following exceptions:

- Table 6.6.1.6.4.1-1 is replaced by Table 16.6.1.11.4.1-1.
- Table 6.6.1.6.4.1-2 is replaced by Table 16.6.1.11.4.1-2.
- Table 6.6.1.6.4.1-3 is replaced by Table 16.6.1.11.4.1-3.

**Table 16.6.1.11.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.11-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.11-2 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.11.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.11.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.1.11.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2 | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | |
| Measurement gap length | ms | 1, 2 | 6 | |
| Measurement gap offset | ms | 1, 2 | 39 | |
| CD-SSB configuration | | 1, 2 | SSB.1 FR1 | |
| SMTC configuration for CD-SSB | | 1, 2 | SMTC.2 | |
| *A3-Offset* | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| *Hysteresis* | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | N/A | OFF |
| Time offset between serving and neighbour cells | | 1, 2 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 16.6.1.11.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.6.4.2 with following exceptions:

- Step 6 in clause 6.6.1.6.4.2 is replaced by following step.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1042 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

#### 16.6.1.11.4.3 Message contents

Same as the message contents given in clause 6.6.1.6.4.3.

### 16.6.1.11.5 Test requirement

Same as the test requirement given in clause 6.6.1.6.5 with following exceptions:

- Table 6.6.1.6.5-1 is replaced by Table 16.6.1.11.5-1.
- The overall delay measured is expressed as:

  Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + $T_{SSB_time_index_intra_RedCap}$ + TTI insertion uncertainty

  - $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms
  - $T_{SSB_measurement_period_intra_RedCap}$= 200 ms
  - $T_{SSB_time_index_intra_RedCap}$ = 240 ms
  - TTI insertion uncertainty = 2 ms

  As a result, the overall delay measured shall be less than a total of 1042 ms.

**Table 16.6.1.11.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | N/A | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP2 configuration | | 1, 2 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP2 configuration | | 1, 2 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.1.12 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE

### 16.6.1.12.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

### 16.6.1.12.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting CSI-RS-based RLM and BWP operation without bandwidth restriction.

### 16.6.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.12.

### 16.6.1.12.4 Test description

#### 16.6.1.12.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.6.4.1 with following exceptions:

- Table 6.6.1.6.4.1-1 is replaced by Table 16.6.1.12.4.1-1.
- Table 6.6.1.6.4.1-2 is replaced by Table 16.6.1.12.4.1-2.
- Table 6.6.1.6.4.1-3 is replaced by Table 16.6.1.12.4.1-3.

**Table 16.6.1.12.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.1.12-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.1.12-2 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.1.12.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.1.12.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

**Table 16.6.1.12.4.1-3: General test parameters**

| Parameter | Unit | Test config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | Cell 1 | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | |
| Measurement gap type | | 1, 2 | Per-UE gaps | |

| | | | | |
|---|---|---|---|---|
| Measurement gap repetition periodicity | ms | 1, 2 | 40 | |
| Measurement gap length | ms | 1, 2 | 6 | |
| Measurement gap offset | ms | 1, 2 | 39 | |
| SSB configuration | | 1, 2 | SSB.1 FR1 | |
| SMTC configuration | | 1, 2 | SMTC.2 | |
| CSI-RS parameters | | 1, 2 | CSI-RS.1.2 FDD resource #0 | |
| *A3-Offset* | dB | 1, 2 | -4.5 | |
| CP length | | 1, 2 | Normal | |
| *Hysteresis* | dB | 1, 2 | 0 | |
| Time To Trigger | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | N/A | OFF |
| Time offset between serving and neighbour cells | | 1, 2 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1 |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 16.6.1.12.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.6.4.2.

### 16.6.1.12.4.3 Message contents

Same as the message contents given in clause 6.6.1.6.4.3.

**Table 16.6.1.12.4.3-1: *ServingCellConfig***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP-Id1 | DLBWP.1.2 RedCap configuration | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Active DL BWP-ID (BWP2) | BWP-Id1 |
| defaultDownlinkBWP-Id | 0 | Initial BWP (BWP1) | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP-Id1 | ULBWP.1.2 RedCap configuration | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Active UL BWP-ID (BWP2) | BWP-Id1 |
| } | | | |
| } | | | |

### 16.6.1.12.5 Test requirement

Same as the test requirement given in clause 6.6.1.6.5 with following exceptions:

- Table 6.6.1.6.5-1 is replaced by Table 16.6.1.12.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + $T_{SSB_time_index_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms
- $T_{SSB_measurement_period_intra_RedCap}$ = 200 ms
- $T_{SSB_time_index_intra_RedCap}$ = 120 ms
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured shall be less than a total of 922 ms.

**Table 16.6.1.12.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | N/A | | N/A | |
| PDSCH RMC configuration | | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration | | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns | | 1, 2 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.2 RedCap | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.2 RedCap | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | CSI-RS | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s / N_{oc}$ | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.60 | -62.25 | Specified in Cell 1 columns | |
| Propagation Condition | | 1, 2 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.2 Inter-frequency measurements for RedCap

### 16.6.2.0 Minimum conformance requirements

#### 16.6.2.0.1 Minimum conformance requirements for inter-frequency event-triggered measurement with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-

frequency cell within $T_{identify_inter_with_index_RedCap}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index_RedCap}$.

$$T_{identify_inter_without_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap}) \text{ ms}$$

$$T_{identify_inter_with_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap} + T_{SSB_time_index_inter_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_inter_RedCap}$: it is the time period used in PSS/SSS detection given in Table 16.6.2.0.1-1 and Table 16.6.2.0.1-2.

$T_{SSB_time_index_inter_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 16.6.2.0.1-3 and Table 16.6.2.0.1-4.

$T_{SSB_measurement_period_inter_RedCap}$: equal to a measurement period of SSB based measurement given in Table 16.6.2.0.1-5 and Table 16.6.2.0.1-6.

Editor's note: which power class to be used for RedCap depends on the RF session outcome.

$CSSF_{inter_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in clause 9.1A.5.2 for measurement conducted within measurement gaps.

**Table 16.6.2.0.1-1: Time period for PSS/SSS detection (Frequency range 1) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{PSS/SSS_sync_inter_RedCap}$ |
|---|---|
| No DRX | Max(600 ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | Max(600 ms, Ceil(8*1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | 8 × DRX cycle × $CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

**Table 16.6.2.0.1-2: Time period for PSS/SSS detection (Frequency range 1) for 1 Rx RedCap UE**

| Condition NOTE1 | $T_{PSS/SSS_sync_inter_RedCap}$ |
|---|---|
| No DRX | Max(600 ms, 10 × Max(MGRP, SMTC period)) × $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | Max(600 ms, Ceil(10 *1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | 10 × DRX cycle × $CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

**Table 16.6.2.0.1-3: Time period for time index detection (Frequency range 1) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_time_index_inter_RedCap}$ |
|---|---|
| No DRX | Max(120 ms, 3 × Max(MGRP, SMTC period)) × $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | Max(120 ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | 3 × DRX cycle × $CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

**Table 16.6.2.0.1-4: Time period for time index detection (Frequency range 1) for 1 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_time_index_inter_RedCap}$ |
|---|---|
| No DRX | Max(160 ms, 6 × Max(MGRP, SMTC period)) × $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | Max(160 ms, Ceil(6 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | 6 × DRX cycle × $CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

When measurement gaps are provided for inter-frequency measurements, the RedCap UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as

specified in TS 38.133 [6] clauses 10.1A.4, 10.1A.5, 10.1A.8, 10.1A.9, 10.1A.12 and 10.1A.13, respectively, as shown in table 16.6.2.0.1-5 for 2 Rx RedCap and in table 16.6.2.0.1-6 for 1 Rx RedCap, respectively.

**Table 16.6.2.0.1-5: Measurement period for inter-frequency measurements with gaps (Frequency FR1) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_measurement_period_inter_RedCap}$ |
|---|---|
| No DRX | $Max(200\ ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | $Max(200\ ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | $8 \times DRX\ cycle \times CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

**Table 16.6.2.0.1-6: Measurement period for inter-frequency measurements with gaps (Frequency FR1) for 1 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_measurement_period_inter_RedCap}$ |
|---|---|
| No DRX | $Max(400\ ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | $Max(400\ ms, ceil(1.5 \times 8) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | $8 \times DRX\ cycle \times CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 in TS 38.133 [6]. | |

For 2 Rx RedCap UE: Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

For 1 Rx RedCap UE: Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1A.4.1, 10.1A.8.1 and 10.1A.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index_RedCap}$. Both $T_{identify_inter_without_index_RedCap}$ and $T_{identify_inter_with_index_RedCap}$ are defined in TS 38.133 [6] in clause 9.3B.4. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index_RedCap}$ or $T_{identify_intra_with_index_RedCap}$ as defined in TS 38.133 [6] in clause 9.2B.5.1 or clause 9.2B.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index_RedCap}$ or $T_{identify\ intra\ with\ index_RedCap}$ defined in TS 38.133 [6] in clause 9.2B.5.1 or clause 9.2B.6.2 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}\ T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

### 16.6.2.0.2 Minimum conformance requirements for inter-frequency event-triggered measurements without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index_RedCap}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index_RedCap}$. It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following conditions are met:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned, and
- the timing of SSBs across serving cell and inter-frequency neighbor cells are aligned

$$T_{identify_inter_without_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap}) \text{ ms}$$

$$T_{identify_inter_with_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap} + T_{SSB_time_index_inter_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_inter_RedCap}$: it is the time period used in PSS/SSS detection given in table 16.6.2.0.2-1, table 16.6.2.0.2-2.

$T_{SSB_time_index_inter_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in table 16.6.2.0.2-3 and table 16.6.2.0.2-4.

$T_{SSB_measurement_period_inter_RedCap}$: equal to a measurement period of SSB based measurement given in table 16.6.2.0.2-5, table 16.6.2.0.2-6.

$CSSF_{inter_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap_RedCap,i}$ in clause 9.1A.5.1 for measurement conducted outside measurement gaps, i.e. when inter-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to $CSSF_{within_gap_RedCap,i}$ in clause 9.1A.5.2 for measurement conducted within measurement gaps, i.e. when inter-frequency SMTC is fully overlapping with measurement gaps.

$M_{pss/sss_sync_inter_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_inter_RedCap}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{pss/sss_sync_inter_RedCap}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_inter_RedCap}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_RedCap}$ = 24 samples. For a UE supporting FR2 power class 7, $M_{pss/sss_sync_inter_RedCap}$ = 24 samples.

$M_{SSB_index_inter_RedCap}$: For a UE supporting power class 1 or 5, $M_{SSB_index_inter_RedCap}$ = 40 samples. For a vehicle mounted UE supporting power class 2, $M_{pss/sss_sync_inter_RedCap}$ = 24 samples. For a UE supporting power class 3, $M_{SSB_index_inter_RedCap}$ = 24 samples. For a UE supporting power class 4, $M_{meas_period_inter_RedCap}$ = 24 samples. For a UE supporting power class 7, $M_{SSB_index_inter_RedCap}$ = 24 samples.

$M_{meas_period_inter_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{meas_period_inter_RedCap}$ = 40 samples. For a vehicle mounted UE supporting FR2 power class 2, $M_{pss/sss_sync_inter_RedCap}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter_RedCap}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter_RedCap}$ = 24 samples. For a UE supporting FR2 power class 7, $M_{meas_period_inter_RedCap}$ = 24 samples.

When inter-frequency SMTC is fully non overlapping with measurement gaps or inter-frequency SMTC is fully overlapping with MGs, Kp = 1.

When inter-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2,

$K_{layer1_measurement}$ = 1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by inter-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by inter-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$ = 1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

**Table 16.6.2.0.2-1: Time period for PSS/SSS detection (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_inter_RedCap}$ |
|---|---|
| No DRX | max(600 ms, ceil(5 x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | ceil(5 x $K_p$) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.2.0.2-2: Time period for PSS/SSS detection (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_inter_RedCap}$ |
|---|---|
| No DRX | max( 600 ms, ceil(7 x $K_p$) x SMTC period )[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max( 600 ms, ceil(1.5 x 7 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | ceil(7 x $K_p$) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.2.0.2-3: Time period for time index detection (FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_inter_RedCap}$ |
|---|---|
| No DRX | max(120 ms, ceil(3 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max(120 ms, ceil(1.5 x 3 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | Ceil(3 x $K_p$) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.2.0.2-4: Time period for time index detection (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_time_index_inter_RedCap}$ |
|---|---|
| No DRX | max(160 ms, ceil(6 x $K_p$ ) x SMTC period)[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max(160 ms, ceil(1.5 x 6 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | Ceil(6 x $K_p$) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

The RedCap UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1A.4, 10.1A.5, 10.1A.8, 10.1A.9, 10.1A.12 and 10.1A.13, respectively, as shown in table 16.6.2.0.2-5, for 2 Rx RedCap and table 16.6.2.0.2-5 for 1 Rx RedCap, if UE supports inter-frequency measurement without measurement gaps:

**Table 16.6.2.0.2-5: Measurement period for inter-frequency measurements without gaps ((FR1) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200 ms, ceil(5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max(200 ms, ceil(1.5x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | ceil(5 x $K_p$ ) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 16.6.2.0.2-6: Measurement period for inter-frequency measurements without gaps ((FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_inter}$ |
|---|---|
| No DRX | max(200 ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | max(200 ms, ceil(1.5 x 5 x $K_p$) x max(SMTC period, DRX cycle)) x $CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | ceil(5 x $K_p$ ) x DRX cycle x $CSSF_{inter_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified, | |

## 16.6.2.1 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE

### 16.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.1.

### 16.6.2.1.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.1.4.1-3 and Table 16.6.2.1.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.1.4.1-1.

**Table 16.6.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.1-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.1-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.1-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.1-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |

| | |
|---|---|
| Note 1: | The UE is only required to be tested in one of the supported test configurations. |
| Note 2: | Target NR cell has the same SCS, BW and duplex mode as NR serving cell. |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.1.4.1-2.

**Table 16.6.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.2.1.4.1-3 below.

2. Message contents are defined in clause 16.6.2.1.4.3.

3. There two cells on two carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.2.1.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | | |
| CP length | | Config 1, 2, 3, 4 | Normal | | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | | Synchronous cells. |

| | | | | | |
|---|---|---|---|---|---|
| T1 | s | Config 1, 2, 3, 4 | 5 | | |
| T2 | s | Config 1, 2, 3, 4 | 1.1 | 12 | |

**Table 16.6.2.1.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Test 1 & 3 | Test 2 & 4 | Comment |
|---|---|---|---|
| | Value | Value | |
| *drx-onDurationTimer* | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| *drx-InactivityTimer* | ms1 | ms1 | |
| *drx-RetransmissionTimerDL* | sl1 | sl1 | |
| *drx-RetransmissionTimerUL* | sl1 | sl1 | |
| *drx-LongCycleStartOffset* | ms40 | Ms640 | |
| *shortDRX* | disable | disable | |

**Table 16.6.2.1.4.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Value | Comment |
|---|---|---|
| *TimeAlignmentTimer* | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 16.6.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1, 11520 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.1.4.3 Message contents

Same as the message contents given in clause 6.6.2.2.4.3.

### 16.6.2.1.5 Test requirement

Table 16.6.2.1.4.1-3 and Table 16.6.2.1.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2, 3 | TDD | | | |
| | | Config 4 | HD-FDD | | | |
| TDD configuration | | Config 1 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3, 4 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | Config 1, 2, 3, 4 | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | Config 1, 2, 3, 4 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR.2.1 TDD | | NA | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | NA | |
| | | | Config 2 | CCR.1.1 TDD | | NA | |
| | | | Config 3 | CCR.2.1 TDD | | NA | |
| SSB parameters | | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1,2,3,4 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SSB_RP Note 3 | | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io[Note3] | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16 MHz | Config 3 | -61.66 | -61.66 | -67.11 | -59.32 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 11520 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.2 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE

### 16.6.2.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.2.

### 16.6.2.2.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.2.4.1-3 and Table 16.6.2.2.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

16.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.2.4.1-1.

**Table 16.6.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.2-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.2-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.2-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.2-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.2.4.1-2.

**Table 16.6.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.2.2.4.1-3 below.
2. Message contents are defined in clause 16.6.2.2.4.3.
3. There two cells on two carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.2.2.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | | |
| CP length | | Config 1, 2, 3, 4 | Normal | | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | | |

| | | | | | |
|---|---|---|---|---|---|
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | | |
| T2 | s | Config 1, 2, 3, 4 | 1.1 | 11 | |

**Table 16.6.2.2.4.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Test 1 & 3 | Test 2 & 4 | Comment |
|---|---|---|---|
| | Value | Value | |
| *drx-onDurationTimer* | ms1 | ms1 | As specified in clause 6.3.2 in TS 38.331 [13] |
| *drx-InactivityTimer* | ms1 | ms1 | |
| *drx-RetransmissionTimerDL* | sl1 | sl1 | |
| *drx-RetransmissionTimerUL* | sl1 | sl1 | |
| *drx-LongCycleStartOffset* | ms40 | Ms640 | |
| *shortDRX* | disable | disable | |

**Table 16.6.2.2.4.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Value | Comment |
|---|---|---|
| *TimeAlignmentTimer* | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 16.6.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1, 10240 ms for Test 2, 1080 ms for Test 3 and 10240 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.2.4.3 Message contents

Same as the message contents given in clause 6.6.2.2.4.3.

### 16.6.2.2.5 Test requirement

Table 16.6.2.2.4.1-3 and Table 16.6.2.2.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | Cell 2 |
|---|---|---|---|---|

| | | | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|---|
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3, 4 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | Config 1, 2, 3, 4 | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | Config 1, 2, 3, 4 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR.2.1 TDD | | NA | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | NA | |
| | | | Config 2 | CCR.1.1 TDD | | NA | |
| | | | Config 3 | CCR.2.1 TDD | | NA | |
| SSB parameters | | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1,2,3 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SSB_RP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16 MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.3 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used for 1 Rx UE

### 16.6.2.3.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.3.

#### 16.6.2.3.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.3.4.1-3 and Table 16.6.2.3.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

##### 16.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.3.4.1-1.

**Table 16.6.2.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.3-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.3-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.3-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.3-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.3.4.1-2.

**Table 16.6.2.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.3.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | | As specified in clause TS 38.133 [6] 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |

| | | | | |
|---|---|---|---|---|
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.1 | |

### 16.6.2.3.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 920 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.3.4.3 Message contents

Same as the message contents given in clause 6.6.2.1.4.3.

### 16.6.2.3.5 Test requirement

Table 16.6.2.3.4.1-3 and Table 16.6.2.3.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1, 2, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | | dBm/18.72 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |
| Propagation Condition | | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1000 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used for 2 Rx UE

### 16.6.2.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.4.

### 16.6.2.4.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.4.4.1-3 and Table 16.6.2.4.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.4.4.1-1.

**Table 16.6.2.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.4-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.4-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.4-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.4-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |
| Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.4.4.1-2.

**Table 16.6.2.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.4.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1 | |

### 16.6.2.4.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 920 ms Test 2 then the number of successful tests is increased by one. If

the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 16.6.2.4.4.3 Message contents

Same as the message contents given in clause 6.6.2.1.4.3.

### 16.6.2.4.5 Test requirement

Table 16.6.2.4.4.1-3 and Table 16.6.2.4.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.4.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR2.1 TDD | | NA | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | NA | |
| | | | Config 2 | CCR.1.1 TDD | | NA | |
| | | | Config 3 | CCR.2.1 TDD | | NA | |
| SSB parameters | | | Config 1, 2, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SSB_RP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.72 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSBRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### 16.6.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 1 Rx UE

#### 16.6.2.5.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

#### 16.6.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.5.

#### 16.6.2.5.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.5.4.1-3 and Table 16.6.2.5.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

##### 16.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.5.4.1-1.

**Table 16.6.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.5.4.1-2.

**Table 16.6.2.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.5.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |

| | | | | |
|---|---|---|---|---|
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.3 | |

### 16.6.2.5.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1242 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.5.4.3 Message contents

Same as the message contents given in clause 6.6.2.1.4.3.

### 16.6.2.5.5 Test requirement

Table 16.6.2.5.4.1-3 and Table 16.6.2.5.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2, 3 | TDD | | | |
| | | Config 4 | HD-FDD | | | |
| TDD configuration | | Config 1, 4 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |
| | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1, 2, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | | dBm/18.72 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |

| | | | | |
|---|---|---|---|---|
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | AWGN |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x1 | 1x1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test is 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 2 Rx UE

### 16.6.2.6.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.6.

### 16.6.2.6.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.6.4.1-3 and Table 16.6.2.6.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.6.4.1-1.

**Table 16.6.2.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

| Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. |
|---|

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.6.4.1-2.

**Table 16.6.2.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.6.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.1 | |

### 16.6.2.6.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.2.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.2.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1042 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 16.6.2.6.4.3 Message contents

Same as the message contents given in clause 6.6.2.1.4.3.

### 16.6.2.6.5 Test requirement

Table 16.6.2.6.4.1-3 and Table 16.6.2.6.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1, 2, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4A | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1, 2, 3, 4 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SSB_RP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.36 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test is 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.7 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 1 Rx UE

### 16.6.2.7.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.7.

### 16.6.2.7.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.7.4.1-3 and Table 16.6.2.7.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.7.4.1-1.

**Table 16.6.2.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.7-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.7-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.7.4.1-2.

**Table 16.6.2.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.7.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |

| | | | | | |
|---|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | | As specified in TS 38.133 [6] clause 9.1A.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | | |
| CP length | | Config 1, 2, 3, 4 | Normal | | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | | Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 µs | | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | | |
| T2 | s | Config 1, 2, 3, 4 | 1.5 | 16 | |

### 16.6.2.7.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.6.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.6.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1440 ms for Test 1, 15360 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

### 16.6.2.7.4.3 Message contents

Same as the message contents given in clause 6.6.2.6.4.3.

### 16.6.2.7.5 Test requirement

Table 16.6.2.7.4.1-3 and Table 16.6.2.7.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | Config 1 | FDD | | | |
| | | Config 2, 3 | TDD | | | |
| | | Config 4 | HD-FDD | | | |
| TDD configuration | | Config 1, 4 | Not Applicable | | | |
| | | Config 2 | TDDConf.1.1 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | - | |
| | | | Config 2 | CR.1.1 TDD | | | |
| | | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | | Config 1, 4 | CCR.1.1 FDD | | - | |
| | | | Config 2 | CCR.1.1 TDD | | | |
| | | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4 | | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | Config 1, 2, 3, 4 | -98 | | -98 | |
| $N_{oc}$ Note2 | | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | | Config 3 | -91 | -91 | -Infinity | -88 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io[Note3] | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.36 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x1 | | 1x1 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 15360 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1 and 2 the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.8 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 2 Rx UE

### 16.6.2.8.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.8.

### 16.6.2.8.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.8.4.1-3 and Table 16.6.2.8.5-1, respectively. In the measurement configuration a measurement object is

configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.8.4.1-1.

**Table 16.6.2.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.8-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.8-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.8.4.1-2.

**Table 16.6.2.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.8.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 0 | | As specified in TS 38.133 [6] clause 9.1A.2-1. |
| Measurement gap offset | | Config 1, 2, 3, 4 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | | |
| CP length | | Config 1, 2, 3, 4 | Normal | | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | DRX.7 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |

| | | | | | |
|---|---|---|---|---|---|
| | | Config 2, 3 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | | |
| T2 | s | Config 1, 2, 3, 4 | 1.3 | 13.5 | |

### 16.6.2.8.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.6.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.6.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1260 ms for Test 1, 12160 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.8.4.3 Message contents

Same as the message contents given in clause 6.6.2.6.4.3.

### 16.6.2.8.5 Test requirement

Table 16.6.2.8.4.1-3 and Table 16.6.2.8.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | | |
| | | | Config 3 | SR2.1 TDD | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| RMSI CORESET Reference Channel | | Config 1, 4 | CR.1.1 FDD | | - | |
| | | Config 2 | CR.1.1 TDD | | | |
| | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | CCR.1.1 FDD | | - | |
| | | Config 2 | CCR.1.1 TDD | | | |
| | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4 | | Config 1, 4 | SMTC.2 | | SMTC.5 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1, 2, 4 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1, 2, 3, 4 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.36 MHz | Config 3 | -61.68 | -61.68 | -67.13 | -59.34 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1260 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1 and 2 the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.9 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 1 Rx UE

Editor's Note:

- Antenna configuration missing in TS 38.133

### 16.6.2.9.1 Test purpose

To verify that the UE makes correct reporting of an event when mandatory gap pattern with 3 ms MGL is configured. This test will partly verify the inter-frequency cell search requirements in TS 38.133 [6] clause 9.3B.4.

### 16.6.2.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting *supportedGapPattern-NRonly-r16* and Gap Pattern 3.

### 16.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.9.

### 16.6.2.9.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.9.4.1-3 and Table 16.6.2.9.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.9.4.1-1.

**Table 16.6.2.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.9-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.9-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.9-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.9-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.9.4.1-2.

**Table 16.6.2.9.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.9.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | | |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 3 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 4 | 12 | | |
| | | Config 2, 3 | 9 | | |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | | |
| CP length | | Config 1, 2, 3, 4 | Normal | | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | | |
| T2 | s | Config 1, 2, 3, 4 | 1.5 | 1 | |

16.6.2.9.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.9.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.9.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1440 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 16.6.2.9.4.3 Message contents

Same as the message contents given in clause 6.6.2.9.4.3 with the following exceptions:

**Table 16.6.2.9.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Default Message Contents | |
|---|---|
| Specific message contents exceptions for Test Configuration 16.6.2.9-1 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 12 |
| Specific message contents exceptions for Test Configuration 16.6.2.9-2 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 16.6.2.9-3 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 16.6.2.9-4 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 12 |

#### 16.6.2.9.5 Test requirement

Table 16.6.2.9.4.1-3 and Table 16.6.2.9.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.9.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 2 | SR.1.1 TDD | | | |
| | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1, 4 | CR.1.1 FDD | | - | |
| | | Config 2 | CR.1.1 TDD | | | |
| | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | CCR.1.1 FDD | | - | |
| | | Config 2 | CCR.1.1 TDD | | | |
| | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4 | | Config 1, 4 | SMTC.1 | | SMTC.9 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1, 2, 4 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.36 MHz | Config 3 | -61.66 | -61.66 | -67.11 | -59.32 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x1 | | 1x1 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.10 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 2 Rx UE

### 16.6.2.10.1 Test purpose

To verify that the UE makes correct reporting of an event when mandatory gap pattern with 3 ms MGL is configured.

### 16.6.2.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting *supportedGapPattern-NRonly-r16* and Gap Pattern 3.

### 16.6.2.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.10.

### 16.6.2.10.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.10.4.1-3 and Table 16.6.2.10.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.10.4.1-1.

**Table 16.6.2.10.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.10-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.10-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.10-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.10-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.10.4.1-2.

**Table 16.6.2.10.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.10.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2 |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.10.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1, 2, 3, 4 | 3 | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1, 4 | 12 | |
| | | Config 2, 3 | 9 | |
| SMTC-SSB parameters | | Config 1, 4 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 2 | SSB.1 FR1 | As specified in clause A.3.10.1 |
| | | Config 3 | SSB.1 RedCap FR1 | As specified in clause A.3.10.1 |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.5 | |

### 16.6.2.10.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.9.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.9.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 16.6.2.10.4.3 Message contents

Same as the message contents given in clause 6.6.2.9.4.3 with the following exception:

**Table 16.6.2.10.4.3-1: Common Exception messages SA inter-frequency event triggered reporting with additional mandatory gap pattern**

| Default Message Contents | |
|---|---|
| Specific message contents exceptions for Test Configuration 16.6.2.10-1 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 12 |
| Specific message contents exceptions for Test Configuration 16.6.2.10-2 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 16.6.2.10-3 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 9 |
| Specific message contents exceptions for Test Configuration 16.6.2.10-4 | Table H.3.1-6 with Conditions gapUE, Pattern #3 and gap offset = 12 |

#### 16.6.2.10.5 Test requirement

Table 16.6.2.10.4.1-3 and Table 16.6.2.10.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.10.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| | | | Config 4 | HD-FDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.2 | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Config 2 | SR.1.1 TDD | | | |
| | | Config 3 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1, 4 | CR.1.1 FDD | | - | |
| | | Config 2 | CR.1.1 TDD | | | |
| | | Config 3 | CR2.1 TDD | | | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | CCR.1.1 FDD | | - | |
| | | Config 2 | CCR.1.1 TDD | | | |
| | | Config 3 | CCR.2.1 TDD | | | |
| SSB parameters | | Config 1, 4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | Config 3 | SSB.1 RedCap FR1 | | SSB.3 RedCap FR1 | |
| SMTC configuration defined in A.4 | | Config 1, 4 | SMTC.1 | | SMTC.9 | |
| | | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1, 2, 4 | 15 | | | |
| | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/18.36 MHz | Config 3 | -61.66 | -61.66 | -67.11 | -59.32 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |
| Antenna Configuration | | Config 1, 2, 3, 4 | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

The UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.11 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 1 Rx UE

### 16.6.2.11.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency NR cell search without measurement gap requirements in TS 38.133 [6] clause 9.3B.7.

### 16.6.2.11.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx which supports *interFrequencyMeas-Nogap-r16* from Release 17 onwards and long DRX cycle.

### 16.6.2.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.11.

### 16.6.2.11.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.11.4.1-3 and Table 16.6.2.11.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.11.4.1-1.

**Table 16.6.2.11.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.11-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.11-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.11-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.11-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.11.4.1-2.

**Table 16.6.2.11.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.11.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.11.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies is used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 μs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.5 | |

**Table 16.6.2.11.4.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting**

| Field | Value | Comment |
|---|---|---|
| *TimeAlignmentTimer* | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 16.6.2.11.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.10.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.10.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1282 ms for Test Configurations 1 and 4 and 922 ms for Test

Configurations 2 and 3 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.11.4.3 Message contents

Same as the message contents given in clause 6.6.2.10.4.3.

### 16.6.2.11.5 Test requirement

Table 16.6.2.11.4.1-3 and Table 16.6.2.11.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.11.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1, 4 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3, 4 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | Config 1, 2, 3, 4 | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | Config 1, 2, 3, 4 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR2.1 TDD | | NA | |
| SSB parameters | | | Config 1, 4 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.1 RedCap FR1 | |
| SMTC configuration defined in A.3.11 | | | Config 1, 4 | SMTC.2 | | SMTC.2 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1, 2, 3, 4 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/38.16 MHz | Config 3 | -61.66 | -61.66 | -67.11 | -59.32 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test config 1 and 4, UE is required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test config 2 and 3, UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test is 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.2.12 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 2 Rx UE

### 16.6.2.12.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the inter-frequency NR cell search without measurement gap requirements in TS 38.133 [6] clause 9.3B.7.

### 16.6.2.12.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx which supports *interFrequencyMeas-Nogap-r16* from Release 17 onwards and long DRX cycle.

### 16.6.2.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.2.12.

### 16.6.2.12.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the different frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.2.12.4.1-3 and Table 16.6.2.12.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the neighbour cell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

#### 16.6.2.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.2.12.4.1-1.

**Table 16.6.2.12.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.2.12-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.2.12-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.2.12-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.2.12-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.2.12.4.1-2.

**Table 16.6.2.12.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.2.12.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.2.12.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1, 2, 3, 4 | 1, 2 | Two FR1 NR carrier frequencies are used. |
| Active cell | | Config 1, 2, 3, 4 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1, 2, 3, 4 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| *A3-Offset* | dB | Config 1, 2, 3, 4 | -6 | |
| *Hysteresis* | dB | Config 1, 2, 3, 4 | 0 | |
| CP length | | Config 1, 2, 3, 4 | Normal | |
| TimeToTrigger | s | Config 1, 2, 3, 4 | 0 | |
| Filter coefficient | | Config 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | Config 1, 2, 3, 4 | DRX.1 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | Config 2, 3 | 3 µs | Synchronous cells. |
| T1 | s | Config 1, 2, 3, 4 | 5 | |
| T2 | s | Config 1, 2, 3, 4 | 1.5 | |

**Table 16.6.2.12.4.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection**

| Field | Value | Comment |
|---|---|---|
| *TimeAlignmentTimer* | ms500 | As specified in clause 6.3.2 in TS 38.331 [13] |

### 16.6.2.12.4.2 Test procedure

Same as the test procedure given in clause 6.6.2.10.4.2 with following exceptions:

- Step 6 in test procedure in clause 6.6.2.10.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1122 ms for Test Configurations 1 and 4 and 922 ms for Test Configurations 2 and 3, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.2.12.4.3 Message contents

Same as the message contents given in clause 6.6.2.10.4.3.

16.6.2.12.5 Test requirement

Table 16.6.2.12.4.1-3 and Table 16.6.2.12.5-1 define the primary level settings including test tolerances.

**Table 16.6.2.12.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | Config 1, 2, 3, 4 | 1 | | 2 | |
| Duplex mode | | | Config 1, 4 | FDD | | | |
| | | | Config 2, 3 | TDD | | | |
| TDD configuration | | | Config 1, 4 | Not Applicable | | | |
| | | | Config 2 | TDDConf.1.1 | | | |
| | | | Config 3 | TDDConf.2.1 | | | |
| $BW_{channel}$ | | MHz | Config 1, 2, 4 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP BW | | MHz | Config 1, 2 | 10: $N_{RB,c}$ = 52 | | | |
| | | | Config 3 | 20: $N_{RB,c}$ = 51 | | | |
| BWP configuration | Initial DL BWP | | Config 1, 2, 3, 4 | DLBWP.0.1 | | NA | |
| | Initial UL BWP | | Config 1, 2, 3, 4 | ULBWP.0.1 | | NA | |
| | Dedicated DL BWP | | Config 1, 2, 3, 4 | DLBWP.1.1 | | NA | |
| | Dedicated UL BWP | | Config 1, 2, 3, 4 | ULBWP.1.1 | | NA | |
| TRS configuration | | | Config 1, 4 | TRS.1.1 FDD | | NA | |
| | | | Config 2 | TRS.1.1 TDD | | NA | |
| | | | Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1, 2, 3, 4 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1, 4 | SR.1.1 FDD | | NA | |
| | | | Config 2 | SR.1.1 TDD | | NA | |
| | | | Config 3 | SR2.1 TDD | | NA | |
| CORESET Reference Channel | | | Config 1, 4 | CR.1.1 FDD | | NA | |
| | | | Config 2 | CR.1.1 TDD | | NA | |
| | | | Config 3 | CR2.1 TDD | | NA | |
| SSB parameters | | | Config 1, 4 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| | | | Config 3 | SSB.1 RedCap FR1 | | SSB.1 RedCap FR1 | |
| SMTC configuration defined in A.3.11 | | | Config 1, 4 | SMTC.2 | | SMTC.2 | |
| | | | Config 2, 3 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1, 2, 4 | 15 | | | |
| | | | Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | | | Config 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | Config 1, 2, 3, 4 | -98 | | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | Config 1, 2, 4 | -98 | | -98 | |
| | | Config 3 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1, 2, 4 | -94 | -94 | -Infinity | -91 |
| | | Config 3 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1, 2, 3, 4 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1, 2, 4 | -64.59 | -64.59 | -70.05 | -62.2 |
| | dBm/18.36 MHz | Config 3 | -61.66 | -61.66 | -67.11 | -59.32 |
| Propagation Condition | | Config 1, 2, 3, 4 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test config 1 and 4, UE is required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1120 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test config 2 and 3, UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test is 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.3 Inter-RAT measurements for RedCap

### 16.6.3.0 Minimum conformance requirements

#### 16.6.3.0.1 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN FDD

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- For 2 Rx RedCap UE:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.3 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.5 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

- For 1 Rx RedCap UE:
  - RSRP related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2A.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
  - RSRQ related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2A.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

#### 16.6.3.0.1.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within $T_{\text{Identify_RedCap, E-UTRAN FDD}}$ according to the following expression:

$$T_{\text{Identify_RedCap,E-UTRAN FDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1_RedCap}}} \cdot \text{CSSF}_{\text{interRAT_RedCap}} \quad ms,$$

where:

$T_{\text{BasicIdentify}}$ = 480 ms,

$T_{\text{Inter1_RedCap}}$ is defined in TS 38.133 [6] clause 9.4A.1,

$\text{CSSF}_{\text{interRAT_RedCap}} = \text{CSSF}_{\text{within_gap_RedCap,i}}$ is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in TS 38.133 [6] clause 9.1A.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{\text{Measure_RedCap, E-UTRAN FDD}}$ defined in Table 16.6.3.0.1.1-1 and Table 16.6.3.0.1.1-2 for 2 Rx RedCap UE and 1 Rx RedCap UE, respectively.

**Table 16.6.3.0.1.1-1: Measurement period and measurement bandwidth for 2 Rx RedCap UE**

| Configuration | Physical Layer Measurement period: $T_{\text{Measure_RedCap, E-UTRAN FDD}}$ [ms] | Measurement bandwidth [RB] |
|---|---|---|
| 0 | 480 x $\text{CSSF}_{\text{interRAT_RedCap}}$ | 6 |
| 1 (Note 1) | 240 x $\text{CSSF}_{\text{interRAT_RedCap}}$ | 50 |
| NOTE 1: This configuration is optional. | | |

**Table 16.6.3.0.1.1-2: Measurement period and measurement bandwidth for 1 Rx RedCap UE**

| Configuration | Physical Layer Measurement period: $T_{\text{Measure_RedCap, E-UTRAN FDD}}$ [ms] | Measurement bandwidth [RB] |
|---|---|---|
| 0 | 960 x $\text{CSSF}_{\text{interRAT_RedCap}}$ | 6 |
| 1 (Note 1) | 480 x $\text{CSSF}_{\text{interRAT_RedCap}}$ | 50 |
| NOTE 1: This configuration is optional. | | |

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

For 2 Rx RedCap UE:

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.5.

For 1 Rx RedCap UE:

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.3.

#### 16.6.3.0.1.2 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within $T_{Identify_RedCap,\ E\text{-}UTRAN\ FDD}$ specified in Table 16.6.3.0.1-1.

**Table 16.6.3.0.1.2-1: Requirement to identify a newly detectable E-UTRAN FDD cell**

| DRX cycle length (s) | $T_{Identify_RedCap,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) | |
|---|---|---|
| | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤ 0.16 | Non-DRX requirements in clause 9.4A.2.2 apply | Non-DRX requirements in clause 9.4A.2.2 apply |
| 0.256 | 5.12* $CSSF_{interRAT_RedCap}$ (20*$CSSF_{interRAT_RedCap}$) | 7.68* $CSSF_{interRAT_RedCap}$ (30*$CSSF_{interRAT_RedCap}$) |
| 0.32 | 6.4* $CSSF_{interRAT_RedCap}$ (20*$CSSF_{interRAT_RedCap}$) | 7.68* $CSSF_{interRAT_RedCap}$ (24*$CSSF_{interRAT_RedCap}$) |
| 0.32 < DRX-cycle ≤ 10.24 | Note1 (20*$CSSF_{interRAT_RedCap}$) | Note1 (20*$CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in TS 38.133 [6] clause 9.4A.2.2. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure_RedCap,\ E\text{-}UTRAN\ FDD}$ specified in Table 16.6.3.0.1-2 and Table 16.6.3.0.1-3.

**Table 16.6.3.0.1.2-2: Requirement to measure E-UTRAN FDD cells for 2 Rx RedCap UE**

| DRX cycle length (s) | $T_{measure_RedCap,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) |
|---|---|
| ≤ 0.08 | Non-DRX requirements in clause 9.4A.2.2 apply |
| 0.08 < DRX-cycle ≤ 10.24 | Note1 (5* $CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in TS 38.133 [6] clause 9.4A.2.2. | |

**Table 16.6.3.0.1.2-3: Requirement to measure E-UTRAN FDD cells for 1 Rx RedCap UE**

| DRX cycle length (s) | $T_{measure_RedCap,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles) |
|---|---|
| ≤ 0.08 | Non-DRX requirements in clause 9.4A.2.2 apply |
| 0.08 < DRX-cycle ≤ 10.24 | Note1 (10* $CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in clause TS 38.133 [6] 9.4A.2.2. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

For 2 Rx RedCap UE:

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.5.

For 1 Rx RedCap UE:

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.3.

#### 16.6.3.0.1.3 Measurement reporting requirements for Event-Triggered Reporting

For 2 Rx RedCap UE: The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

For 1 Rx RedCap UE: The reported NR – E-UTRAN FDD RSRP and RSRQ measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2A.2 and 10.2A.3, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$ where $TTI_{DCCH}$ is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify_RedCap,\ E\text{-}UTRAN\ FDD}$ defined in clauses 16.6.3.0.1.1 and 16.6.3.0.1.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify_RedCap,\ E\text{-}UTRAN\ FDD}$ becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure_RedCap,\ E\text{-}UTRAN\ FDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

### 16.6.3.0.2 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN TDD

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- For 2 Rx RedCap UE:
  - RSRP related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
  - RSRQ related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.3 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

    RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2.5 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].
- For 1 Rx RedCap UE:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2A.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] clause 10.2A.3 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

#### 16.6.3.0.2.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within $T_{\text{Identify_RedCap, E-UTRAN TDD}}$ according to the following expression:

- When configuration 0 or configuration 1 in Table 16.6.3.0.2.1-1 is applied,

$$T_{\text{Identify_RedCap,E-UTRAN TDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1_RedCap}}} \cdot \text{CSSF}_{\text{interRAT_RedCap}} \quad ms,$$

- When configuration 2 or configuration 3 in Table 16.6.3.0.2.1-1 is applied,

$$T_{\text{Identify_RedCap,E-UTRAN TDD}} = T_{\text{BasicIdentify}} \cdot \frac{480}{T_{\text{Inter1_RedCap}}} \cdot \text{CSSF}_{\text{interRAT_RedCap}} + 240 \cdot \text{CSSF}_{\text{interRAT_RedCap}} \quad ms,$$

where:

$T_{\text{BasicIdentify}}$ = 480 ms,

$T_{\text{Inter1_RedCap}}$ is defined in TS 38.133 [6] clause 9.4A.1,

$\text{CSSF}_{\text{interRAT_RedCap}} = \text{CSSF}_{\text{within_gap_RedCap,i}}$ is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in TS 38.133 [6] clause 9.1A.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{\text{Measure_RedCap, E-UTRAN TDD}}$ defined in Table 16.6.3.0.2.1-1 and Table 16.6.3.0.2.1-2 for 2 Rx RedCap UE and 1 Rx RedCap UE, respectively.

**Table 16.6.3.0.2.1-1: $T_{\text{Measure_RedCap, E-UTRAN TDD}}$ for different configurations for 2 Rx RedCap UE**

| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) | | DwPTS | | $T_{\text{Measure_RedCap, E-UTRAN TDD}}$ (ms) |
|---|---|---|---|---|---|---|
| | | DL | UL | Normal CP | Extended CP | |
| 0 | 6 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 480 x $\text{CSSF}_{\text{interRAT_RedCap}}$ |
| 1 (Note 1) | 50 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 240 x $\text{CSSF}_{\text{interRAT_RedCap}}$ |
| 2 | 6 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 720 x $\text{CSSF}_{\text{interRAT_RedCap}}$ |
| 3 (Note 1) | 50 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 480 x $\text{CSSF}_{\text{interRAT_RedCap}}$ |
| NOTE 1: This configuration is optional. | | | | | | |

**Table 16.6.3.0.2.1-2: $T_{\text{Measure_RedCap, E-UTRAN TDD}}$ for different configurations for 1 Rx RedCap UE**

| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) | | DwPTS | | $T_{\text{Measure_RedCap, E-UTRAN TDD}}$ (ms) |
|---|---|---|---|---|---|---|
| | | DL | UL | Normal CP | Extended CP | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 6 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 960 x $CSSF_{interRAT_RedCap}$ |
| 1 (Note 1) | 50 | 2 | 2 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 480 x $CSSF_{interRAT_RedCap}$ |
| 2 | 6 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 1440 x $CSSF_{interRAT_RedCap}$ |
| 3 (Note 1) | 50 | 1 | 3 | $19760 \cdot T_s$ | $20480 \cdot T_s$ | 960 x $CSSF_{interRAT_RedCap}$ |
| NOTE 1: This configuration is optional. | | | | | | |

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

For 2 Rx RedCap UE:

- The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.5.

For 1 Rx RedCap UE:

- The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.3.

#### 16.6.3.0.2.2 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within $T_{Identify_RedCap,\ E\text{-}UTRAN\ TDD}$ specified in Table 16.6.3.0.2.2-1.

**Table 16.6.3.0.2.2-1: Requirement to identify a newly detectable E-UTRAN TDD cell**

| DRX cycle length (s) | $T_{Identify_RedCap,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) | |
|---|---|---|
| | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4A.3.2 apply | Non-DRX requirements in clause 9.4A.3.2 apply |
| 0.256 | 5.12* $CSSF_{interRAT_RedCap}$ (20*$CSSF_{interRAT_RedCap}$) | 7.68* $CSSF_{interRAT_RedCap}$ (30*$CSSF_{interRAT_RedCap}$) |
| 0.32 | 6.4* $CSSF_{interRAT_RedCap}$ (20*$CSSF_{interRAT_RedCap}$) | 7.68* $CSSF_{interRAT_RedCap}$ (24*$CSSF_{interRAT_RedCap}$) |
| 0.32 < DRX-cycle ≤ 10.24 | Note1 (20*$CSSF_{interRAT_RedCap}$) | Note1 (20*$CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in TS 38.133 [6] clause 9.4A.3.2. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure_RedCap,\ E\text{-}UTRAN\ TDD}$ specified in Table 16.6.3.0.2.2-2 and Table 16.6.3.0.2.2-3 for 2 Rx RedCap UE and 1 Rx RedCap UE, respectively.

**Table 16.6.3.0.2.2-2: Requirement to measure E-UTRAN TDD cells for 2 Rx RedCap UE**

| DRX cycle length (s) | $T_{measure_RedCap,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) |
|---|---|

| | |
|---|---|
| ≤ 0.08 | Non-DRX Requirements in clause 9.4A.3.2 apply |
| 0.128 | For configuration 2 Note3, non-DRX requirements in clause 9.4A.3.2 apply, Otherwise: Note1 (5*$CSSF_{interRAT_RedCap}$) |
| 0.128 < DRX-cycle ≤ 10.24 | Note1 (5*$CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in TS 38.133 [6] clause 9.4A.3.2.<br>NOTE 3: See Table 16.6.3.0.2.1-1. | |

**Table 16.6.3.0.2.2-3: Requirement to measure E-UTRAN TDD cells for 1 Rx RedCap UE**

| DRX cycle length (s) | $T_{measure_RedCap,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles) |
|---|---|
| ≤ 0.08 | Non-DRX Requirements in clause 9.4A.3.2 apply |
| 0.128 | For configuration 2 Note3, non-DRX requirements in clause 9.4A.3.2 apply, Otherwise: Note1 (5*$CSSF_{interRAT_RedCap}$) |
| 0.128 < DRX-cycle ≤ 10.24 | Note1 (10*$CSSF_{interRAT_RedCap}$) |
| NOTE 1: The time depends on the DRX cycle length.<br>NOTE 2: $CSSF_{interRAT_RedCap}$ is as defined in clause TS 38.133 [6] 9.4A.3.2.<br>NOTE 3: See Table 9.4A.3.2-1 in TS 38.133 [6]. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

For 2 Rx RedCap UE:

- The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2.5.

For 1 Rx RedCap UE:

- The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clause 10.2A.3.

### 16.6.3.0.2.3 Measurement reporting requirements for Event-Triggered Reporting

For 2 Rx RedCap UE: The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

For 1 Rx RedCap UE: The reported NR – E-UTRAN TDD RSRP and RSRQ measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2A.2 and 10.2A.3, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$ where $TTI_{DCCH}$ is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify_RedCap,\ E\text{-}UTRAN\ TDD}$ defined in clauses 16.6.3.0.2.1 and 16.6.3.0.2.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify_RedCap,\ E\text{-}UTRAN\ TDD}$ becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event

triggered measurement reporting delay shall be less than $T_{Measure_RedCap,\ E\text{-}UTRAN\ TDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

## 16.6.3.1 NR - E-UTRA event-triggered reporting in non-DRX for 1 Rx UE

### 16.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the NR - E-UTRAN inter-RAT cell search requirements in TS 38.133 [6] clauses 9.4A.2 and 9.4A.3.

### 16.6.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.3.0.1 and 16.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.3.1.

### 16.6.3.1.4 Test description

Two cells are deployed in the test, Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.3.1.4.1-3, Table 16.6.3.1.5-1 and Table 16.6.3.1.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event B2 is used. The test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

#### 16.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.3.1.4.1-1.

**Table 16.6.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.3.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.1-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.1-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.6.3.1-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.3.1.4.1-2.

**Table 16.6.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.3.1.4.1-3 below.

2. Message contents are defined in clause 16.6.3.1.4.3.

3. There are two carriers and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.3.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 16.6.3.1.5-1 and 16.6.3.1.5-2 | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 1 |
| Gap Pattern Id | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| *b2-Threshold1* | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *b2-Threshold2EUTRA* | dBm | -96 Note2 | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *Hysteresis* | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in Table 16.6.3.1.5-1.<br>Note 2: Includes test tolerance as detailed in Annex F.1.3.2. | | | |

### 16.6.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.6.3.1.4.2 with following exceptions:

- Step 6 in clause 6.6.3.1.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842 ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement, then the number of failure tests is increased by one.

### 16.6.3.1.4.3 Message contents

Same as the message contents given in clause 6.6.3.1.4.3.

### 16.6.3.1.5 Test requirement

Tables 16.6.3.1.4.1-3, 16.6.3.1.5-1 and 16.6.3.1.5-2 define the primary level settings including test tolerances.

**Table 16.6.3.1.5-1: NR PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | 1, 3, 7, 8 | FDD | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 2, 4, 5, 6 | TDD | |
| TDD Configuration | SCS = 15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS = 30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52 (TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 FR1 | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| *b2-Threshold1* | | dBm | 1, 2, 4, 5, 7, 8 | -95 [Note4] | |
| | | | 3, 6 | -92 [Note4] | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -104 | |
| | | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 19.55 | -1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 19.55 | -1.55 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -84.45 | -105.55 |
| | | | 3, 6 | -81.45 | -102.55 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -84.45 | -105.55 |
| | | | 3, 6 | -81.45 | -102.55 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -56.45 | -73.74 |

| | | | | |
|---|---|---|---|---|
| | dBm/18.36 MHz | 3, 6 | -53.52 | -70.82 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x1 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Includes test tolerances as detailed in Annex F.1.3.2.

**Table 16.6.3.1.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |

| | | | | |
|---|---|---|---|---|
| PDSCH_RB<br>OCNG_RA[Note3]<br>OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| RSRP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45 |
| SCH_RP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45 |
| Io[Note5] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -76.22+10log ($N_{RB,c}$ /50) | -57.61+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x1 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3840 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.3.2 NR - E-UTRA event-triggered reporting in non-DRX for 2 Rx UE

### 16.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the NR - E-UTRAN inter-RAT cell search requirements in TS 38.133 [6] clauses 9.4A.2 and 9.4A.3.

### 16.6.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.3.0.1 and 16.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.3.2.

### 16.6.3.2.4 Test description

Two cells are deployed in the test, Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.3.2.4.1-3, Table

16.6.3.2.5-1 and Table 16.6.3.2.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than *threshold2*) is used. The test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

#### 16.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.3.2.4.1-1.

**Table 16.6.3.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.3.2-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.2-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.2-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.6.3.2-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.3.2.4.1-2.

**Table 16.6.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.3.2.4.1-3 below.
2. Message contents are defined in clause 16.6.3.2.4.3.
3. There are two carriers and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.3.2.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 16.6.3.2.5-1 and 16.6.3.2.5-2. | |
| Active cell | | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | Cell 2 is on RF channel number 1 |
| Gap Pattern Id | | 0 | As specified in TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | Measurement quantity for Cell 2 |
| *b2-Threshold1* | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |

| | | | |
|---|---|---|---|
| *b2-Threshold2EUTRA* | dBm | -95 | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *Hysteresis* | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | OFF |
| T1 | s | 5 | |
| T2 | s | 5 | |
| Note 1: Values are defined in Table 16.6.3.2.5-1. | | | |

### 16.6.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.6.3.1.4.2 with following exceptions:

- Step 6 in clause 6.6.3.1.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842 ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement, then the number of failure tests is increased by one.

### 16.6.3.2.4.3 Message contents

Same as the message contents given in clause 6.6.3.1.4.3.

### 16.6.3.2.5 Test requirement

Tables 16.6.3.2.4.1-3, 16.6.3.2.5-1 and 16.6.3.2.5-2 define the primary level settings including test tolerances.

**Table 16.6.3.2.5-1: NR PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | | 1, 3, 7, 8 | FDD | |
| | | | 2, 4, 5, 6 | TDD | |
| TDD Configuration | SCS = 15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS = 30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52(TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.1.1 | |

| | | | | |
|---|---|---|---|---|
| OCNG pattern[Note1] | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 FR1 | |
| SSB configuration | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | 3, 6 | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | 2, 5 | TRS.1.1 TDD | |
| | | 3, 6 | TRS.1.2 TDD | |
| *b2-Threshold1* | dBm | 1, 2, 4, 5, 7, 8 | -96 | |
| | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$[Note2] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $N_{oc}$[Note2] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -104 | |
| | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 17.55 | -1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 17.55 | -1.55 |
| SS-RSRP[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -86.45 | -105.55 |
| | | 3, 6 | -83.45 | -102.55 |
| SSB_RP[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -86.45 | -105.55 |
| | | 3, 6 | -83.45 | -102.55 |
| Io[Note3] | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -58.42 | -73.74 |
| | dBm/38.16 MHz | 3, 6 | -55.50 | -70.82 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.6.3.2.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |

| | | | | |
|---|---|---|---|---|
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| RSRP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45 |
| SCH_RP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.3+TT |
| Io[Note5] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -76.22+10log ($N_{RB,c}$ /50) | -57.61+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Note 5: | $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
|---|---|

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3840 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.3.3 NR - E-UTRA event-triggered reporting in DRX for 1 Rx UE

### 16.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the NR - E-UTRAN inter-RAT cell search requirements in TS 38.133 [6] clauses 9.4A.2 and 9.4A.3.

### 16.6.3.3.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.3.0.1 and 16.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.3.3.

### 16.6.3.3.4 Test description

Two cells are deployed in the test, Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.3.3.4.1-3, Table 16.6.3.3.5-1 and Table 16.6.3.3.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event B2 is used. The test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

#### 16.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.3.3.4.1-1.

**Table 16.6.3.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.3.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.3.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.3-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.3.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.3-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.3-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.6.3.3-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.3.3.4.1-2.

**Table 16.6.3.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.3.3.4.1-3 below.

2. Message contents are defined in clause 16.6.3.3.4.3.

3. There are two carriers and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.3.3.4.1-3: General test parameters**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Test 1 | Test 2 | |
| NR RF Channel Number | | 1 | | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 16.6.3.3.5-1 and 16.6.3.3.5-2. | | |
| Active cell | | Cell 1 | | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | | As specified in TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | | Measurement quantity for Cell 2 |
| *b2-Threshold1* | dBm | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *b2-Threshold2EUTRA* | dBm | -96 Note2 | | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *Hysteresis* | dB | 0 | | |
| TimeToTrigger | s | 0 | | |
| Filter coefficient | | 0 | | L3 filtering is not used |
| DRX | | DRX.1 | DRX.7 | DRX cycle configurations DRX.1 and DRX.7 are defined in TS 38.133 [6] Table A.3.3.1-1 and Table A.3.3.7-1 respectively. |
| T1 | s | 5 | | |
| T2 | s | 5 | 15 | |
| Note 1: Values are defined in Table 16.6.3.3.5-1.<br>Note 2: Includes test tolerance as detailed in Annex F.1.3.2. | | | | |

### 16.6.3.3.4.2 Test procedure

Same as the test procedure given in clause 6.6.3.2.4.2 with following exceptions:

- Step 6 in clause 6.6.3.2.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842 ms for Test 1 or less than 12802 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

#### 16.6.3.3.4.3 Message contents

Same as the message contents given in clause 6.6.3.2.4.3.

### 16.6.3.3.5 Test requirement

Tables 16.6.3.3.4.1-3, 16.6.3.3.5-1 and 16.6.3.3.5-2 define the primary level settings including test tolerances.

**Table 16.6.3.3.5-1: NR PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1**

| Parameter | | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|---|
| | | | | T1 | T2 |
| RF channel number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |
| Duplex mode | | | 1, 3, 7, 8 | FDD | |
| | | | 2, 4, 5, 6 | TDD | |
| TDD Configuration | SCS = 15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS = 30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52(TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 FR1 | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| *b2-Threshold1* | | dBm | 1, 2, 4, 5, 7, 8 | -95 [Note4] | |
| | | | 3, 6 | -92 [Note4] | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS | | | | |
| $N_{oc}$[Note2] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $N_{oc}$[Note2] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -104 | |
| | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 19.55 | -1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 19.55 | -1.55 |
| SS-RSRP[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -84.45 | -105.55 |
| | | 3, 6 | -81.45 | -102.55 |
| SSB_RP[Note3] | dBm/SCS | 1, 2, 4, 5, 7, 8 | -84.45 | -105.55 |
| | | 3, 6 | -81.45 | -102.55 |
| Io[Note3] | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -56.45 | -73.74 |
| | dBm/38.16 MHz | 3, 6 | -53.52 | -70.82 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x1 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Includes test tolerances as detailed in Annex F.1.3.2.

**Table 16.6.3.3.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD | |

| | | | | |
|---|---|---|---|---|
| | | | 20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$ Note5 | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| RSRP Note5 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45 |
| SCH_RP Note5 | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45 |
| Io Note5 | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -76.22+10log ($N_{RB,c}$ /50) | -57.61+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x1 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3840 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12800 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.3.4 NR - E-UTRA event-triggered reporting in DRX for 2 Rx UE

### 16.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the NR - E-UTRAN inter-RAT cell search requirements in TS 38.133 [6] clauses 9.4A.2 and 9.4A.3.

### 16.6.3.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.3.0.1 and 16.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.3.4.

### 16.6.3.4.4 Test description

Two cells are deployed in the test, Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.3.4.4.1-3, Table 16.6.3.4.5-1 and Table 16.6.3.4.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter-RAT neighbour becomes better than *threshold2*) is used. The test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

#### 16.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.3.4.4.1-1.

**Table 16.6.3.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.3.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.3.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.3.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.3.4-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.4-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.3.4-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 16.6.3.4-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 16.6.3.4.4.1-2.

**Table 16.6.3.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The test parameters for PCell and neighbour cell are given in Table 16.6.3.4.4.1-3 below.

2. Message contents are defined in clause 16.6.3.4.4.3.

3. There are two carriers and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 16.6.3.4.4.1-3: General test parameters**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Test 1 | Test 2 | |
| NR RF Channel Number | | 1 | | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 1 | | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables 16.6.3.4.5-1 and 16.6.3.4.5-2. | | |
| Active cell | | Cell 1 | | Cell 1 is on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 is on RF channel number 2 |
| Gap Pattern Id | | 0 | | As specified in TS 38.133 [6] Clause Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity | | SS-RSRP | | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity | | RSRP | | Measurement quantity for Cell 2 |
| *b2-Threshold1* | dBm | Note 1 | | SS-RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *b2-Threshold2EUTRA* | dBm | -95 | | E-UTRAN RSRP threshold for SS-RSRP measurement on Cell1 for event B2 |
| *Hysteresis* | dB | 0 | | |
| TimeToTrigger | s | 0 | | |
| Filter coefficient | | 0 | | L3 filtering is not used |
| DRX | | DRX.1 | DRX.7 | DRX cycle configurations DRX.1 and DRX.7 are defined in TS 38.133 [6] Table A.3.3.1-1 and Table A.3.3.7-1 respectively. |
| T1 | s | 5 | | |
| T2 | s | 5 | 15 | |
| Note 1: Values are defined in Table 16.6.3.4.5-1. | | | | |

### 16.6.3.4.4.2 Test procedure

Same as the test procedure given in clause 6.6.3.2.4.2 with following exceptions:

- Step 6 in clause 6.6.3.2.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3842 ms for Test 1 or less than 12802 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

### 16.6.3.4.4.3 Message contents

Same as the message contents given in clause 6.6.3.2.4.3.

### 16.6.3.4.5 Test requirement

Tables 16.6.3.4.4.1-3, 16.6.3.4.5-1 and 16.6.3.4.5-2 define the primary level settings including test tolerances.

**Table 16.6.3.4.5-1: NR PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| Duplex mode | | | 1, 3, 7, 8 | FDD | |
| | | | 2, 4, 5, 6 | TDD | |
| TDD Configuration | SCS = 15 kHz | | 2, 5 | TDDConf.1.1 | |
| | SCS = 30 kHz | | 3, 6 | TDDConf.2.1 | |
| $BW_{channel}$ | | MHz | 1, 4, 7, 8 | 10: $N_{RB,c}$ = 52 (FDD) | |
| | | | 2, 5 | 10: $N_{RB,c}$ = 52(TDD) | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 (TDD) | |
| PDSCH reference measurement channel | | | 1, 4, 7, 8 | SR.1.1 FDD | |
| | | | 2, 5 | SR.1.1 TDD | |
| | | | 3, 6 | SR.2.1 TDD | |
| RMSI CORSET reference channel | | | 1, 4, 7, 8 | CR.1.1 FDD | |
| | | | 2, 5 | CR.1.1 TDD | |
| | | | 3, 6 | CR.2.1 TDD | |
| Dedicated CORSET reference channel | | | 1, 4, 7, 8 | CCR.1.1 FDD | |
| | | | 2, 5 | CCR.1.1 TDD | |
| | | | 3, 6 | CCR.2.1 TDD | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.1.1 | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.1.1 | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 FR1 | |
| SSB configuration | | | 1, 2, 4, 5, 7, 8 | SSB.1 FR1 | |
| | | | 3, 6 | SSB.1 RedCap FR1 | |
| CSI-RS for tracking | | | 1, 4, 7, 8 | TRS.1.1 FDD | |
| | | | 2, 5 | TRS.1.1 TDD | |
| | | | 3, 6 | TRS.1.2 TDD | |
| *b2-Threshold1* | | dBm | 1, 2, 4, 5, 7, 8 | -96 | |
| | | | 3, 6 | -93 | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | |
| $N_{oc}$[Note2] | | dBm/15 KHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -104 | |
| | | | 3, 6 | -101 | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 17.55 | -1.55 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 17.55 | -1.55 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -86.45 | -105.55 |
| | | | 3, 6 | -83.45 | -102.55 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5, 7, 8 | -86.45 | -105.55 |
| | | | 3, 6 | -83.45 | -102.55 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5, 7, 8 | -58.42 | -73.74 |

| | | | | |
|---|---|---|---|---|
| | dBm/38.16 MHz | 3, 6 | -55.50 | -70.82 |
| Propagation condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table 16.6.3.4.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1**

| Parameter | Unit | Configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1, 2, 3, 4, 5, 6, 7, 8 | 2 | |
| Duplex mode | | 1, 2, 3, 7 | FDD | |
| | | 4, 5, 6, 8 | TDD | |
| TDD special subframe configuration[Note1] | | 4, 5, 6, 8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6, 8 | 1 | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6, 7, 8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 1, 2, 3, 7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | | 1, 2, 3, 7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4, 5, 6, 8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |

| | | | | |
|---|---|---|---|---|
| OCNG_RA[Note3]<br>OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -104 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | 18.55+TT |
| RSRP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.45+TT |
| SCH_RP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6, 7, 8 | -Infinity | -85.3+TT |
| Io[Note5] | dBm/9 MHz | 1, 2, 3, 4, 5, 6, 7, 8 | -76.22+10log ($N_{RB,c}$ /50) +TT | -57.61+10log ($N_{RB,c}$ /50) |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6, 7, 8 | 1x2 Low | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].<br>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.<br>Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3840 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12800 ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2 ms higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 16.6.4 L1-RSRP measurement for beam reporting for RedCap

### 16.6.4.0 Minimum conformance requirements

#### 16.6.4.0.1 General

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured CSI-RS, SSB or CSI-RS and SSB resources for L1-RSRP. The measurements shall be performed for PCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* within the *CSI-ResourceConfig* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1 dB step size according to TS 38.133 [6] clause 10.1A.14 for FR1, for 1 Rx RedCap, and TS 38.133 [6] clause 10.1.19 for FR1 and TS 38.133 [6] clause 10.1.20 for FR2 for 2 Rx RedCap, if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in TS 38.133 [6] clause 10.1A.14 for FR1, for 1 Rx RedCap, and TS 38.133 [6] clause 10.1.19 for FR1 and TS 38.133 [6] clause 10.1.20 for FR2 for 2 Rx RedCap. The differential L1-RSRP is quantized to a 4-bit value with 2 dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TS 38.133 [6] clause 10.1.6.

For 1 Rx RedCap, reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1A.14 for FR1.

For 2 Rx RedCap, reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [9].

For 1 Rx RedCap, reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in TS 38.133 [6] clause 10.1A.14.

For 2 Rx Redcap, reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [9].

For FD-FDD and TDD RedCap UEs, there are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

For HD-FDD RedCap UE, scheduling restrictions apply for transmission on PUCCH/PUSCH/SRS during the CBD evaluation period, as CBD evaluation is prioritized over UL transmission. The CBD evaluation period equals the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ in case L1-RSRP measurement is performed on SSB as defined in clause 16.6.4.0.2, or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ in case L1-RSRP measurement is performed on CSI-RS and/or SSB as defined in clause 16.6.4.0.3.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [13] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* defined in TS 38.331 [13] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- For FD-FDD and TDD RedCap UEs, the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

- For HD-FDD RedCap UE, scheduling restrictions apply for transmission on PUCCH/PUSCH/SRS during the CBD evaluation period, as CBD evaluation is prioritized over UL transmission. The CBD evaluation period equals the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ in case L1-RSRP measurement is performed on SSB as defined in clause 16.6.4.0.2, or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ in case L1-RSRP measurement is performed on CSI-RS and/or SSB as defined in clause 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.1, 9.5B.3 and 9.5B.6.

#### 16.6.4.0.2 Minimum conformance requirements for SSB based L1-RSRP measurement for beam reporting

The requirements in this clause apply, provided:

- The SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

For 1 Rx RedCap:

- L1-RSRP related side conditions given in TS 38.133 [6] clause 10.1A.14.1 for FR1, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.4.1 for a corresponding band.

For 2 Rx RedCap:

- L1-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.19.1 and 10.1.20.1 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.4.1 for a corresponding band.

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 16.6.4.0.2-1 for FR1 for 2 Rx RedCap, and Table 16.6.4.0.2-2 for FR1 for 1 Rx RedCap, where:

- M = 1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M = 3 otherwise.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

- $T_{SSB}$ = *ssb-periodicityServingCell*

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 16.6.4.0.2-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (FR1) for 2 Rx RedCap**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320 ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320 ms | $\text{ceil}(M*P)*T_{DRX}$ |
| Note: $T_{SSB}$ = *ssb-periodicityServingCell* is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. | |

**Table 16.6.4.0.2-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (FR1) for 1 Rx RedCap**

| Configuration | $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (ms) |
|---|---|
| non-DRX | $\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$ |
| DRX cycle ≤ 320 ms | $\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$ |
| DRX cycle > 320 ms | $\text{ceil}(M*P)*T_{DRX}$ |

| Note: | $T_{SSB}$ = *ssb-periodicityServingCell* is the periodicity of the SSB-Index configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting. |
|---|---|

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.2, 9.5B.4.1 and 9.5B.5.1.

#### 16.6.4.0.3 Minimum conformance requirements for CSI-RS based L1-RSRP measurement for beam reporting

The requirements in this clause apply, provided:

- The CSI-RS resources configured for L1-RSRP measurements are measurable.

A CSI-RS resource configured for L1-RSRP shall be considered measurable when for each relevant CSI-RS the following conditions are met:

For 1 Rx RedCap:

- L1-RSRP related side conditions given in TS 38.133 [6] clauses 10.1A.14.2 for FR1, respectively, for a corresponding band,
- CSI-RS_RP and CSI-RS Ês/Iot according to TS 38.133 [6] Annex B.2.4.2 for a corresponding band.

For 2 Rx RedCap:

- L1-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.19.2 and 10.1.20.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RS_RP and CSI-RS Ês/Iot according to TS 38.133 [6] Annex B.2.4.2 for a corresponding band.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ is defined in Table 16.6.4.0.3-1 for FR1 for 2 Rx RedCap, and in Table 16.6.4.0.3-2 for 1 Rx RedCap, where:

- For periodic CSI-RS resources, M = 1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M = 3 otherwise
- For aperiodic CSI-RS resources M = 1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N = 1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N = ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N = 1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N = 1. UE is not required to meet the accuracy requirements in TS 38.133 [6] clauses 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

$T_{CSI-RS}$ = the periodicity of CSI-RS configured for L1-RSRP measurement

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

**Table 16.6.4.0.3-1: Measurement period $T_{L1-RSRP_Measurement_Period_CSI-RS_RedCap}$ (FR1) for 2 Rx RedCap**

| Configuration | $T_{L1-RSRP_Measurement_Period_CSI-RS_RedCap}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320 ms | max($T_{Report}$, ceil(1.5*M*P)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320 ms | ceil(M*P)*$T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: The requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

**Table 16.6.4.0.3-2: Measurement period $T_{L1-RSRP_Measurement_Period_CSI-RS_RedCap}$ (FR1) for 1 Rx RedCap**

| Configuration | $T_{L1-RSRP_Measurement_Period_CSI-RS_RedCap}$ (ms) |
|---|---|
| non-DRX | max($T_{Report}$, ceil(M*P)*$T_{CSI-RS}$) |
| DRX cycle ≤ 320 ms | max($T_{Report}$, ceil(1.5*M*P)*max($T_{DRX}$,$T_{CSI-RS}$)) |
| DRX cycle > 320 ms | ceil(M*P)*$T_{DRX}$ |
| Note 1: $T_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. $T_{DRX}$ is the DRX cycle length. $T_{Report}$ is configured periodicity for reporting.<br>Note 2: The requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. | |

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.2, 9.5B.4.2 and 9.5B.5.2.

## 16.6.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE

### 16.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

### 16.6.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards.

### 16.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.1.

### 16.6.4.1.4 Test description

#### 16.6.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.1.4.1 with following exceptions:

- Table 6.6.4.1.4.1-1 is replaced by Table 16.6.4.1.4.1-1.
- Table 6.6.4.1.4.1-2 is replaced by Table 16.6.4.1.4.1-3.
- Table 6.6.4.1.4.1-3 is replaced by Table 16.6.4.1.4.1-2.

**Table 16.6.4.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.6.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.4.1.4.1-2: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.1.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2, 3 | | TDD |
| | 4 | | HD-FDD |
| TDD Configuration | 1, 4 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | 1, 4 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1, 4 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1, 4 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 |
| | 3 | | SSB.2 RedCap FR1 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 RedCap |
| TRS Configuration | 1, 4 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~4 | | Off |
| *reportConfigType* | 1~4 | | periodic |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 80 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 1 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |

| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
|---|---|

#### 16.6.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.1.4.2 with following exceptions:

- Step 5 in test procedure given in clause 6.6.4.1.4.2 is replaced by following step.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configurations 1, 2, 4 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 16.6.4.1.5-2 for test configurations 1, 2, 4 and Table 16.6.4.1.5-3 for test configuration 3) and the relative L1-RSRP requirement for SSB#0 in Table 16.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.1.5-2 for test configurations 1, 2, 4 and in Table 16.6.4.1.5-3 for test configuration 3 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

#### 16.6.4.1.4.3 Message contents

Same as the message contents given in clause 6.6.4.1.4.3.

### 16.6.4.1.5 Test requirement

Same as the test requirements given in clause 6.6.4.1.5 with following exceptions:

- Table 6.6.4.1.5-1 is replaced by Table 16.6.4.1.5-1.
- Table 6.6.4.1.5-2 is replaced by Table 16.6.4.1.5-2.
- Table 6.6.4.1.5-3 is replaced by Table 16.6.4.1.5-3.
- Table 6.6.4.1.5-4 is replaced by Table 16.6.4.1.5-4.

**Table 16.6.4.1.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~4 | dBm/15 kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 6.5 |
| SSB RSRP Note3 | 1, 2, 4 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -88.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -85.15 |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -59.32 |
| | 3 | dBm/18.36 MHz | -60.77 | -60.77 | -63.79 | -56.39 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 6.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (SSB#1) | 55 |
| Highest reported value (SSB#1) | 81 |

**Table 16.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (SSB#1) | 58 |
| Highest reported value (SSB#1) | 84 |

**Table 16.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T2 |
|---|---|
| Lowest DIFF RSRP reported (SSB#0) | 0 |
| Highest DIFF RSRP reported (SSB#0) | 6 |

## 16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE

### 16.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

### 16.6.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards.

### 16.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.2.

### 16.6.4.2.4 Test description

#### 16.6.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.1.4.1 with following exceptions:

- Table 6.6.4.1.4.1-1 is replaced by Table 16.6.4.2.4.1-1.

- Table 6.6.4.1.4.1-2 is replaced by Table 16.6.4.2.4.1-3.
- Table 6.6.4.1.4.1-3 is replaced by Table 16.6.4.2.4.1-2.

**Table 16.6.4.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.6.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.4.2.4.1-2: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.2.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2, 3 | | TDD |
| | 4 | | HD-FDD |
| TDD Configuration | 1, 4 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | 1, 4 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1, 4 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1, 4 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 |
| | 3 | | SSB.2 RedCap FR1 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 RedCap |
| TRS Configuration | 1, 4 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~4 | | Off |
| *reportConfigType* | 1~4 | | periodic |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP |

| | | | |
|---|---|---|---|
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 80 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 1 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 16.6.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.1.4.2.

### 16.6.4.2.4.3 Message contents

Same as the message contents given in clause 6.6.4.1.4.3.

### 16.6.4.2.5 Test requirement

Same as the test requirements given in clause 6.6.4.1.5 with following exceptions:

- Table 6.6.4.1.5-1 is replaced by Table 16.6.4.2.5-1.

**Table 16.6.4.2.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~4 | dBm/15 kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1, 2, 4 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3 | dBm/18.36 MHz | -60.77 | -60.77 | -63.79 | -58.67 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 3.5 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |
| Note 4: Void | | | | | | |

## 16.6.4.3 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE

### 16.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

### 16.6.4.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting long DRX cycle.

### 16.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.3.

### 16.6.4.3.4 Test description

#### 16.6.4.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.2.4.1 with following exceptions:

- Table 6.6.4.2.4.1-1 is replaced by Table 16.6.4.3.4.1-1.
- Table 6.6.4.2.4.1-2 is replaced by Table 16.6.4.3.4.1-3.
- Table 6.6.4.2.4.1-3 is replaced by Table 16.6.4.3.4.1-2.

**Table 16.6.4.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.6.4.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.3-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.4.3.4.1-2: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.3.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2, 3 | | TDD |
| | 4 | | HD-FDD |

| | | | |
|---|---|---|---|
| TDD Configuration | 1, 4 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | 1, 4 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1, 4 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1, 4 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 |
| | 3 | | SSB.2 RedCap FR1 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 RedCap |
| TRS Configuration | 1, 4 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~4 | | DRX.3 |
| *reportConfigType* | 1~4 | | periodic |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 80 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 1 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 16.6.4.3.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.2.4.2 with following exceptions:

- Step 5 in test procedure given in clause 6.6.4.2.4.2 is replaced by following step.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configurations 1, 2, 4 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 16.6.4.3.5-2 for test configurations 1, 2, 4 and Table 16.6.4.3.5-3 for test configuration 3) and the relative L1-RSRP requirement for SSB#0 in Table 16.6.4.3.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

- R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.3.5-2 for test configurations 1, 2, 4 and in Table 16.6.4.3.5-3 for test configuration 3 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.3.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

### 16.6.4.3.4.3 Message contents

Same as the message contents given in clause 6.6.4.2.4.3.

### 16.6.4.3.5 Test requirement

Same as the test requirements given in clause 6.6.4.2.5 with following exceptions:

- Table 6.6.4.2.5-1 is replaced by Table 16.6.4.3.5-1.
- Table 6.6.4.2.5-2 is replaced by Table 16.6.4.3.5-2.
- Table 6.6.4.2.5-3 is replaced by Table 16.6.4.3.5-3.
- Table 6.6.4.2.5-4 is replaced by Table 16.6.4.3.5-4.

**Table 16.6.4.3.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~4 | dBm/15 kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 6.5 |
| SSB RSRP Note3 | 1, 2, 4 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -88.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -85.15 |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -59.32 |
| | 3 | dBm/18.36 MHz | -60.77 | -60.77 | -63.79 | -56.39 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 6.5 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | T2 |
|---|---|
| Lowest reported value (SSB#1) | 55 |
| Highest reported value (SSB#1) | 81 |

**Table 16.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | T2 |
|---|---|

| | |
|---|---|
| Lowest reported value (SSB#1) | 58 |
| Highest reported value (SSB#1) | 84 |

**Table 16.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T2 |
|---|---|
| Lowest DIFF RSRP reported (SSB#0) | 0 |
| Highest DIFF RSRP reported (SSB#0) | 6 |

## 16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE

### 16.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

### 16.6.4.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting long DRX cycle.

### 16.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.4.

### 16.6.4.4.4 Test description

#### 16.6.4.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.2.4.1 with following exceptions:

- Table 6.6.4.2.4.1-1 is replaced by Table 16.6.4.4.4.1-1.
- Table 6.6.4.2.4.1-2 is replaced by Table 16.6.4.4.4.1-3.
- Table 6.6.4.2.4.1-3 is replaced by Table 16.6.4.4.4.1-2.

**Table 16.6.4.4.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.6.4.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.4.4.4.1-2: Test Environment parameters**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.4.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.4.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1 | | FDD |
| | 2, 3 | | TDD |
| | 4 | | HD-FDD |
| TDD Configuration | 1, 4 | | N/A |
| | 2 | | TDDConf.1.1 |
| | 3 | | TDDConf.2.1 |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | 1, 4 | | SR.1.1 FDD |
| | 2 | | SR.1.1 TDD |
| | 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1, 4 | | CR.1.1 FDD |
| | 2 | | CR.1.1 TDD |
| | 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1, 4 | | CCR.1.1 FDD |
| | 2 | | CCR.1.1 TDD |
| | 3 | | CCR.2.1 TDD |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 |
| | 3 | | SSB.2 RedCap FR1 |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 RedCap |
| TRS Configuration | 1, 4 | | TRS.1.1 FDD |
| | 2 | | TRS.1.1 TDD |
| | 3 | | TRS.1.2 TDD |
| DRX configuration | 1~4 | | DRX.3 |
| *reportConfigType* | 1~4 | | periodic |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP |
| Number of reported RS | 1~4 | | 2 |
| L1-RSRP reporting period | 1~4 | slot | 80 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 1 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1~4 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

16.6.4.4.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.2.4.2.

#### 16.6.4.4.4.3 Message contents

Same as the message contents given in clause 6.6.4.2.4.3.

### 16.6.4.4.5 Test requirement

Same as the test requirements given in clause 6.6.4.2.5 with following exceptions:

- Table 6.6.4.2.5-1 is replaced by Table 16.6.4.4.5-1.

**Table 16.6.4.4.5-1: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~4 | dBm/15 kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SSB SCS | -94.65 | | | |
| | 3 | | -91.65 | | | |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 3.5 |
| SSB RSRP Note3 | 1, 2, 4 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.15 |
| | 3 | | -91.65 | -91.65 | -Infinity | -88.15 |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.59 |
| | 3 | dBm/18.36 MHz | -60.77 | -60.77 | -63.79 | -58.67 |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 3.5 Note 4 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## 16.6.4.5 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE

### 16.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 16.6.4.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.5.

### 16.6.4.5.4 Test description

#### 16.6.4.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.3.4.1 with following exceptions:

- Table 6.6.4.3.4.1-1 is replaced by Table 16.6.4.5.4.1-1.
- Table 6.6.4.3.4.1-2 is replaced by Table 16.6.4.5.4.1-2.

- Table 6.6.4.3.4.1-3 is replaced by Table 16.6.4.5.4.1-3.

**Table 16.6.4.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.4.5-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.5-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.5-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.5-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.4.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.5.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| SSB GSCN | | | freq1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1, 2, 4 | | SSB.3 FR1 |
| | Config 3 | | SSB.2 Redcap FR1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS 1.3 FDD |
| | Config 2 | | CSI-RS 1.3 TDD |
| | Config 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | | | OP.1 |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | | DLBWP.1.1 |

| | | |
|---|---|---|
| | | ULBWP.1.1 |
| SMTC configuration | | SMTC.1 RedCap |
| DRX configuration | | Off |
| *reportConfigType* | | aperiodic |
| *reportQuantity* | | cri-RSRP |
| Number of reported RS | | 2 |
| *qcl-Info* | | SSB#0 for resource#0 |
| | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | slots | 8 |
| T1 | s | 5 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

### 16.6.4.5.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.3.4.2.

### 16.6.4.5.4.3 Message contents

Same as the message contents given in clause 6.6.4.3.4.3.

### 16.6.4.5.5 Test requirement

Same as the test requirements given in clause 6.6.4.3.5 with following exceptions:

- Table 6.6.4.3.5-1 is replaced by Table 16.6.4.5.5-1.
- Table 6.6.4.3.5-2 is replaced by Table 16.6.4.5.5-2.
- Table 6.6.4.3.5-3 is replaced by Table 16.6.4.5.5-3.
- Table 6.6.4.3.5-4 is replaced by Table 16.6.4.5.5-4.

**Table 16.6.4.5.5-1: Cell specific test parameters**

| Parameter | | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | | dBm/15 kHz | -94.65 | |
| $N_{oc}$ Note1 | Config 1, 2, 4 | dBm/SCS | -94.65 | |
| | Config 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | Config 1, 2, 4 | dBm/SSB SCS | -94.65 | -88.15 |
| | Config 3 | | -91.64 | -85.14 |
| Io Note2 | Config 1, 2, 4 | dBm/9.36 MHz | -63.69 | -59.32 |
| | Config 3 | dBm/18.36 MHz | -60.76 | -56.39 |
| $\hat{E}_s/N_{oc}$ | | dB | 0 | 6.5 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

**Table 16.6.4.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 81 |

**Table 16.6.4.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 84 |

**Table 16.6.4.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 6 |

## 16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE

### 16.6.4.6.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 16.6.4.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.6.4.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.6.

### 16.6.4.6.4 Test description

#### 16.6.4.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.3.4.1 with following exceptions:

- Table 6.6.4.3.4.1-1 is replaced by Table 16.6.4.6.4.1-1.
- Table 6.6.4.3.4.1-2 is replaced by Table 16.6.4.6.4.1-2.
- Table 6.6.4.3.4.1-3 is replaced by Table 16.6.4.6.4.1-3.

**Table 16.6.4.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.4.6-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.6-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.6-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.6-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.4.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.6.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| SSB GSCN | | | freq1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1, 2, 4 | | SSB.3 FR1 |
| | Config 3 | | SSB.2 Redcap FR1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS 1.3 FDD |
| | Config 2 | | CSI-RS 1.3 TDD |
| | Config 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | | | OP.1 |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | | SMTC.1 RedCap |

| | | |
|---|---|---|
| DRX configuration | | Off |
| *reportConfigType* | | aperiodic |
| *reportQuantity* | | cri-RSRP |
| Number of reported RS | | 2 |
| *qcl-Info* | | SSB#0 for resource#0 |
| | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | slots | 8 |
| T1 | s | 5 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

### 16.6.4.6.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.3.4.2.

### 16.6.4.6.4.3 Message contents

Same as the message contents given in clause 6.6.4.3.4.3.

### 16.6.4.6.5 Test requirement

Same as the test requirements given in clause 6.6.4.3.5 with following exceptions:

- Table 6.6.4.3.5-1 is replaced by Table 16.6.4.6.5-1.

**Table 16.6.4.6.5-1: Cell specific test parameters**

| Parameter | | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | | dBm/15 kHz | -94.65 | |
| $N_{oc}$ Note1 | Config 1, 2, 4 | dBm/SCS | -94.65 | |
| | Config 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | Config 1, 2, 4 | dBm/SSB SCS | -94.65 | -91.15 |
| | Config 3 | | -91.65 | -88.14 |
| Io Note2 | Config 1, 2, 4 | dBm/9.36 MHz | -63.69 | -61.59 |
| | Config 3 | dBm/18.36 MHz | -60.77 | -58.67 |
| $\hat{E}_s/N_{oc}$ | | dB | 0 | 3.5 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

## 16.6.4.7 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 1 Rx UE

### 16.6.4.7.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 16.6.4.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting long DRX cycle.

### 16.6.4.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.7.

### 16.6.4.7.4 Test description

#### 16.6.4.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.4.4.1 with following exceptions:

- Table 6.6.4.4.4.1-1 is replaced by Table 16.6.4.7.4.1-1.
- Table 6.6.4.4.4.1-2 is replaced by Table 16.6.4.7.4.1-2.
- Table 6.6.4.4.4.1-3 is replaced by Table 16.6.4.7.4.1-3.

**Table 16.6.4.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.4.7-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.7-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.7-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.7-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.4.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.7.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| SSB GSCN | | | freq1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |

| | | | |
|---|---|---|---|
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1, 2, 4 | | SSB.3 FR1 |
| | Config 3 | | SSB.2 Redcap FR1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS 1.3 FDD |
| | Config 2 | | CSI-RS 1.3 TDD |
| | Config 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | | | OP.1 |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | | SMTC.1 RedCap |
| DRX configuration | | | DRX.3 |
| *reportConfigType* | | | aperiodic |
| *reportQuantity* | | | cri-RSRP |
| Number of reported RS | | | 2 |
| *qcl-Info* | | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | | slots | 8 |
| T1 | | s | 5 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 16.6.4.7.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.4.4.2.

### 16.6.4.7.4.3 Message contents

Same as the message contents given in clause 6.6.4.4.4.3.

16.6.4.7.5 Test requirement

Same as the test requirements given in clause 6.6.4.4.5 with following exceptions:

- Table 6.6.4.4.5-1 is replaced by Table 16.6.4.7.5-1.
- Table 6.6.4.4.5-2 is replaced by Table 16.6.4.7.5-2.
- Table 6.6.4.4.5-3 is replaced by Table 16.6.4.7.5-3.
- Table 6.6.4.4.5-4 is replaced by Table 16.6.4.7.5-4.

**Table 16.6.4.7.5-1: Cell specific test parameters**

| Parameter | | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | | dBm/15 kHz | -94.65 | |
| $N_{oc}$ Note1 | Config 1, 2, 4 | dBm/SCS | -94.65 | |
| | Config 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | Config 1, 2, 4 | dBm/SSB SCS | -94.65 | -88.15 |
| | Config 3 | | -91.64 | -85.15 |
| Io Note2 | Config 1, 2, 4 | dBm/9.36 MHz | -63.69 | -59.32 |
| | Config 3 | dBm/18.36 MHz | -60.76 | -56.39 |
| $\hat{E}_s/N_{oc}$ | | dB | 0 | 0 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table 16.6.4.7.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 55 |
| Highest reported value (CSI-RS#1) | 81 |

**Table 16.6.4.7.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | T1 |
|---|---|
| Lowest reported value (CSI-RS#1) | 58 |
| Highest reported value (CSI-RS#1) | 84 |

**Table 16.6.4.7.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations**

| | T1 |
|---|---|
| Lowest DIFF RSRP reported (CSI-RS#0) | 0 |
| Highest DIFF RSRP reported (CSI-RS#0) | 6 |

## 16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE

### 16.6.4.8.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 16.6.4.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting long DRX cycle.

### 16.6.4.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.8.

### 16.6.4.8.4 Test description

#### 16.6.4.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.4.4.1 with following exceptions:

- Table 6.6.4.4.4.1-1 is replaced by Table 16.6.4.8.4.1-1.
- Table 6.6.4.4.4.1-2 is replaced by Table 16.6.4.8.4.1-2.
- Table 6.6.4.4.4.1-3 is replaced by Table 16.6.4.8.4.1-3.

**Table 16.6.4.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.4.8-1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.4.8-2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.4.8-3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.4.8-4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1. | |

**Table 16.6.4.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.4.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

**Table 16.6.4.8.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| SSB GSCN | | | freq1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| | Config 4 | | HD-FDD |

| | | | |
|---|---|---|---|
| TDD Configuration | Config 1, 4 | | N/A |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3 | | 20: $N_{RB,c}$ = 51 |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD |
| | Config 2 | | SR.1.1 TDD |
| | Config 3 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB configuration | Config 1, 2, 4 | | SSB.3 FR1 |
| | Config 3 | | SSB.2 Redcap FR1 |
| CSI-RS configuration | Config 1, 4 | | CSI-RS 1.3 FDD |
| | Config 2 | | CSI-RS 1.3 TDD |
| | Config 3 | | CSI-RS 2.3 TDD |
| OCNG Patterns | | | OP.1 |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | | | SMTC.1 RedCap |
| DRX configuration | | | DRX.3 |
| *reportConfigType* | | | aperiodic |
| *reportQuantity* | | | cri-RSRP |
| Number of reported RS | | | 2 |
| *qcl-Info* | | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | | slots | 8 |
| T1 | | s | 5 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 16.6.4.8.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.4.4.2.

### 16.6.4.8.4.3 Message contents

Same as the message contents given in clause 6.6.4.4.4.3.

#### 16.6.4.8.5 Test requirement

Same as the test requirements given in clause 6.6.4.4.5 with following exceptions:

- Table 6.6.4.4.5-1 is replaced by Table 16.6.4.8.5-1.

**Table 16.6.4.8.5-1: Cell specific test parameters**

| Parameter | | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | | dBm/15 kHz | -94.65 | |
| $N_{oc}$ Note1 | Config 1, 2, 4 | dBm/SCS | -94.65 | |
| | Config 3 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | | dB | 0 | 3.5 |
| CSI-RS RSRP Note2 | Config 1, 2, 4 | dBm/SSB SCS | -94.65 | -91.15 |
| | Config 3 | | -91.65 | -88.14 |
| Io Note2 | Config 1, 2, 4 | dBm/9.36 MHz | -63.69 | -61.59 |
| | Config 3 | dBm/18.36 MHz | -60.77 | -58.67 |
| $\hat{E}_s/N_{oc}$ | | dB | 0 | 3.5 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

## 16.6.5 NR measurements with autonomous gaps for RedCap

### 16.6.5.0 Minimum conformance requirements

#### 16.6.5.0.1 Minimum conformance requirements for NR SA FR1 intra-frequency CGI identification of NR neighbour cell in FR1 for 1 Rx UE

The requirements in this clause are specified for CGI identification of an NR target cell and are applicable for a UE in RRC_CONNECTED state and configured with SA operation mode.

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of *reportCGI*. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI. The UE may make autonomous gaps in both downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3 of TS 38.331 [13]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of *reportCGI*, regardless of whether DRX is used or not, the UE shall be able to identify a new CGI of NR cell within:

$$T_{identify_CGI_redcap} = (T_{MIB_redcap} + T_{SIB1_redcap})\ ms$$

Where:

$T_{MIB_redcap}$ is the time period used to acquire MIB message. $T_{MIB_redcap} = 6 * T_{SMTC}$ ms for target cell carrier frequency on FR1.

$T_{SIB1_redcap}$ is the time period used to acquire SIB1 message. $T_{SIB1_redcap} = 12 * T_{RMSI\text{-}scheduling}$ ms.

Where $T_{SMTC}$ is the SMTC periodicity configured for the target cell measurement, and $T_{RMSI\text{-}scheduling}$ is

- the periodicity with which the SIB1 is actually transmitted by the NR target cell when SSB and RMSI CORESET multiplexing pattern is 1

- the maximum between the periodicity with which the SIB1 is actually transmitted by the NR target cell and $T_{SMTC}$ when SSB and RMSI CORESET multiplexing pattern is 2 or 3.

The requirement for identifying the CGI of an NR cell within $T_{identify_CGI_redcap}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

Within the time $T_{identify_CGI_redcap}$, over which the UE identifies the CGI of an NR cell, the UE shall fulfil interruption requirements specified in,

- Clause 9.11A.4 of TS 38.133 [6] if the UE is configured with SA operation mode.

In the requirement a cell is known if,

- During the last 5 seconds before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and
- During MIB decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2B or 9.3B of TS 38.133 [6], and
- During SIB1 decoding the SSB used for MIB decoding remains detectable according to the cell identification conditions specified in clauses 9.2B or 9.3B of TS 38.133 [6], and
- During MIB decoding, the SSB for MIB decoding remains detectable with SNR $\geqslant$ -3 dB
- During SIB1 decoding, the PDSCH for SIB1 decoding remains detectable with SNR $\geqslant$ -3 dB

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI_redcap}$ plus RRC procedure delay defined in clause 12 in TS 38.331 [13].

When a RedCap UE is identifying CGI of an NR cell with autonomous gaps, the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on PCell for the following slots:

- with up to K1 interruptions with interrupted slots up to X1 specified in Table 16.6.5.0.1-1 for each interruption during MIB decoding time period $T_{MIB_redcap}$ (ms).
- with up to L1 interruptions with interrupted slots up to Y1 specified in Table 16.6.5.0.1-1 during SIB1 decoding time period $T_{SIB1_redcap}$ (ms) for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to L2 interruptions with interrupted slots up to interruption length Y2 specified in Table 16.6.5.0.1-1 during SIB1 decoding time period $T_{SIB1_redcap}$ (ms) for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- K1 = 6 for the target cell carrier frequency on FR1, and
- L1 = $T_{SIB1_redcap}$ /20 and
- L2 = $T_{SIB1_redcap}$ /$T_{SMTC}$, where $T_{SMTC}$ is the periodicity of the SMTC occasion configured for the target cell carrier.

**Table 16.6.5.0.1-1: Interruption length X1, Y1 and Y2 during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) | Interruption length Y2 (slots) |
|---|---|---|---|---|
| 0 | 1 | 6 | 7 | 6 |
| 1 | 0.5 | 12 | 13 | 10 |
| 2 | 0.25 | 24 | 25 | 19 |
| 3 | 0.125 | 48 | 49 | 37 |

The normative reference for this requirement is TS 38.133 [6] clause 9.11A.

### 16.6.5.0.2 Minimum conformance requirements for NR SA FR1 intra-frequency CGI identification of NR neighbour cell in FR1 for 2 Rx UE

Same as clause 16.6.5.0.1 with the following exception:

$$T_{SIB1_redcap} = 6 * T_{RMSI\text{-}scheduling} \text{ ms}$$

The normative reference for this requirement is TS 38.133 [6] clause 9.11A.

### 16.6.5.0.3 Minimum conformance requirements for CGI identification of an E-UTRA cell with autonomous gaps

The requirements in this clause apply when the 1 Rx RedCap UE or 2 Rx RedCap UE is configured with standalone NR. The UE shall identify and report the CGI when requested by an NR PCell for the purpose '*reportCGI*'. The UE may make autonomous gaps in downlink reception and uplink transmission for receiving MIB and SIB1 message according to clause 5.5.3.1 in TS 38.331 [13].

For 2 Rx RedCap UE: If autonomous gaps are used for measurement with the purpose of '*reportCGI*', the UE shall be able to identify a new CGI of E-UTRA cell within$T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ = 150 ms.

For 1 Rx RedCap UE: If autonomous gaps are used for measurement with the purpose of '*reportCGI*', the UE shall be able to identify a new CGI of E-UTRA cell within $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ = 190 ms.

This is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell, provided that the E-UTRA cell has been already identified by the UE.

A cell shall be considered identifiable following conditions are fulfilled:

- RSRP related side conditions given in Clause 9.1 in TS 36.133 [23] are fulfilled for a corresponding band,
- SCH_RP and SCH Ês/Iot according to Annex B.2.2 in TS 36.133 [23] for a corresponding band

The MIB of an E-UTRA cell whose CGI is identified shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [27].

The requirement for identifying a new CGI of an E-UTRA cell within $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

The E-UTRA CGI reporting delay is defined as the time between a command that will trigger an E-UTRA CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and an additional 30 ms margin.

When a UE is identifying CGI of an E-UTRA FDD cell or E-UTRA TDD cell with autonomous gaps, within time period $T_{identify_CGI_RedCap,\ E\text{-}UTRA}$ specified in this clause, the UE shall be able to transmit at least the number of ACK/NACKs specified in Table 16.6.5.0.3-1 on PCell in the frequency range where autonomous gaps are used, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,

- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured.

**Table 16.6.5.0.3-1: Minimum number of ACK/NACKs transmitted by the UE during $T_{identify_CGI_RedCap, E-UTRAN}$**

| Minimum number of transmitted ACK/NACKs | SCS | |
|---|---|---|
| | Duplex mode configuration | SCS |
| 84 | FDD | 15 kHz |
| 193 | FDD | 30 kHz |
| 28 | TDD Note 1 | 15 kHz |
| 81 | TDD Note 1 | 30 kHz |
| NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [2]. | | |

The normative reference for this requirement is TS 38.133 [6] clauses 9.4A.4.

## 16.6.5.1 NR SA FR1 CGI identification of NR neighbour cell for 1 Rx UE

### 16.6.5.1.1 Test Purpose

The purpose of this test is to verify that the UE makes correct reporting of intra-frequency CGI identification of an NR neighbour cell in FR1 with autonomous gaps. This test shall partly verify the measurement requirements in clause 9.11A of TS 38.133 [6].

### 16.6.5.1.2 Test Applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting acquisition of CGI from neighbour NR cell using autonomous gap.

### 16.6.5.1.3 Minimum Conformance Requirements

The minimum conformance requirements are specified in clause 16.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.5.1.

### 16.6.5.1.4 Test Description

#### 16.6.5.1.4.1 Initial conditions

This test can be run in the configuration defined in Table 16.6.5.1.4.1-1.

**Table 16.6.5.1.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 16.6.5.1-1 | 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.5.1-2 | 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.5.1-3 | 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.5.1-4 | 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.6.5.1.4.1-2.

**Table 16.6.5.1.4.1-2: Test Environment parameters**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration from Table 16.6.5.1.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 16.6.5.1.4.1-3.
2. Message contents are defined in clause 16.6.5.1.4.3.
3. There are two cells: Cell 1 and Cell 2 specified in the test. Cell 1 is the FR1 PCell and Cell 2 is an FR1 neighbour cell on the same frequency as the PCell. The Cell 1 and Cell 2 are configured according to the settings in Annex C.1.1 and C.1.2.

**Table 16.6.5.1.4.1-3: General test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4 | Cell 1 | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | |
| CP length | | 1, 2, 3, 4 | Normal | |
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3, 4 | | OFF |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | |
| T2 | s | 1, 2, 3, 4 | 5 | |
| T3 | s | 1, 2, 3, 4 | 5 | |

### 16.6.5.1.4.2 Test procedure

The test consists of two cells: Cell 1 and Cell 2. Cell 1 is the FR1 PCell and Cell 2 is an FR1 neighbour cell on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.5.1.4.1-3 and Table 16.6.5.1.5-1, respectively. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 16.6.5.1.5-1. T1 starts.
3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 16.6.5.1.5-1. T2 starts.

5. SS shall transmit an *RRCReconfiguration* message to configure the measurement object for the frequency of the serving cell and to indicate the UE that event-triggered reporting with Event A3 is used.

6. The UE shall transmit *RRCReconfigurationComplete* message.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. After the SS receives the *MeasurementReport* message in step 6, the SS shall transmit *RRCReconfiguration* message triggering CGI identification and configuring *reportCGI* and *useAutonomousGaps* IEs set to TRUE.

9. T3 starts when the last TTI containing the above RRC message implying CGI identification is sent to the UE.

10. The UE shall transmit *RRCReconfigurationComplete* message.

11. The SS verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell during T3 until a measurement report with CGI is sent. If the UE sends a measurement report containing the CGI of Cell 2 within 372 ms from the start of time period T3, then the number of successful tests is increased by one otherwise the number of failure tests is increased by one.

12. Repeat steps 2-11 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.5.1.4.3-1: Common Exception messages for NR SA FR1 intra-frequency CGI identification of NR neighbour cell in FR1 for 1 Rx UE**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2<br>Table H.3.1-4 with condition SSB Index and *A3-offset* = -4.5 dB<br>Table H.3.1-5<br>Table H.3.1-7 with condition INTRA-FREQ and SSB Index<br>Table H.3.1-8 with condition SSB RLM<br>Table 4.6.3-142 of TS 38.508-1 [14] with condition CGI and AutoGaps |

### 16.6.5.1.5 Test Requirements

Tables 16.6.5.1.4.1-3 and 16.6.5.1.5-1 define the general parameters and cell specific parameters for this test.

**Table 16.6.5.1.5-1: NR Cell specific test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1, 4 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/18.36 MHz | 3 | -61.67 | -59.32 | -61.67 | -59.32 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send a measurement report containing the CGI of Cell 2 within 372 ms from the start of time period T3.

Test requirement = RRC Procedure delay + $T_{identify_CGI_redcap}$ + reporting delay = 10 + 360 + 2 ms from the start of T3 = 372 ms, allow 375 ms.

The UE shall be scheduled continuously throughout the test. From the start of T3 until 375 ms, the interruption on PCell shall not be more than the values specified for SA in TS 38.133 [6] clause 9.11A.

The rate of correct events observed during repeated tests shall be at least 90%.

## 16.6.5.2 NR SA FR1 CGI identification of NR neighbour cell for 2 Rx UE

### 16.6.5.2.1 Test Purpose

The purpose of this test is to verify that the UE makes correct reporting of intra-frequency CGI identification of an NR neighbour cell in FR1 with autonomous gaps. This test shall partly verify the measurement requirements in clause 9.11A of TS 38.133 [6].

### 16.6.5.2.2 Test Applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting acquisition of CGI from neighbour NR cell using autonomous gap.

#### 16.6.5.2.3 Minimum Conformance Requirements

The minimum conformance requirements are specified in clause 16.6.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.5.2.

#### 16.6.5.2.4 Test Description

##### 16.6.5.2.4.1 Initial conditions

This test can be run in the configuration defined in Table 16.6.5.2.4.1-1.

**Table 16.6.5.2.4.1-1: Supported test configurations**

| Test Case ID | Test Config Index | Description |
|---|---|---|
| 16.6.5.2-1 | 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.6.5.2-2 | 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.6.5.2-3 | 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.6.5.2-4 | 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 16.6.5.2.4.1-2.

**Table 16.6.5.2.4.1-2: Test Environment parameters**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration from Table 16.6.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 16.6.5.2.4.1-3.
2. Message contents are defined in clause 16.6.5.2.4.3.
3. There are two cells: Cell 1 and Cell 2 specified in the test. Cell 1 is the FR1 PCell and Cell 2 is an FR1 neighbour cell on the same frequency as the PCell. The Cell 1 and Cell 2 are configured according to the settings in Annex C.1.1 and C.1.2.

**Table 16.6.5.2.4.1-3: General test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2, 3, 4 | Cell 1 | |
| Neighbour cell | | 1, 2, 3, 4 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 | |
| SSB configuration | | 1, 4 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.1 RedCap FR1 | |
| SMTC configuration | | 1, 4 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| *A3-Offset* | dB | 1, 2, 3, 4 | -4.5 | |
| CP length | | 1, 2, 3, 4 | Normal | |

| | | | | |
|---|---|---|---|---|
| *Hysteresis* | dB | 1, 2, 3, 4 | 0 | |
| Time To Trigger | s | 1, 2, 3, 4 | 0 | |
| Filter coefficient | | 1, 2, 3, 4 | 0 | L3 filtering is not used |
| DRX | | 1, 2, 3, 4 | | OFF |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 2 is 3 ms later than the timing of Cell 1. |
| | | 2 | 3 μs | Synchronous cells |
| | | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4 | 5 | |
| T2 | s | 1, 2, 3, 4 | 5 | |
| T3 | s | 1, 2, 3, 4 | 5 | |

#### 16.6.5.2.4.2 Test procedure

Same as in clause 16.6.5.1.4.2.

#### 16.6.5.2.4.3 Message contents

Same as in clause 16.6.5.1.4.3.

### 16.6.5.2.5 Test Requirements

Tables 16.6.5.2.4.1-3 and 16.6.5.2.5-1 define the general parameters and cell specific parameters for this test.

**Table 16.6.5.2.5-1: NR Cell specific test parameters for SA intra-frequency CGI identification of NR neighbour cell in FR1**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 4 | N/A | | N/A | |
| | | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| | | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1, 4 | SR.1.1 FDD | | N/A | |
| | | 2 | SR.1.1 TDD | | | |
| | | 3 | SR.2.1 TDD | | | |
| RMSI CORESET RMC configuration | | 1, 4 | CR.1.1 FDD | | CR.1.1 FDD | |
| | | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
| | | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1, 4 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| | | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 2 | TRS.1.1 TDD | | N/A | |
| | | 3 | TRS.1.2 TDD | | N/A | |
| IInitial BWP configuration | | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2, 3, 4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2, 3, 4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2, 3, 4 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2 | -98 | | | |
| | | 3 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2 | | | | |
| | | 3 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
| | | 2 | | | | |
| | | 3 | | | | |
| SS-RSRP Note 3 | dBm/SCS | 1, 4 | -94 | -94 | -Infinity | -94 |
| | | 2 | -94 | -94 | -Infinity | -94 |
| | | 3 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | --64.60 | -62.25 |
| | dBm/9.36 MHz | 2 | -64.60 | -62.25 | --64.60 | -62.25 |
| | dBm/18.36 MHz | 3 | -61.67 | -59.32 | -61.67 | -59.32 |
| Propagation Condition | | 1, 2, 3, 4 | AWGN | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send a measurement report containing the CGI of Cell 2 within 255 ms from the start of time period T3.

Test requirement = RRC Procedure delay + $T_{identify_CGI}$ + reporting delay = 10 + 240 + 2 ms from the start of T3 = 252 ms, allow 255 ms.

The UE shall be scheduled continuously throughout the test. From the start of T3 until 255 ms, the interruption on PCell shall not be more than the values specified for SA in TS 38.133 [6] clause 9.11A.

The rate of correct events observed during repeated tests shall be at least 90%.

## 16.6.5.3 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 1 Rx UE

### 16.6.5.3.1 Test purpose

To verify the requirement for identification of a new CGI of E-UTRA cell with autonomous gaps in NR SA in TS 38.133 [6] clause 9.4A.4.

### 16.6.5.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards and supporting acquisition of CGI from neighbour E-UTRA cell using autonomous gap.

### 16.6.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.5.3.

### 16.6.5.3.4 Test description

The test scenario comprises of one NR carrier and an E-UTRA carrier and two cells. PDCCHs indicating new transmissions shall be sent continuously to ensure that the UE would have ACK/NACK sending during identifying a new CGI of E-UTRAN cell.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively:

- At the start of time duration T1, the UE does not have any timing information of Cell 2.

- Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event B2. The RRC message shall create a measurement report configuration with purpose *reportCGI* and *useAutonomousGaps* set to *setup*.

- The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE.

#### 16.6.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.5.3.4.1-1.

**Table 16.6.5.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.5.3-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.5.3-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.5.3-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.5.3-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.5.3-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.5.3-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.6.5.3.4.1-2

**Table 16.6.5.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.5.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 16.6.5.3.4.3.

2. The power levels and settings for NR PCell (Cell 1) and E-UTRA neighbour cell (Cell 2) are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 16.3.1.3.4.1-3 below.

**Table 16.6.5.3.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Active cell | | Cell 1 | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| LTE Channel Bandwidth | MHz | 10 | |
| LTE PDSCH/PCFICH/PDCCH/PHICH parameters | | | As specified in clause A.6.1.1 |
| CP length | | Normal | |
| *Hysteresis* | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | |
| *useAutonomousGaps* | | setup | As specified in clause 5.5.3.1 in TS 38.331 [13]. |
| Time offset between cells | ms | 3 | Asynchronous cells |
| T1 | s | 5 | |

| | | | |
|---|---|---|---|
| T2 | s | ≤ 10 | |
| T3 | s | 5 | |

#### 16.6.5.3.4.2 Test procedure

Throughout the test, the UE shall be scheduled to perform DL reception on every slot suitable for DL.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 16.6.5.3.5-1 and Table 16.6.5.3.5-2. T1 starts.
3. The SS transmits an *RRCReconfiguration* message to configure event B2 triggered measurement reporting on E-UTRA Cell 2.
4. The UE transmits an *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 16.6.5.3.5-1 and 16.6.5.3.5-2, T2 starts.
6. UE transmits a *MeasurementReport* message triggered by Event B2.
7. After receiving *MeasurementReport* message in step 6, the SS transmits an *RRCReconfiguration* message to release the gap configuration.
8. UE transmits an *RRCReconfigurationComplete* message.
9. After receiving *RRCReconfigurationComplete* message in step 6, the SS transmits an *RRCReconfiguration* message to configure an autonomous gap based CGI measurement reporting on E-UTRA Cell 2.
10. The start of T3 is the instant when the last TTI containing the *RRCReconfiguration* message in step 7 is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Tables 16.6.5.3.5-1 and 16.6.5.3.5-2.
11. The UE transmits an *RRCReconfigurationComplete* message.
12. If the UE

    a) transmits a *MeasurementReport* message containing CGI of E-UTRA Cell 2 less than 240 ms from the beginning of time period T3, and

    b) transmits ACK/NACKs no less than the minimum number of ACK/NACKs given in Table 16.6.5.3.5-5 from the start of T3 until 240 ms,

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
13. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
14. Repeat steps 2-13 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 16.6.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 16.6.5.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1 |

**Table 16.6.5.3.4.3-2: *MeasConfig* (Steps 3, 7 & 9, test procedure)**

| Derivation path: Table H.3.1-2 with condition INTER-RAT | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-B2 | Table 16.6.5.3.4.3-3 | Step 3 |
| | ReportConfigInterRAT-CGI | Table 16.6.5.3.4.3-5 | Step 9 |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig-DEFAULT specified in Table H.3.1-6 with condition gapUE and Pattern #0 | | Step 3 |
| measGapConfig SEQUENCE { | | | Step 7 |
| gapUE CHOICE { | | | |
| release | null | MG needs to be released to apply interruption requirements | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.6.5.3.4.3-3: *ReportConfigInterRAT-B2* (Table 16.6.5.3.4.3-2)**

| Derivation Path: Table H.3.1-4A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| rsrp | 58 | Actual threshold = 58-156 = -98 dBm/SCS | SCS15 |
| | 61 | Actual threshold = 61-156 = -95 dBm/SCS | SCS30 |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| rsrp | 31 | Actual threshold = 31-140 = -109 dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.6.5.3.4.3-4: *MeasResults* (Step 6, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measResultServingMOList | Not checked | | |
| measResultNeighCells CHOICE { | | | |

| | | | |
|---|---|---|---|
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA { | 1 entry | | |
| MeasResultEUTRA[1] SEQUENCE { | | Entry 1 | |
| eutra-PhysCellId | EUTRA-PhysCellId of Cell 2 | | |
| measResult SEQUENCE { | | | |
| rsrp | (0..97) | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.6.5.3.4.3-5: *ReportConfigInterRAT-CGI* (Table 16.6.5.3.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-141 with condition CGI | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| reportCGI SEQUENCE { | | | |
| cellForWhichToReportCGI | EUTRA-PhysCellId of Cell 2 | | |
| useAutonomousGaps-r16 | setup | | |
| } | | | |
| } | | | |
| } | | | |

**Table 16.6.5.3.4.3-6: *MeasResults* (Step 12, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measResultServingMOList | Not checked | | |
| measResultNeighCells CHOICE { | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA { | 1 entry | | |
| MeasResultEUTRA[1] SEQUENCE { | | Entry 1 | |
| eutra-PhysCellId | EUTRA-PhysCellId of Cell 2 | | |
| measResult | Not checked | | |
| cgi-Info | Checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

16.6.5.3.5 Test requirements

Table 16.6.5.3.4.1-3, Table 16.6.5.3.5-1 and Table 16.6.5.3.5-2 define the primary level settings including test tolerances for the test.

**Table 16.6.5.3.5-3: NR cell specific test parameters (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | | 1, 4 | FDD | | |
| | | 2, 3, 5, 6 | TDD | | |
| | | | | | |
| TDD Configuration | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $BW_{channel}$ | | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 | | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.1 RedCap FR1 | | |
| *b2-Threshold1* | | dBm/SCS | 1, 2, 4, 5 | -98 | | |
| | | | 3, 6 | -95 | | |
| *b2-Threshold2EUTRA* | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -109 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106.55 | | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -106.55 | | |
| | | | 3, 6 | -103.55 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | -2 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | -2 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88.55 | -108.55 | -108.55 |
| | | | 3, 6 | -85.55 | -105.55 | -105.55 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88.55 | -108.55 | -108.55 |
| | | | 3, 6 | -85.55 | -105.55 | -105.55 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -60.53 | -76.47 | -76.47 |
| | | dBm/18.36 MHz | 3, 6 | -57.60 | -73.55 | -73.55 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration | | | 1, 2, 3, 4, 5, 6 | 1x1 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.6.5.3.5-4: E-UTRA cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode | | 1, 2, 3 | FDD | | |
| | | 4, 5, 6 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | | |

| | | | | | |
|---|---|---|---|---|---|
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 10 MHz: $N_{RB,c}$ = 50 | | |
| PDSCH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.3 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.0 TDD | | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.6 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.6 TDD | | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 10 MHz: OP.10 FDD | | |
| | | 4, 5, 6 | 10 MHz: OP.1 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note3] | | | | | |
| OCNG_RB[Note3] | | | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7.55 | 7.55 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7.55 | 7.55 |
| RSRP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -98.45 | -98.45 |
| SCH_RP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -98.45 | -98.45 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration | | 1, 2, 3, 4, 5, 6 | 1x1 | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit a measurement report containing the cell global identifier of Cell 2 within overall delay from the start of T3, where the overall delay is calculated as follows,

Overall delay = $T_{RRC\ Processing}$ + $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ + additional margin + TTI insertion uncertainty

- $T_{RRC\ Processing}$ = 15 ms;
- $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ = 190 ms, is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell;
- TTI insertion uncertainty = 2 x $TTI_{DCCH}$ = 2 ms, is the delay uncertainty when inserting the measurement report to the TTI of the uplink DCCH;
- additional margin = 30 ms, is specified in TS 38.133 [6] clause 9.4A.4.2

Which gives overall delay = 15 + 190 + 30 + 2 = 237 ms, allow 240 ms.

From the start of T3 until 240 ms. The number of ACK/NACK being transmitted by the UE shall be no less than the minimum number of ACK/NACK given in Table 16.6.5.3.5-5.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 16.6.5.3.5-5: Minimum number of ACK/NACKs transmitted by the UE during the overall delay**

| Test configuration | Minimum number of transmitted ACK/NACKs[Note 1] |
|---|---|
| 1, 4 | 127 |
| 2, 5 | 42 |
| 3, 6 | 115 |
| NOTE 1: The overall ACK/NACK number is caused by two parts. Firstly, at least X ACK/NACK shall be sent during identifying the cell global identifier of Cell 2, where X is defined in TS 38.133 [6] Table 9.4A.4.3-1. Secondly, given that continuous DL data allocation, additional 43, 14 and 34 ACK/NACK shall be sent for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively, from the start of T3 until 240 ms excludes 190 ms for identifying the cell global identifier of Cell 2. | |

## 16.6.5.4 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 2 Rx UE

### 16.6.5.4.1 Test purpose

To verify the requirement for identification of a new CGI of E-UTRA cell with autonomous gaps in NR SA in TS 38.133 [6] clause 9.4A.4.

### 16.6.5.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting acquisition of CGI from neighbour E-UTRA cell using autonomous gap.

### 16.6.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.5.4.

### 16.6.5.4.4 Test description

Same as the test description given in clause 16.6.5.3.4

#### 16.6.5.4.4.1 Initial conditions

Same as the initial conditions given in clause 16.6.5.3.4 with following exceptions:

- Table 16.6.5.3.4.1-1 is replaced by Table 16.6.5.4.4.1-1;
- Table 16.6.5.3.4.1-2 is replaced by Table 16.6.5.4.4.1-2;
- Table 16.6.5.3.4.1-3 is replaced by Table 16.6.5.4.4.1-3.

**Table 16.6.5.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.6.5.4-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 16.6.5.4-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.5.4-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 16.6.5.4-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 16.6.5.4-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 16.6.5.4-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.6.5.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.6.5.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 16.6.5.4.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | 2 | 1 LTE carrier frequency is used in the test |
| Active cell | | Cell 1 | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| LTE Channel Bandwidth | MHz | 10 | |
| LTE PDSCH/PCFICH/PDCCH/PHICH parameters | | | As specified in clause A.6.1.1 |
| CP length | | Normal | |
| *Hysteresis* | dB | 0 | |
| Time To Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | |
| *useAutonomousGaps* | | setup | As specified in clause 5.5.3.1 in TS 38.331 [13]. |
| Time offset between cells | ms | 3 | Asynchronous cells |
| T1 | s | 5 | |
| T2 | s | ≤ 10 | |
| T3 | s | 5 | |

### 16.6.5.4.4.2 Test procedure

Same as the test procedure given in clause 16.6.5.3.4.2 with following exceptions:

- Step 12 in clause 16.6.5.3.4.2 is replaced by following step:

  12. If the UE

      a) transmits a *MeasurementReport* message containing CGI of E-UTRA Cell 2 less than 200 ms from the beginning of time period T3, and

      b) transmits ACK/NACKs no less than the minimum number of ACK/NACKs given in Table 16.6.5.4.5-5 from the start of T3 until 200 ms,

  then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

### 16.6.5.4.4.3 Message contents

Same as the message contents given in clause 16.6.5.3.4.3.

### 16.6.5.4.5 Test requirements

Table 16.6.5.4.4.1-3, Table 16.6.5.4.5-1 and Table 16.6.5.4.5-2 define the primary level settings including test tolerances for the test.

**Table 16.6.5.4.5-3: NR cell specific test parameters (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 |
|---|---|---|---|

| | | | | T1 | T2 | T3 |
|---|---|---|---|---|---|---|
| RF channel number | | | 1, 2, 3, 4, 5, 6 | 1 | | |
| Duplex mode | | | 1, 4 | FDD | | |
| | | | 2, 3, 5, 6 | TDD | | |
| | | | | | | |
| TDD Configuration | | | 2, 5 | TDDConf.1.1 | | |
| | | | 3, 6 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1, 2, 4, 5 | 10: $N_{RB,c}$ = 52 | | |
| | | | 3, 6 | 20: $N_{RB,c}$ = 51 | | |
| PDSCH reference measurement channel | | | 1, 4 | SR.1.1 FDD | | |
| | | | 2, 5 | SR.1.1 TDD | | |
| | | | 3, 6 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1, 4 | CR.1.1 FDD | | |
| | | | 2, 5 | CR.1.1 TDD | | |
| | | | 3, 6 | CR.2.1 TDD | | |
| BWP configurations | Initial DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | | |
| | Initial UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.0.1 | | |
| | Dedicated UL BWP | | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | | |
| OCNG pattern[Note1] | | | 1, 2, 3, 4, 5, 6 | OP.1 | | |
| SMTC configuration | | | 1, 2, 3, 4, 5, 6 | SMTC.1 | | |
| SSB configuration | | | 1, 2, 4, 5 | SSB.1 FR1 | | |
| | | | 3, 6 | SSB.1 RedCap FR1 | | |
| *b2-Threshold1* | | dBm/SCS | 1, 2, 4, 5 | -98 | | |
| | | | 3, 6 | -95 | | |
| *b2-Threshold2EUTRA* | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -109 | | |
| EPRE ratio of PSS to SSS | | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106 | | |
| $N_{oc}$[Note2] | | dBm/SCS | 1, 2, 4, 5 | -106 | | |
| | | | 3, 6 | -103 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | -2 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 1, 2, 3, 4, 5, 6 | 18 | -2 | -2 |
| SS-RSRP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88 | -108 | -108 |
| | | | 3, 6 | -85 | -105 | -105 |
| SSB_RP[Note3] | | dBm/SCS | 1, 2, 4, 5 | -88 | -108 | -108 |
| | | | 3, 6 | -85 | -105 | -105 |
| Io[Note3] | | dBm/9.36 MHz | 1, 2, 4, 5 | -59.98 | -75.92 | -75.92 |
| | | dBm/18.36 MHz | 3, 6 | -57.05 | -72.99 | -72.99 |
| Propagation condition | | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.6.5.4.5-4: E-UTRA cell specific test parameters (Cell 2)**

| Parameter | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1, 2, 3, 4, 5, 6 | 2 | | |
| Duplex mode | | 1, 2, 3 | FDD | | |
| | | 4, 5, 6 | TDD | | |
| TDD special subframe configuration[Note1] | | 4, 5, 6 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 4, 5, 6 | 1 | | |
| $BW_{channel}$ | MHz | 1, 2, 3, 4, 5, 6 | 10 MHz: $N_{RB,c}$ = 50 | | |
| PDSCH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.3 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.0 TDD | | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2] | | 1, 2, 3 | 10 MHz: R.6 FDD | | |
| | | 4, 5, 6 | 10 MHz: R.6 TDD | | |
| OCNG Patterns[Note2] | | 1, 2, 3 | 10 MHz: OP.10 FDD | | |
| | | 4, 5, 6 | 10 MHz: OP.1 TDD | | |
| PBCH_RA | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note3] | | | | | |
| OCNG_RB[Note3] | | | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -106 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 | 7 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 1, 2, 3, 4, 5, 6 | -Infinity | 7 | 7 |
| RSRP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -99 | -99 |
| SCH_RP[Note5] | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -Infinity | -99 | -99 |
| Propagation Condition | | 1, 2, 3, 4, 5, 6 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | 1, 2, 3, 4, 5, 6 | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit a measurement report containing the cell global identifier of Cell 2 within overall delay from the start of T3, where the overall delay is calculated as follows,

Overall delay = $T_{RRC\ Processing}$ + $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ + additional margin + TTI insertion uncertainty

- $T_{RRC\ Processing}$ = 15 ms;
- $T_{identify_CGI_RedCap,\ E\text{-}UTRAN}$ = 150 ms, is the maximum allowed time for the UE to identify a new CGI of an E-UTRA cell;

- TTI insertion uncertainty = 2 x $TTI_{DCCH}$ = 2 ms, is the delay uncertainty when inserting the measurement report to the TTI of the uplink DCCH;

- additional margin = 30 ms, is specified in TS 38.133 [6] clause 9.4A.4.2

Which gives overall delay = 15 + 150 + 30 + 2 = 197 ms, allow 200 ms.

From the start of T3 until 200 ms. The number of ACK/NACK being transmitted by the UE shall be no less than the minimum number of ACK/NACK given in Table 16.6.5.4.5-5.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 16.6.5.4.5-5: Minimum number of ACK/NACKs transmitted by the UE during the overall delay**

| Test configuration | Minimum number of transmitted ACK/NACKs Note 1 |
|---|---|
| 1, 4 | 127 |
| 2, 5 | 42 |
| 3, 6 | 115 |
| NOTE 1: The overall ACK/NACK number is caused by two parts. Firstly, at least X ACK/NACK shall be sent during identifying the cell global identifier of Cell 2, where X is defined in TS 38.133 [6] Table 9.4A.4.3-1. Secondly, given that continuous DL data allocation, additional 43, 14 and 34 ACK/NACK shall be sent for FDD 15 kHz, TDD 15 kHz and TDD 30 kHz, respectively, from the start of T3 until 200 ms excludes 150 ms for identifying the cell global identifier of Cell 2. | |

# 16.7 Measurement performance requirements for RedCap

## 16.7.1 SS-RSRP for RedCap

### 16.7.1.0 Minimum conformance requirements

#### 16.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The accuracy requirements in clause 6.7.1.0.1 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.1.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each relevant SSB.

**Table 16.7.1.0.1-1: SS-RSRP Intra-frequency absolute accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot | Io Note 1 range | | | | |
| | | | NR operating band groups Note 2 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| | | | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ±5.5 | ±10 | ≥-6 | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±9 | ±12 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The reporting range for SS-RSRP is defined from -156 dBm to -31 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.2.1 and 10.1.6.

### 16.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

The accuracy requirements in clause 6.7.1.0.2 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.1.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding band for each relevant SSB.

**Table 16.7.1.0.2-1: SS-RSRP Intra-frequency relative accuracy for 1 Rx RedCap UE in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 2 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. | | | | | | | |

NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The reporting range for SS-RSRP is defined from -156 dBm to -31 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.2.1 and 10.1.6.

### 16.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

The accuracy requirements in clause 6.7.1.0.3 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.1.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.

**Table 16.7.1.0.3-1: SS-RSRP Inter-frequency Absolute accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}_s/I_{ot}$ Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±5.5 | ±10 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±9 | ±12 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: Void
NOTE 3: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The reporting range for SS-RSRP is defined from -156 dBm to -31 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.4.1.1 and 10.1.6.

#### 16.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

The accuracy requirements in clause 6.7.1.0.4 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.1.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 16.7.1.0.4-1: SS-RSRP Inter-frequency relative accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 3 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±5.5 | ±7 | ≥-6 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.<br>NOTE 3: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The reporting range for SS-RSRP is defined from -156 dBm to -31 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.4.1.2 and 10.1.6.

### 16.7.1.1 Intra-frequency measurements for RedCap for 1 Rx UE

#### 16.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE

##### 16.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

##### 16.7.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.1.

#### 16.7.1.1.1.4 Test description

##### 16.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.1.1.4.1-1.

**Table 16.7.1.1.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.1.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.1.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.1.1.4.1-2.

**Table 16.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.1.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

##### 16.7.1.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.1.4.2 with following exceptions:

- Table 6.7.1.1.1.5-1 is replaced by Table 16.7.1.1.1.5-1.
- Table 6.7.1.1.1.5-2 is replaced by Table 16.7.1.1.1.5-2.

##### 16.7.1.1.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.1.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.1.1.1-1 applies to test configuration 16.7.1.1.1-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.1.1.1-3

#### 16.7.1.1.1.5 Test requirement

Table 16.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 16.7.1.1.1.5-2 for test configurations 1, 2 and 4 and the corresponding absolute accuracy requirements in Table 16.7.1.1.1.5-3 for test configuration 3.

**Table 16.7.1.1.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| BWP BW | Config 1, 4 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| | Config 2 | | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
| | Config 3 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control channel RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1, 4 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 | SSB. 1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Time offset with Cell 1 | Config 1, 4 | | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | | SMTC.2 | | | | | |
| | Config 2, 3 | | | SMTC.1 | | | | | |
| OCNG Patterns | | | | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | | kHz | 15 | | | | | |
| | Config 3 | | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -107.5 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | Not applicable Note 5 | | -94 | | -115.20 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | | dBm/SCS | -107.5 | | -88 | | Same as Noc/15 kHz | |
| | Config 3 | Depending on band group | | Not applicable Note 5 | | -91 | | -112.20 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.23 | -5.57 | 2.23 | -5.57 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | 0 |
| SS-RSRP Note3 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -101.50 | -106.10 | -82 | -86.60 | -111.00 + $\Delta_{BG_offset}$ | -114.00 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | Not applicable Note 5 | Not applicable Note 5 | -85 | -89.60 | -109.20 + $\Delta_{BG_offset}$ | -112.2+ $\Delta_{BG_offset}$ |
| Io Note3 | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -71.68 | | -52.18 | | -80.20 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/38.16 MHz | Not applicable Note 5 | | -51.91 | | -75.13 + $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x1 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Subtest 1 is not used when testing with 30 kHz SSB SCS.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Note 7: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

**Table 16.7.1.1.1.5-2: SS-RSRP Intra-frequency absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | 43 | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | | Bands NR_FDD_FR1_B | 36 |
| | | | Bands NR_TDD_FR1_C | 36 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 37 |
| | | | NR_FDD_FR1_F | 38 |
| | | | Bands NR_FDD_FR1_G | 38 |
| | | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 2) | 57 | 80 | NR_FDD_FR1_A, NR_TDD_FR1_A | 50 |
| | | | NR_FDD_FR1_B | 50 |
| | | | NR_TDD_FR1_C | 51 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | 52 |
| | | | NR_FDD_FR1_F | 52 |
| | | | NR_FDD_FR1_G | 53 |
| | | | NR_FDD_FR1_H | 53 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | 39 | 56 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | | Bands NR_FDD_FR1_B | 31 |
| | | | Bands NR_TDD_FR1_C | 32 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 33 |
| | | | NR_FDD_FR1_F | 33 |
| | | | Bands NR_FDD_FR1_G | 34 |
| | | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 2) | 62 | 83 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 54 |
| | | | Bands NR_FDD_FR1_B | 55 |
| | | | Bands NR_TDD_FR1_C | 55 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 56 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 56 |
| | | | NR_FDD_FR1_F | 57 |
| | | | Bands NR_FDD_FR1_G | 57 |
| | | | Bands NR_FDD_FR1_H | 58 |
| Note 1: NR operating band groups are as defined in clause 3A.4.1. | | | | |

**Table 16.7.1.1.1.5-3: SS-RSRP Intra-frequency absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | N/A | 56 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 37 |
| | | | Bands NR_FDD_FR1_B | 38 |
| | | | Bands NR_TDD_FR1_C | 38 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 39 |

| | | | | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 39 |
| | | | NR_FDD_FR1_F | 40 |
| | | | Bands NR_FDD_FR1_G | 40 |
| | | | Bands NR_FDD_FR1_H | 41 |
| Highest reported value (Cell 2) | N/A | 77 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 51 |
| | | | Bands NR_FDD_FR1_B | 52 |
| | | | Bands NR_TDD_FR1_C | 52 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 53 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 53 |
| | | | NR_FDD_FR1_F | 54 |
| | | | Bands NR_FDD_FR1_G | 54 |
| | | | Bands NR_FDD_FR1_H | 55 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | N/A | 53 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 33 |
| | | | Bands NR_FDD_FR1_B | 33 |
| | | | Bands NR_TDD_FR1_C | 34 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 35 |
| | | | NR_FDD_FR1_F | 35 |
| | | | Bands NR_FDD_FR1_G | 36 |
| | | | Bands NR_FDD_FR1_H | 36 |
| Highest reported value (Cell 2) | N/A | 80 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 56 |
| | | | Bands NR_FDD_FR1_B | 56 |
| | | | Bands NR_TDD_FR1_C | 57 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 57 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 58 |
| | | | NR_FDD_FR1_F | 58 |
| | | | Bands NR_FDD_FR1_G | 59 |
| | | | Bands NR_FDD_FR1_H | 59 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 16.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for 1 Rx UE

#### 16.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.1.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.1.

### 16.7.1.1.2.4 Test description

#### 16.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.1.2.4.1-1.

**Table 16.7.1.1.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.1.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.1.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.1.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.1.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.1.2.4.1-2.

**Table 16.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.1.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 16.7.1.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.2.4.2 with following exceptions:

- Table 6.7.1.1.2.5-1 is replaced by Table 16.7.1.1.2.5-1.
- Table 6.7.1.1.2.5-2 is replaced by Table 16.7.1.1.2.5-2.

#### 16.7.1.1.2.4.3 Message contents

Message contents are same as in clause 16.7.1.1.1.4.3.

### 16.7.1.1.2.5 Test requirement

Table 16.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 16.7.1.1.2.5-2.

**Table 16.7.1.1.2.5-1: Same as Table 16.7.1.1.1.5-1 with the following exceptions:**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -106 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band | | Not applicable Note 5 | | -94 | | -114 + $\Delta_{BG_offset}$ | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | group | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | | dBm/SCS | -106 | | -88 | | Same as Noc/15 kHz | |
| | Config 3 | Depending on band group | | Not applicable Note 5 | | -91 | | -111 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 1.88 | -4.97 | 1.88 | -4.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 2 | 6 | 2 | 3 | 0 |
| SS-RSRP Note3 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -100 | -104 | -82 | -86.00 | -111.00 + $\Delta_{BG_offset}$ | -114.00 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | Not applicable Note 5 | Not applicable Note 5 | -85 | -89 | -108 + $\Delta_{BG_offset}$ | -111+ $\Delta_{BG_offset}$ |
| Io Note3 | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -70.05 | | -52.05 | | -80.20 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/38.16 MHz | Not applicable Note 5 | | -51.77 | | -73.93 + $\Delta_{BG_offset}$ | |

**Table 16.7.1.1.2.5-2: SS-RSRP Intra-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x - 8 | RSRP_x - 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 16.7.1.2 Intra-frequency measurements for RedCap for 2 Rx UE

### 16.7.1.2.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE

#### 16.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.1.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.2.

### 16.7.1.2.1.4 Test description

#### 16.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.2.1.4.1-1.

**Table 16.7.1.2.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.2.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.2.1.4.1-2.

**Table 16.7.1.2.1.4.1-2: Initial conditions for SS-RSRP intra-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.2.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 16.7.1.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.1.4.2 with following exceptions:

- Table 6.7.1.1.1.5-1 is replaced by Table 16.7.1.2.1.5-1.
- Table 6.7.1.1.1.5-2 is replaced by Table 16.7.1.2.1.5-2.

#### 16.7.1.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.1.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.1.1.1-1 applies to test configuration 16.7.1.2.1-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.1.2.1-3

### 16.7.1.2.1.5 Test requirement

Table 16.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 16.7.1.2.1.5-2 for test configurations 1, 2 and 4 and the corresponding absolute accuracy requirements in Table 16.7.1.2.1.5-3 for test configuration 3.

**Table 16.7.1.2.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters**

| Parameter | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|

| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
|---|---|---|---|---|---|---|---|---|
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| BWP BW | Config 1, 4 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
| | Config 2 | | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
| | Config 3 | | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR2.1 TDD | | CR2.1 TDD | | CR2.1 TDD | |
| Control channel RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1, 4 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3 | | SSB.1 RedCap FR1 | SSB. 1 RedCap FR1 | SSB. 1 RedCap FR1 | SSB. 1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3 | | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -107.50 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | Not applicable Note 5 | | -94 | | -115.20 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | | dBm/SCS | -107.50 | | -88 | | Same as Noc/15 kHz | |
| | Config 3 | Depending on band group | | Not applicable Note 5 | | -91 | | -112.20 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.23 | -5.57 | 2.23 | -5.57 | 0.37 | -5.56 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1.4 | 6 | 1.4 | 3 | -0.8 |
| SS-RSRP Note3 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -101.50 | -106.10 | -82 | -86.60 | -111.00 + $\Delta_{BG_offset}$ | -114.80 + $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band group | | Not applicable Note 5 | Not applicable Note 5 | -85 | -89.60 | -109.20 + $\Delta_{BG_offset}$ | -112.20 + $\Delta_{BG_offset}$ |
| Io Note3 | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -71.68 | | -52.18 | | -80.39 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/38.16 MHz | Not applicable Note 5 | | -51.91 | | -75.13 + $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | | | | | |
| Antenna configuration | | | | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Subtest 1 is not used when testing with 30 kHz SSB SCS.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Note 7: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

**Table 16.7.1.2.1.5-2: SS-RSRP Intra-frequency absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | 44 | 60 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 36 |

| | | | | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_B | 36 |
| | | | Bands NR_TDD_FR1_C | 37 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 38 |
| | | | Bands NR_FDD_FR1_G | 39 |
| | | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 2) | 56 | 79 | NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | | NR_FDD_FR1_B | 48 |
| | | | NR_TDD_FR1_C | 49 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | 50 |
| | | | NR_FDD_FR1_G | 51 |
| | | | NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | 40 | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | | Bands NR_FDD_FR1_B | 32 |
| | | | Bands NR_TDD_FR1_C | 32 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 33 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 33 |
| | | | Bands NR_FDD_FR1_G | 34 |
| | | | Bands NR_FDD_FR1_H | 35 |
| Highest reported value (Cell 2) | 61 | 82 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | | Bands NR_FDD_FR1_B | 53 |
| | | | Bands NR_TDD_FR1_C | 53 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 54 |
| | | | Bands NR_FDD_FR1_G | 55 |
| | | | Bands NR_FDD_FR1_H | 56 |
| Note 1: NR operating band groups are as defined in clause 3A.4.1. | | | | |

**Table 16.7.1.2.1.5-3: SS-RSRP Intra-frequency absolute accuracy requirements for the reported values for test configuration 3**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | N/A | 57 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 38 |
| | | | Bands NR_FDD_FR1_B | 39 |
| | | | Bands NR_TDD_FR1_C | 39 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 40 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 40 |
| | | | Bands NR_FDD_FR1_G | 41 |
| | | | Bands NR_FDD_FR1_H | 42 |
| Highest reported value (Cell 2) | N/A | 76 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 50 |
| | | | Bands NR_FDD_FR1_B | 51 |
| | | | Bands NR_TDD_FR1_C | 51 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 52 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 52 |

| | | | | |
|---|---|---|---|---|
| | | | Bands NR_FDD_FR1_G | 53 |
| | | | Bands NR_FDD_FR1_H | 54 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3** | |
| Lowest reported value (Cell 2) | N/A | 54 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 34 |
| | | | Bands NR_FDD_FR1_B | 34 |
| | | | Bands NR_TDD_FR1_C | 35 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 35 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 36 |
| | | | Bands NR_FDD_FR1_G | 37 |
| | | | Bands NR_FDD_FR1_H | 37 |
| Highest reported value (Cell 2) | N/A | 79 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 55 |
| | | | Bands NR_FDD_FR1_B | 55 |
| | | | Bands NR_TDD_FR1_C | 56 |
| | | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 56 |
| | | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 57 |
| | | | Bands NR_FDD_FR1_G | 58 |
| | | | Bands NR_FDD_FR1_H | 58 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 16.7.1.2.2 NR SA FR1 SS-RSRP relative measurement accuracy for 2 Rx UE

#### 16.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.1.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.2.

#### 16.7.1.2.2.4 Test description

##### 16.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.2.2.4.1-1.

**Table 16.7.1.2.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.2.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.2.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.2.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.2.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.2.2.4.1-2.

**Table 16.7.1.2.2.4.1-2: Initial conditions for SS-RSRP intra-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.2.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

### 16.7.1.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.2.4.2 with following exceptions:

- Table 6.7.1.1.2.5-1 is replaced by Table 16.7.1.2.2.5-1.
- Table 6.7.1.1.2.5-2 is replaced by Table 16.7.1.2.2.5-2.

### 16.7.1.2.2.4.3 Message contents

Message contents are same as in clause 16.7.1.2.1.4.3.

### 16.7.1.2.2.5 Test requirement

Table 16.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 16.7.1.2.2.5-2.

**Table 16.7.1.2.2.5-1: Same as Table 16.7.1.2.1.5-1 with the following exceptions:**

| Parameter | | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -106 | | -88 | | -114 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | N/A | | -94 | | -114+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | | dBm/SCS | Same as Noc/15 kHz | | Same as Noc/15 kHz | | Same as Noc/15 kHz | |
| | Config 3 | Depending on band group | | N/A | | -91 | | -111 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | 1.88 | -4.97 | 1.88 | -4.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 2 | 6 | 2 | 3 | 0 |
| SS-RSRP Note3 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -100 | -104 | -82 | -86 | -111.00 + $\Delta_{BG_offset}$ | -114.00 + $\Delta_{BG_offset}$ |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Config 3 | Depending on band group | | N/A | N/A | -85 | -89 | -108.00 + $\Delta_{BG_offset}$ | -111.00 + $\Delta_{BG_offset}$ |
| Io[Note3] | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -70.05 | | -52.05 | | -80.20 + $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/38.16 MHz | N/A | | -51.77 | | -73.93 + $\Delta_{BG_offset}$ | |

**Table 16.7.1.2.2.5-2: SS-RSRP Intra-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x – 8 | RSRP_x – 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x – 1 | RSRP_x + 1 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | RSRP_x - 8 | RSRP_x – 8 | RSRP_x - 7 |
| Highest reported value (Cell 2) | RSRP_x - 1 | RSRP_x - 1 | RSRP_x + 1 |
| RSRP_x is the reported value of Cell 1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 16.7.1.3 Inter-frequency measurements for RedCap for 1 Rx UE

### 16.7.1.3.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE

#### 16.7.1.3.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.1.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.3.

#### 16.7.1.3.1.4 Test description

##### 16.7.1.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.3.1.4.1-1.

**Table 16.7.1.3.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.3.1.4.1-2.

**Table 16.7.1.3.1.4.1-2: Initial conditions for SS-RSRP inter-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.3.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the neighbour cell on a different frequency than the PCell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

### 16.7.1.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.2.1.4.2 with following exceptions:

- Table 6.7.1.2.1.5-1 is replaced by Table 16.7.1.3.1.5-1.
- Table 6.7.1.2.1.5-2 is replaced by Table 16.7.1.3.1.5-2.

### 16.7.1.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.1.2.1-1 applies to test configuration 16.7.1.3.1-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.1.3.1-3

### 16.7.1.3.1.5 Test requirement

Table 16.7.1.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 16.7.1.3.1.5-2 for test configurations 1, 2 and 4 and the corresponding absolute accuracy requirements in Table 16.7.1.3.1.5-3 for test configuration 3.

**Table 16.7.1.3.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | 20: $N_{RB,c}$ = 51 | |
| Duplex mode | Config 1 | | FDD | | FDD | |
| | Config 2 | | TDD | | TDD | |
| | Config 3 | | TDD | | TDD | |
| | Config 4 | | HD-FDD | | HD-FDD | |
| TDD configuration | Config 1 | | N/A | | N/A | |
| | Config 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | Config 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | |
| | | Config 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - | |
| | | Config 3 | | CR.2.1 TDD | - | CR.2.1 TDD | - | |
| Dedicated CORESET Reference Channel | | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| | | Config 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - | |
| | | Config 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - | |
| SSB configuration | | Config 1, 4 | | SSB.1 FR1 | | SSB.1 FR1 | | |
| | | Config 2 | | SSB.1 FR1 | | SSB.1 FR1 | | |
| | | Config 3 | | SSB.1 RedCap FR1 | | SSB.1 RedCap FR1 | | |
| OCNG Patterns | | Config 1~4 | | OP.1 | | OP.1 | | |
| TRS configuration | | Config 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | | |
| | | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | |
| | | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| Initial BWP Configuration | | Config 1~4 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | | |
| Dedicated BWP configuration | | Config 1~4 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | | |
| Time offset with Cell 1 | | Config 1, 4 | ms | - | 3 | - | 3 | |
| | | Config 2, 3 | µs | - | 3 | - | 3 | |
| SMTC configuration | | Config 1, 4 | | SMTC.2 | | SMTC.2 | | |
| | | Config 2, 3 | | SMTC.1 | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | | Config 1~4 | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | | | | |
| $N_{oc}$[Note2] | Depending on band group | Config 1~4 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$[Note2] | Depending on band group | Config 1, 2, 4 | dBm/SSB SCS | -94.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -115+ $\Delta_{BG_offset}$ |
| | Depending on band group | Config 3 | | -91.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -112.00+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | Config 1~4 | dB | 10 | 10 | 13 | | -3 |
| SS-RSRP[Note3] | Depending on band group | Config 1, 2, 4 | dBm/SCS | -84.65 | | (RSRP for Cell 2 +24 dB) | | -118.00+ $\Delta_{BG_offset}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Depending on band group | Config 3 | | -81.65 | | (RSRP for Cell 2 +24 dB) | -115.00+ $\Delta_{BG_offset}$ |
| Io[Note3] | Depending on band group | Config 1, 2, 4 | dBm/9.36 MHz | -56.28 | | (Io for Channel 2 +19.45 dB) | -85.28+ $\Delta_{BG_offset}$ |
| | Depending on band group | Config 3 | dBm/18.36 MHz | -53.33 | | (Io for Channel 2 +19.45 dB) | -82.35+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | | Config 1~4 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | Config 1~4 | - | AWGN | | AWGN | |
| Antenna configuration | | Config 1~4 | | 1x1 low | | 1x1 low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Note 6: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

**Table 16.7.1.3.1.5-2: SS-RSRP Inter-frequency absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 61 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 32 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 33 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 35 |
| Highest reported value (Cell 2) | 82 | NR_FDD_FR1_A, NR_TDD_FR1_A | 46 |
| | | NR_FDD_FR1_B | 46 |
| | | NR_TDD_FR1_C | 47 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | 47 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | 48 |
| | | NR_FDD_FR1_G | 49 |
| | | NR_FDD_FR1_H | 49 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 58 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 27 |
| | | Bands NR_FDD_FR1_B | 27 |
| | | Bands NR_TDD_FR1_C | 28 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 28 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 29 |
| | | Bands NR_FDD_FR1_G | 30 |
| | | Bands NR_FDD_FR1_H | 30 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 50 |
| | | Bands NR_FDD_FR1_B | 51 |
| | | Bands NR_TDD_FR1_C | 51 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 52 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 52 |
| | | Bands NR_FDD_FR1_G | 53 |
| | | Bands NR_FDD_FR1_H | 54 |
| Note 1: NR operating band groups are as defined in clause 3A.4.1. | | | |

**Table 16.7.1.3.1.5-3: SS-RSRP Inter-frequency absolute accuracy requirements for the reported values for test configuration 3**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 64 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 34 |
| | | Bands NR_FDD_FR1_B | 35 |
| | | Bands NR_TDD_FR1_C | 35 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 36 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 36 |
| | | Bands NR_FDD_FR1_G | 37 |
| | | Bands NR_FDD_FR1_H | 38 |
| Highest reported value (Cell 2) | 85 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 49 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 50 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 52 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 61 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 30 |
| | | Bands NR_FDD_FR1_B | 30 |
| | | Bands NR_TDD_FR1_C | 31 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 31 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 32 |
| | | Bands NR_FDD_FR1_G | 33 |
| | | Bands NR_FDD_FR1_H | 33 |
| Highest reported value (Cell 2) | 88 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 53 |
| | | Bands NR_FDD_FR1_B | 54 |
| | | Bands NR_TDD_FR1_C | 54 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 55 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 55 |
| | | Bands NR_FDD_FR1_G | 56 |
| | | Bands NR_FDD_FR1_H | 57 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 16.7.1.3.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 1 Rx UE

#### 16.7.1.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.1.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.1.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.3.

#### 16.7.1.3.2.4 Test description

##### 16.7.1.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.3.2.4.1-1.

**Table 16.7.1.3.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.3.2.4.1-2.

**Table 16.7.1.3.2.4.1-2: Initial conditions for SS-RSRP inter-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.3.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the neighbour cell on a different frequency than the PCell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

#### 16.7.1.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.2.2.4.2 with following exceptions:

- Table 6.7.1.2.2.5-1 is replaced by Table 16.7.1.3.2.5-1.
- Table 6.7.1.2.2.5-2 is replaced by Table 16.7.1.3.2.5-2.

#### 16.7.1.3.2.4.3 Message contents

Message contents are same as in clause 16.7.1.3.1.4.3.

### 16.7.1.3.2.5 Test requirement

Table 16.7.1.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 16.7.1.3.2.5-2.

**Table 16.7.1.3.2.5-1: Same as Table 16.7.1.3.1.5-1**

**Table 16.7.1.3.2.5-2: SS-RSRP Inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 8 | SS-RSRP_x - 32 |
| Highest reported value (Cell 2) | SS-RSRP_x + 8 | SS-RSRP_x - 17 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 10 | SS-RSRP_x - 34 |
| Highest reported value (Cell 2) | SS-RSRP_x + 10 | SS-RSRP_x - 15 |
| SS-RSRP_x is the reported value of Cell 1. | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 16.7.1.4 Inter-frequency measurements for RedCap for 2 Rx UE

### 16.7.1.4.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE

#### 16.7.1.4.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.1.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.1.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.4.

#### 16.7.1.4.1.4 Test description

##### 16.7.1.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.4.1.4.1-1.

**Table 16.7.1.4.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.4.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.4.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.4.1.4.1-2.

**Table 16.7.1.4.1.4.1-2: Initial conditions for SS-RSRP inter-frequency absolute accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.4.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the neighbour cell on a different frequency than the PCell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

### 16.7.1.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.2.1.4.2 with following exceptions:

- Table 6.7.1.2.1.5-1 is replaced by Table 16.7.1.4.1.5-1.
- Table 6.7.1.2.1.5-2 is replaced by Table 16.7.1.4.1.5-2.

### 16.7.1.4.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.1.2.1-1 applies to test configuration 16.7.1.4.1-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.1.4.1-3

### 16.7.1.4.1.5 Test requirement

Table 16.7.1.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 16.7.1.4.1.5-2 for test configurations 1, 2 and 4 and the corresponding absolute accuracy requirements in Table 16.7.1.4.1.5-3 for test configuration 3.

**Table 16.7.1.4.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~4 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 20: $N_{RB,c}$ = 51 | | 20: $N_{RB,c}$ = 51 | |
| Duplex mode | 1 | | FDD | | FDD | |
| | 2 | | TDD | | TDD | |
| | 3 | | TDD | | TDD | |
| | 4 | | HD-FDD | | HD-FDD | |
| TDD configuration | 1, 4 | | N/A | | N/A | |
| | 2 | | TDDConf.1.1 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2 | | SR.1.1 TDD | | SR.1.1 TDD | | |
| | | 3 | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | |
| | | 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - | |
| | | 3 | | CR.2.1 TDD | - | CR.2.1 TDD | - | |
| Dedicated CORESET Reference Channel | | 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
| | | 2 | | CCR.1.1 TDD | - | CCR.1.1 TDD | - | |
| | | 3 | | CCR.2.1 TDD | - | CCR.2.1 TDD | - | |
| SSB configuration | | 1, 4 | | SSB.1 FR1 | | SSB.1 FR1 | | |
| | | 2 | | SSB.1 FR1 | | SSB.1 FR1 | | |
| | | 3 | | SSB.1 RedCap FR1 | | SSB.1 RedCap FR1 | | |
| OCNG Patterns | | 1~4 | | OP.1 | | OP.1 | | |
| TRS configuration | | 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | | |
| | | 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | |
| | | 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | |
| Initial BWP Configuration | | 1~4 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | | |
| Dedicated BWP configuration | | 1~4 | | DLBWP.1.1 ULBWP.1.1 | | DLBWP.1.1 ULBWP.1.1 | | |
| Time offset with Cell 1 | | 1, 4 | ms | - | 3 | - | 3 | |
| | | 2, 3 | µs | - | 3 | - | 3 | |
| SMTC configuration | | 1, 4 | | SMTC.2 | | SMTC.2 | | |
| | | 2, 3 | | SMTC.1 | | SMTC.1 | | |
| EPRE ratio of PSS to SSS | | 1~4 | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | Depending on band group | 1~4 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -115+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Depending on band group | 1, 2, 4 | dBm/SSB SCS | -94.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -115+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3 | | -91.65 | | ( $N_{oc}$ for Channel 2 +8 dB) | | -112.00+ $\Delta_{BG_offset}$ |
| $\hat{E}_s/I_{ot}$ | | 1~4 | dB | 10 | 10 | 13 | | -3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SS-RSRP[Note3] | Depending on band group | 1, 2, 4 | dBm/SCS | -84.65 | | (RSRP for Cell 2 +24 dB) | -118.00+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3 | | -81.65 | | (RSRP for Cell 2 +24 dB) | -115.00+ $\Delta_{BG_offset}$ |
| Io[Note3] | Depending on band group | 1, 2, 4 | dBm/9.36 MHz | -56.28 | | (Io for Channel 2 +19.45 dB) | -85.28+ $\Delta_{BG_offset}$ |
| | Depending on band group | 3 | dBm/18.36 MHz | -53.33 | | (Io for Channel 2 +19.45 dB) | -82.35+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | | 1~4 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~4 | - | AWGN | | AWGN | |
| Antenna configuration | | 1~4 | | 1x2 | | 1x2 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Note 6: $\Delta_{BG_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.

**Table 16.7.1.4.1.5-2: SS-RSRP Inter-frequency absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 32 |
| | | Bands NR_FDD_FR1_B | 33 |
| | | Bands NR_TDD_FR1_C | 33 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 34 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 34 |
| | | Bands NR_FDD_FR1_G | 35 |
| | | Bands NR_FDD_FR1_H | 36 |
| Highest reported value (Cell 2) | 81 | NR_FDD_FR1_A, NR_TDD_FR1_A | 45 |
| | | NR_FDD_FR1_B | 45 |
| | | NR_TDD_FR1_C | 46 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | 46 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | 47 |
| | | NR_FDD_FR1_G | 48 |
| | | NR_FDD_FR1_H | 48 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 59 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 28 |
| | | Bands NR_FDD_FR1_B | 28 |
| | | Bands NR_TDD_FR1_C | 29 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 29 |

| | | | |
|---|---|---|---|
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 30 |
| | | Bands NR_FDD_FR1_G | 31 |
| | | Bands NR_FDD_FR1_H | 31 |
| Highest reported value (Cell 2) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 49 |
| | | Bands NR_FDD_FR1_B | 50 |
| | | Bands NR_TDD_FR1_C | 50 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 51 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 51 |
| | | Bands NR_FDD_FR1_G | 52 |
| | | Bands NR_FDD_FR1_H | 53 |
| Note 1: NR operating band groups are as defined in clause 3A.4.1. | | | |

**Table 16.7.1.4.1.5-3: SS-RSRP Inter-frequency absolute accuracy requirements for the reported values for test configuration 3**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 65 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 35 |
| | | Bands NR_FDD_FR1_B | 36 |
| | | Bands NR_TDD_FR1_C | 36 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 37 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 37 |
| | | Bands NR_FDD_FR1_G | 38 |
| | | Bands NR_FDD_FR1_H | 39 |
| Highest reported value (Cell 2) | 84 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 48 |
| | | Bands NR_FDD_FR1_B | 48 |
| | | Bands NR_TDD_FR1_C | 49 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 49 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 50 |
| | | Bands NR_FDD_FR1_G | 51 |
| | | Bands NR_FDD_FR1_H | 51 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 62 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 31 |
| | | Bands NR_FDD_FR1_B | 31 |
| | | Bands NR_TDD_FR1_C | 32 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 32 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 33 |
| | | Bands NR_FDD_FR1_G | 34 |
| | | Bands NR_FDD_FR1_H | 34 |
| Highest reported value (Cell 2) | 87 | Bands NR_FDD_FR1_A, NR_TDD_FR1_A | 52 |
| | | Bands NR_FDD_FR1_B | 53 |
| | | Bands NR_TDD_FR1_C | 53 |
| | | Bands NR_FDD_FR1_D, NR_TDD_FR1_D | 54 |
| | | Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E | 54 |
| | | Bands NR_FDD_FR1_G | 55 |
| | | Bands NR_FDD_FR1_H | 56 |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 16.7.1.4.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 2 Rx UE

#### 16.7.1.4.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.1.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.1.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.1.4.

#### 16.7.1.4.2.4 Test description

##### 16.7.1.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.7.1.4.2.4.1-1.

**Table 16.7.1.4.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations**

| Test Case ID | Description |
|---|---|
| 16.7.1.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.1.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.1.4.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.1.4.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 16.7.1.4.2.4.1-2.

**Table 16.7.1.4.2.4.1-2: Initial conditions for SS-RSRP inter-frequency relative accuracy in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.1.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 16.7.1.4.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the neighbour cell on a different frequency than the PCell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

##### 16.7.1.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.2.2.4.2 with following exceptions:

- Table 6.7.1.2.2.5-1 is replaced by Table 16.7.1.4.2.5-1.
- Table 6.7.1.2.2.5-2 is replaced by Table 16.7.1.4.2.5-2.

#### 16.7.1.4.2.4.3 Message contents

Message contents are same as in clause 16.7.1.4.1.4.3.

### 16.7.1.4.2.5 Test requirement

Table 16.7.1.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 16.7.1.4.2.5-1 shall meet the corresponding relative accuracy requirements in Table 16.7.1.4.2.5-2.

**Table 16.7.1.4.2.5-1: Same as Table 16.7.1.4.1.5-1**

**Table 16.7.1.4.2.5-2: SS-RSRP Inter-frequency relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 7 | SS-RSRP_x - 31 |
| Highest reported value (Cell 2) | SS-RSRP_x + 7 | SS-RSRP_x - 18 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 2) | SS-RSRP_x - 9 | SS-RSRP_x - 33 |
| Highest reported value (Cell 2) | SS-RSRP_x + 9 | SS-RSRP_x - 17 |
| SS-RSRP_x is the reported value of Cell 1. | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 16.7.2 SS-RSRQ for RedCap

### 16.7.2.0 Minimum conformance requirements

#### 16.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.2.0.1 shall apply.

When RedCap UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.15 for a corresponding band for each relevant SSB.

**Table 16.7.2.0.1-1: SS-RSRQ Intra-frequency absolute accuracy for 1 Rx RedCap UE in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB $\hat{E}_s/I_{ot}$** | **$I_o$ [Note 1] range** | | | | |
| | | | **NR operating band groups [Note 3]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **$dBm/BW_{Channel}$** | **$dBm/BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3.5 | ±5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4.5 | ±5 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.6.1.1.

### 16.7.2.0.2 Inter-frequency SS-RSRQ absolute measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.2.0.2 shall apply.

When RedCap UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.2.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.16 for a corresponding band for each relevant SSB.

**Table 16.7.2.0.2-1: SS-RSRQ Inter-frequency absolute accuracy for 1 Rx RedCap UE in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** | **Io [Note 1] range** | | | | |
| | | | **NR operating band groups [Note 3]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±3.5 | ±5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4.5 | ±5 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.<br>NOTE 3: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.8.1.1.

### 16.7.2.0.3 Inter-frequency SS-RSRQ relative measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.2.0.3 shall apply.

When RedCap UE is only required to support 1 Rx, the relative accuracy requirements in Table 16.7.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 16.7.2.0.3-1: SS-RSRQ Inter-frequency relative accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4 | ±5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±5 | ±5 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.8.1.2.

## 16.7.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE

### 16.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

### 16.7.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.1.

### 16.7.2.1.4 Test description

#### 16.7.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.1.4.1 with followings exceptions:

- Table 6.7.2.1.4.1-1 is replaced by Table 16.7.2.1.4.1-1;
- Table 6.7.2.1.4.1-2 is replaced by Table 16.7.2.1.4.1-2.

**Table 16.7.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | - Without LTE link | | |

### 16.7.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.2.1.4.2 with following exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 16.7.2.1.5-1;
- Table 6.7.2.1.5-2 is replaced by Table 16.7.2.1.5-2.

### 16.7.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.2.1-1 applies to test configuration 16.7.2.1-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.1-3

**Table 16.7.2.1.4.3-1: *RLC-Config***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-149 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLC-Config ::= CHOICE { | | | |
| am SEQUENCE { | | | |
| ul-AM-RLC SEQUENCE { | | | |
| maxRetxThreshold | t32 | | SRB1 |
| } | | | |
| } | | | |
| } | | | |

### 16.7.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.2.1.5 with followings exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 16.7.2.1.5-1;
- Table 6.7.2.1.5-2 is replaced by Table 16.7.2.1.5-2.

**Table 16.7.2.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Gap Pattern ID | | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OP. 1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | | | |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | kHz | 15 | | | | | |
| | | Config 3 | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | -92.6 | | - | | -114+ $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | | -89.6 | | - | | -111+ $\Delta_{BG_offset}$ | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| SS-RSRP Note 3 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -83.5 | -83.5 | -103.9 | -103.9 | -118+ $\Delta_{BG_offset}$ | -118+ $\Delta_{BG_offset}$ |
| | Config 3 | Depending on band Group | | -85.6 | -85.6 | - | - | -115+ $\Delta_{BG_offset}$ | -115+ $\Delta_{BG_offset}$ |
| SS-RSRQ Note3 | | Depending on band group | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 + $\Delta_{BG_offset}$ | -17.34 + $\Delta_{BG_offset}$ |
| Io Note3 | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -50 | | -70 | | -83.5+ $\Delta_{BG_offset}$ | |
| | Config 3 | Depending on band group | dBm/18.36 MHz | -50 | | - | | -80.6+ $\Delta_{BG_offset}$ | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | | | | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Note 7: Subtest 2 is not used when testing with 30 kHz SSB SCS.

**Table 16.7.2.1.5-2: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x + 50 | SS-RSRQ_x + 44 | SS-RSRQ_x + 42 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 64 | SS-RSRQ_x + 62 | SS-RSRQ_x + 61 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x + 47 | SS-RSRQ_x + 43 | SS-RSRQ_x + 41 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 67 | SS-RSRQ_x + 63 | SS-RSRQ_x + 62 |

NOTE: SS-RSRQ_x is the reported value of Cell 1.

## 16.7.2.2 NR SA FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE

### 16.7.2.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

### 16.7.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.2.

### 16.7.2.2.4 Test description

#### 16.7.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.1.4.1 with followings exceptions:

- Table 6.7.2.1.4.1-1 is replaced by Table 16.7.2.2.4.1-1;
- Table 6.7.2.1.4.1-2 is replaced by Table 16.7.2.2.4.1-2.

**Table 16.7.2.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | - Without LTE link | | |

#### 16.7.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.2.1.4.2 with following exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 16.7.2.2.5-1;
- Table 6.7.2.1.5-2 is replaced by Table 16.7.2.2.5-2.

#### 16.7.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.2.1-1 applies to test configuration 16.7.2.2-4.
- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.2-3

### 16.7.2.2.5 Test requirement

Same as the test requirements given in clause 6.7.2.1.5 with followings exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 16.7.2.2.5-1;
- Table 6.7.2.1.5-2 is replaced by Table 16.7.2.2.5-2.

**Table 16.7.2.2.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Gap Pattern ID | | | 0 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR2.1 TDD | | SR2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control Channel RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | | | |
| | | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | | | |
| OCNG Patterns | | | | OP. 1 | | | | | | | |
| SS-RSSI-Measurement | | | | Not Applicable | | | | | | | |
| Time offset with Cell 1 | | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 | | |
| | | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 | | |
| SMTC configuration | | Config 1, 4 | | SMTC.2 | | | | | | | |
| | | Config 2, 3 | | SMTC.1 | | | | | | | |
| SSB configuration | | Config 1, 2, 4 | | SSB.1 FR1 | | | | | | | |
| | | Config 3 | | SSB.1 RedCap FR1 | | | | | | | |
| CSI-RS for tracking | | Config 1, 4 | | TRS.1.1 FDD | | | | | | | |
| | | Config 2 | | TRS.1.1 TDD | | | | | | | |
| | | Config 3 | | TRS.1.2 TDD | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4 | kHz | 15 | | | | | | | |
| | | Config 3 | | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | 0 | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/15 kHz | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | | | |
| | Config 3 | Depending on band group | | -92.6 | | - | | -114+ $\Delta_{BG_offset}$ | | | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | Depending on band group | dBm/SCS | -86.5 | | -101 | | -114+ $\Delta_{BG_offset}$ | | | |
| | Config 3 | Depending on band group | | -89.6 | | - | | -111+ $\Delta_{BG_offset}$ | | | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5..46 | -5.46 | | |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 | | |
| SS-RSRP Note3 | Config 1,2,4 | Depending on band group | dBm/SCS | -83.5 | -83.5 | -103.9 | -103.9 | -118+ $\Delta_{BG_offs}$ | -118+ $\Delta_{BG_offs}$ | | |
| | Config 3 | Depending on band Group | | -86.6 | -86.6 | - | - | -115 | -115+ $\Delta_{BG_offset}$ | | |
| SS-RSRQ Note3 | | Depending on band group | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 | | |
| Io Note3 | Config 1, 2, 4 | Depending on band group | dBm/9.36 MHz | -51.57 | | -70 | | -83.5+ $\Delta_{BG_offset}$ | | | |
| | Config 3 | Depending on band group | dBm/18.36 MHz | -50 | | - | | -80.6+ $\Delta_{BG_offset}$ | | | |
| Propagation condition | | | - | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN | | |
| Antenna configuration | | | | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

| | |
|---|---|
| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |
| Note 7: | Subtest 2 is not used when testing with 30 kHz SSB SCS. |

**Table 16.7.2.2.5-2: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x + 52 | SS-RSRQ_x + 46 | SS-RSRQ_x + 44 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 62 | SS-RSRQ_x + 60 | SS-RSRQ_x + 59 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x + 49 | SS-RSRQ_x + 45 | SS-RSRQ_x + 43 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 65 | SS-RSRQ_x + 61 | SS-RSRQ_x + 60 |
| NOTE: SS-RSRQ_x is the reported value of Cell 1. | | | |

## 16.7.2.3 Inter-frequency measurement accuracy for 1 Rx UE

### 16.7.2.3.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE

#### 16.7.2.3.1.1 Test purpose

To verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.8.1.1.

#### 16.7.2.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.3.

#### 16.7.2.3.1.4 Test description

##### 16.7.2.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.1 with followings exceptions:

- Table 6.7.2.2.1.4.1-1 is replaced by Table 16.7.2.3.1.4.1-1;
- Table 6.7.2.2.1.4.1-2 is replaced by Table 16.7.2.3.1.4.1-2.

**Table 16.7.2.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.2.3.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

### 16.7.2.3.1.4.2 Test procedure

Same as the test procedure in clause 6.7.2.2.1.4.2 with following exceptions:

- Table 6.7.2.2.1.5-1 is replaced by Table 16.7.2.3.1.5-1;
- Table 6.7.2.2.1.5-2 is replaced by Table 16.7.2.3.1.5-2.

### 16.7.2.3.1.4.3 Message contents

Same as the message contents in clause 6.7.2.2.1.4.3 with following exceptions:

- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.3.1-3.

### 16.7.2.3.1.5 Test requirement

Same as the test requirements in clause 6.7.2.2.1.5 with followings exceptions:

- Table 6.7.2.2.1.5-1 is replaced by Table 16.7.2.3.1.5-1;
- Table 6.7.2.2.1.5-2 is replaced by Table 16.7.2.3.1.5-2.

**Table 16.7.2.3.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Gap pattern ID | | | 0 | | | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | R.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | | | | |
| $N_{oc}$[Note2] | Config 1, 2, 4 | dBm/15 kHz | -81.68 | | -106 | | -116 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -86.27 | | -113 | | -116 + $\Delta_{BG_offset}$ | |
| $N_{oc}$[Note2] | Config 1, 2, 4 | dBm/SCS | -81.68 | | -106 | | -116 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -83.27 | | -110 | | -113 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.75 | | -1.75 | | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | dB | -1.75 | | -1.75 | | 3 | -1.75 |
| SS-RSRP[Note3] | Config 1, 2, 4 | dBm/SCS | -83.43 | | -107.75 | | -113+ $\Delta_{BG_offset}$ | -117.7+ $\Delta_{BG_offset}$ |
| | Config 3 | | -85.02 | | -111.75 | | -110+ $\Delta_{BG_offset}$ | -114.7+ $\Delta_{BG_offset}$ |
| SS-RSRQ[Note3] | | dB | -14.77 | | -14.77 | | -12.56 | -14.76 |
| Io[Note3] | Config 1, 2, 4 | dBm/ChBW | -51.51 | | -75.83 | | -83.28+ $\Delta_{BG_offset}$ | -85.83+ $\Delta_{BG_offset}$ |
| | Config 3 | | -53.17 | | -79.90 | | -80.36+ $\Delta_{BG_offset}$ | -82.90+ $\Delta_{BG_offset}$ |
| Propagation condition | | | AWGN | | | | | |
| Antenna configuration | | | 1x1 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

| Note 6: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |
|---|---|

**Table 16.7.2.3.1.5-2: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_50 | SS-RSRQ_50 | SS-RSRQ_50 |
| Highest reported value (Cell 2) | SS-RSRQ_64 | SS-RSRQ_64 | SS-RSRQ_64 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_47 | SS-RSRQ_47 | SS-RSRQ_47 |
| Highest reported value (Cell 2) | SS-RSRQ_67 | SS-RSRQ_67 | SS-RSRQ_67 |

## 16.7.2.3.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 1 Rx UE

### 16.7.2.3.2.1 Test purpose

To verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.8.1.2.

### 16.7.2.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

### 16.7.2.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.3.

### 16.7.2.3.2.4 Test description

#### 16.7.2.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.2 with followings exceptions:

- Table 6.7.2.2.2.4.1-1 is replaced by Table 16.7.2.3.2.4.1-1;
- Table 6.7.2.2.2.4.1-2 is replaced by Table 16.7.2.3.2.4.1-2.

**Table 16.7.2.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.2.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

#### 16.7.2.3.2.4.2 Test procedure

Same as the test procedure in clause 6.7.2.2.2.4.2 with following exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 16.7.2.3.1.5-1;
- Table 6.7.2.2.2.5-2 is replaced by Table 16.7.2.3.2.5-2.

#### 16.7.2.3.2.4.3 Message contents

Same as the message contents in clause 6.7.2.2.2.4.3 with following exceptions:

- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.3.2-3.

#### 16.7.2.3.2.5 Test requirement

Same as the test requirements in clause 6.7.2.2.2.5 with followings exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 16.7.2.3.1.5-1;
- Table 6.7.2.2.2.5-2 is replaced by Table 16.7.2.3.2.5-1.

**Table 16.7.2.3.2.5-1: SS-RSRQ Inter-frequency relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x - 13 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 11 | SS-RSRQ_x - 11 | SS-RSRQ_x - 15 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 11 | SS-RSRQ_x + 11 | SS-RSRQ_x + 6 |
| NOTE: SS-RSRQ_x is the reported value of Cell 1. | | | |

## 16.7.2.4 Inter-frequency measurement accuracy for 2 Rx UE

### 16.7.2.4.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE

#### 16.7.2.4.1.1 Test purpose

To verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.8.1.1.

#### 16.7.2.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.2.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.4.

#### 16.7.2.4.1.4 Test description

##### 16.7.2.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.1 with followings exceptions:

- Table 6.7.2.2.1.4.1-1 is replaced by Table 16.7.2.4.1.4.1-1;
- Table 6.7.2.2.1.4.1-2 is replaced by Table 16.7.2.4.1.4.1-2;

**Table 16.7.2.4.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.4.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.4.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.2.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

##### 16.7.2.4.1.4.2 Test procedure

Same as the test procedure in clause 6.7.2.2.1.4.2 with followings exceptions:

- Table 6.7.2.2.1.5-1 is replaced by Table 16.7.2.4.1.5-1;
- Table 6.7.2.2.1.5-2 is replaced by Table 16.7.2.4.1.5-2.

##### 16.7.2.4.1.4.3 Message contents

Same as the message contents in clause 6.7.2.2.1.4.3 with following exceptions:

- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.4.1-3.

#### 16.7.2.4.1.5 Test requirement

Same as the test requirements in clause 6.7.2.2.1.5 with followings exceptions:

- Table 6.7.2.2.1.5-1 is replaced by Table 16.7.2.4.1.5-1;
- Table 6.7.2.2.1.5-2 is replaced by Table 16.7.2.4.1.5-2.

**Table 16.7.2.4.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| Gap pattern ID | | | 0 | | | | | |
| BWP BW | Config 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 20: $N_{RB,c}$ = 51 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| TRS Configuration | Config 1, 4 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| OCNG Patterns | | | OCNG pattern 1 | | | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS[Note 1] | | | | | | | | |
| $N_{oc}$ [Note2] | Config 1, 2, 4 | dBm/15 kHz | -81.68 | | -106 | | -116 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -86.27 | | -113 | | -116 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ [Note2] | Config 1, 2, 4 | dBm/SCS | -81.68 | | -106 | | -116 + $\Delta_{BG_offset}$ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | | -83.27 | -110 | -113 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s / N_{oc}$ | | dB | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP[Note3] | Config 1, 2, 4 | dBm/SCS | -83.43 | -107.75 | -113+ $\Delta_{BG_offset}$ | -117.7+ $\Delta_{BG_offset}$ |
| | Config 3 | | -85.02 | -111.75 | -110+ $\Delta_{BG_offset}$ | -114.7+ $\Delta_{BG_offset}$ |
| SS-RSRQ[Note3] | | dB | -14.77 | -14.77 | -12.56 | -14.76 |
| Io[Note3] | Config 1, 2, 4 | dBm/ChBW | -51.51 | -75.83 | -83.28+ $\Delta_{BG_offset}$ | -85.83+ $\Delta_{BG_offset}$ |
| | Config 3 | | -53.17 | -79.90 | -80.36+ $\Delta_{BG_offset}$ | -82.90+ $\Delta_{BG_offset}$ |
| Propagation condition | | | AWGN | | | |
| Antenna configuration | | | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRQ, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.2.4.1.5-2: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_52 | SS-RSRQ_52 | SS-RSRQ_52 |
| Highest reported value (Cell 2) | SS-RSRQ_62 | SS-RSRQ_62 | SS-RSRQ_62 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_49 | SS-RSRQ_49 | SS-RSRQ_49 |
| Highest reported value (Cell 2) | SS-RSRQ_65 | SS-RSRQ_65 | SS-RSRQ_65 |

## 16.7.2.4.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 2 Rx UE

### 16.7.2.4.2.1 Test purpose

To verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.8.1.2.

### 16.7.2.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

### 16.7.2.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.2.4.

### 16.7.2.4.2.4 Test description

#### 16.7.2.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.2 with followings exceptions:

- Table 6.7.2.2.2.4.1-1 is replaced by Table 16.7.2.4.2.4.1-1;
- Table 6.7.2.2.2.4.1-2 is replaced by Table 16.7.2.4.2.4.1-2.

**Table 16.7.2.4.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.2.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.2.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.2.4.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.2.4.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.2.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.2.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

### 16.7.2.4.2.4.2 Test procedure

Same as the test procedure in clause 6.7.2.2.2.4.2 with followings exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 16.7.2.4.2.5-1;
- Table 6.7.2.2.2.5-2 is replaced by Table 16.7.2.4.2.5-1.

### 16.7.2.4.2.4.3 Message contents

Same as the message contents in clause 6.7.2.2.2.4.3 with following exceptions:

- Table H.3.1-3 is used with associated condition SSB.1 RedCap FR1 for test configuration 16.7.2.4.2-3.

### 16.7.2.4.2.5 Test requirement

Same as the test requirements in clause 6.7.2.2.2.5 with followings exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 16.7.2.4.2.5-1;
- Table 6.7.2.2.2.5-2 is replaced by Table 16.7.2.4.2.5-1;

**Table 16.7.2.4.2.5-1: SS-RSRQ Inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 7 | SS-RSRQ_x - 7 | SS-RSRQ_x - 11 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 7 | SS-RSRQ_x + 7 | SS-RSRQ_x + 2 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_x - 9 | SS-RSRQ_x - 9 | SS-RSRQ_x - 13 |
| Highest reported value (Cell 2) | SS-RSRQ_x + 9 | SS-RSRQ_x + 9 | SS-RSRQ_x + 4 |
| NOTE: SS-RSRQ_x is the reported value of Cell 1. | | | |

# 16.7.3 SS-SINR for RedCap

## 16.7.3.0 Minimum conformance requirements

### 16.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.3.0.1 shall apply.

When RedCap UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.15 for a corresponding band for each relevant SSB.

**Table 16.7.3.0.1-1: SS-SINR Intra-frequency absolute accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB $\hat{E}s/Iot$ Note 3 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | dBm/$BW_{Channel}$ | dBm/$BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.0 | ±4 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB $\hat{E}s/Iot \leq 25$ dB under non-HST scenarios.
NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.
NOTE 5: The requirements apply for SSB $\hat{E}s/Iot \leq 5$ dB with SCS 15 kHz or 30 kHz under NR high speed scenarios.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.10.1.1.

### 16.7.3.0.2 Inter-frequency SS-SINR absolute measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.3.0.2 shall apply.

When RedCap UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.3.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.16 for a corresponding band for each relevant SSB.

**Table 16.7.3.0.2-1: SS-SINR Inter-frequency absolute accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 3 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | | |
| ±4.0 | ±5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±4.5 | ±5 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.12.1.1.

### 16.7.3.0.3 Inter-frequency SS-SINR relative measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.3.0.3 shall apply.

When RedCap UE is only required to support 1 Rx, the relative accuracy requirements in Table 16.7.3.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.16 for a corresponding band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- |Channel 1_Io -Channel 2_Io | ≤ 20 dB

**Table 16.7.3.0.3-1: SS-SINR Inter-frequency relative accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | |
|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | SSB Ês/Iot Note 2,4 | Io Note 1 range | | | | |
| | | | NR operating band groups Note 5 | Minimum Io | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{SSB}$ | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | | |
| | | | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ±4.5 | ±5 | ≥-3 | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| ±5 | ±5 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 5: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.12.1.2.

## 16.7.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for 1 Rx UE

### 16.7.3.1.1 Test purpose

To verify that the intra-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.10.1.1.

### 16.7.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards and supporting SS-SINR measurement.

### 16.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.1.

### 16.7.3.1.4 Test description

#### 16.7.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.1.4.1 with followings exceptions:

- Table 6.7.3.1.4.1-1 is replaced by Table 16.7.3.1.4.1-1;
- Table 6.7.3.1.4.1-2 is replaced by Table 16.7.3.1.4.1-2.

**Table 16.7.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.1.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

### 16.7.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.1.4.2 with following exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 16.7.3.1.5-1;
- Table 6.7.3.1.5-2 is replaced by Table 16.7.3.1.5-2.

### 16.7.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.3.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.1-1 applies to test configuration 16.7.3.1-4.

**Table 16.7.3.1.4.3-1: *RLC-Config***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-149 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLC-Config ::= CHOICE { | | | |
| am SEQUENCE { | | | |
| ul-AM-RLC SEQUENCE { | | | |
| maxRetxThreshold | t32 | | SRB1 |
| } | | | |
| } | | | |
| } | | | |

### 16.7.3.1.5 Test requirement

Same as the test requirements given in clause 6.7.3.1.5 with followings exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 16.7.3.1.5-1;
- Table 6.7.3.1.5-2 is replaced by Table 16.7.3.1.5-2.

**Table 16.7.3.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | |
| | Config 2, 3 | | SMTC.1 | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -93 | | -116 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -93 | | -116 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -90 | | -113 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54 | 2.66 | -3.50 | -3.50 |
| SS-RSRP Note3 | Config 1, 2, 4 | dBm/SCS | -88.46 | -90.34 | -119.50 + $\Delta_{BG_offset}$ | -119.50 + $\Delta_{BG_offset}$ |
| | Config 3 | | -85.46 | -87.34 | -116.50 + $\Delta_{BG_offset}$ | -116.50 + $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | dB | 0 | -3.19 | -5.10 | -5.10 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -57.5 | | -85.28 + $\Delta_{BG_offset}$ | |
| | Config 3 | dBm/18.36 MHz | -54.57 | | -82.35 + $\Delta_{BG_offset}$ | |
| Propagation condition | | - | AWGN | | | |
| Antenna configuration | | - | 1x1 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.3.1.5-2: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|

| | All bands | All bands |
|---|---|---|
| **Normal Conditions** | | |
| Lowest reported value (Cell 2) | SINR_29 | SINR_26 |
| Highest reported value (Cell 2) | SINR_51 | SINR_47 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 2) | SINR_28 | SINR_25 |
| Highest reported value (Cell 2) | SINR_52 | SINR_48 |

## 16.7.3.2 NR SA FR1 SS-SINR absolute measurement accuracy for 2 Rx UE

### 16.7.3.2.1 Test purpose

To verify that the intra-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.10.1.1.

### 16.7.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting SS-SINR measurement.

### 16.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.2.

### 16.7.3.2.4 Test description

#### 16.7.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.1.4.1 with followings exceptions:

- Table 6.7.3.1.4.1-1 is replaced by Table 16.7.3.2.4.1-1;
- Table 6.7.3.1.4.1-2 is replaced by Table 16.7.3.2.4.1-2.

**Table 16.7.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

#### 16.7.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.1.4.2 with following exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 16.7.3.2.5-1;
- Table 6.7.3.1.5-2 is replaced by Table 16.7.3.2.5-2.

#### 16.7.3.2.4.3 Message contents

Same as the message contents given in clause 6.7.3.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.1-1 applies to test configuration 16.7.3.2-4.

### 16.7.3.2.5 Test requirement

Same as the test requirements given in clause 6.7.3.1.5 with followings exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 16.7.3.2.5-1;
- Table 6.7.3.1.5-2 is replaced by Table 16.7.3.2.5-2.

**Table 16.7.3.2.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| | Config 4 | | HD-FDD | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | |
| | Config 2, 3 | | SMTC.1 | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | |
| | Config 1, 2, 4 | kHz | 15 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 3 | | 30 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -93 | | -116 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -93 | | -116 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -90 | | -113 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | dB | 0 | -3.19 | -5.10 | -5.10 |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54 | 2.66 | -3.50 | -3.50 |
| SS-RSRP Note3 | Config 1, 2, 4 | dBm/SCS | -88.46 | -90.34 | -119.50 + $\Delta_{BG_offset}$ | -119.50 + $\Delta_{BG_offset}$ |
| | Config 3 | | -85.46 | -87.34 | -116.50 + $\Delta_{BG_offset}$ | -116.50 + $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | dB | 0 | -3.19 | -5.10 | -5.10 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -57.5 | | -85.28 + $\Delta_{BG_offset}$ | |
| | Config 3 | dBm/18.36 MHz | -54.57 | | -82.35 + $\Delta_{BG_offset}$ | |
| Propagation condition | | - | AWGN | | | |
| Antenna configuration | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.3.2.5-2: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| | **Test 1** | **Test 2** |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest reported value (Cell 2) | SINR_31 | SINR_28 |
| Highest reported value (Cell 2) | SINR_49 | SINR_45 |
| **Extreme Conditions** | | |
| Lowest reported value (Cell 2) | SINR_30 | SINR_27 |
| Highest reported value (Cell 2) | SINR_50 | SINR_46 |

## 16.7.3.3 Inter-frequency measurement accuracy for 1 Rx UE

### 16.7.3.3.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 1 Rx UE

#### 16.7.3.3.1.1 Test purpose

To verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.12.1.1.

#### 16.7.3.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards and supporting SS-SINR measurement.

#### 16.7.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.3.

#### 16.7.3.3.1.4 Test description

##### 16.7.3.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.1.4.1 with followings exceptions:

- Table 6.7.3.2.1.4.1-1 is replaced by Table 16.7.3.3.1.4.1-1;
- Table 6.7.3.2.1.4.1-2 is replaced by Table 16.7.3.3.1.4.1-2.

**Table 16.7.3.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

##### 16.7.3.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.2.1.4.2 with following exceptions:

- Table 6.7.3.2.1.5-1 is replaced by Table 16.7.3.3.1.5-1;
- Table 6.7.3.2.1.5-2 is replaced by Table 16.7.3.3.1.5-2.

##### 16.7.3.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.2.1-1 applies to test configuration 16.7.3.3.1-4.

#### 16.7.3.3.1.5 Test requirement

Same as the test requirements in clause 6.7.3.2.1.5 with followings exceptions:

- Table 6.7.3.2.1.5-1 is replaced by Table 16.7.3.3.1.5-1;

- Table 6.7.3.2.1.5-2 is replaced by Table 16.7.3.3.1.5-2.

**Table 16.7.3.3.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | | | |
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note2 | | dBm/15 kHz | -88 | -108.5 | -119.5 + $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -88 | -108.5 | -119.5 + $\Delta_{BG_offset}$ |
| | Config 3 | | -85 | -105.5 | -116.5 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | | dB | -1.75 | 20 | -3.65 |
| $\hat{E}_s / N_{oc}$ | | dB | -1.75 | 20 | -3.65 |
| SS-RSRP Note3 | Config 1, 2, 4 | dBm/SCS | -89.75 | -88.50 | -123.15 + $\Delta_{BG_offset}$ |
| | Config 3 | | -86.75 | -85.50 | -120.15 + $\Delta_{BG_offset}$ |
| SS-SINR Note3 | | dB | -1.75 | 20 | -3.65 |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -57.83 | -60.50 | -89.99 + $\Delta_{BG_offset}$ |
| | Config 3 | dBm/18.36 MHz | -54.90 | -57.57 | -87.06 + $\Delta_{BG_offset}$ |
| Propagation condition | | - | AWGN | | |
| Antenna configuration | | - | 1x1 | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.3.3.1.5-2: SS-SINR Inter-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SINR_34 | SINR_78 | SINR_30 |
| Highest reported value (Cell 2) | SINR_52 | SINR_95 | SINR_49 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SINR_32 | SINR_76 | SINR_29 |
| Highest reported value (Cell 2) | SINR_54 | SINR_97 | SINR_50 |

## 16.7.3.3.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 1 Rx UE

### 16.7.3.3.2.1 Test purpose

To verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.12.1.2.

### 16.7.3.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards and supporting SS-SINR measurement.

### 16.7.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.3.

#### 16.7.3.3.2.4 Test description

##### 16.7.3.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.2 with followings exceptions:

- Table 6.7.3.2.2.4.1-1 is replaced by Table 16.7.3.3.2.4.1-1;
- Table 6.7.3.2.2.4.1-2 is replaced by Table 16.7.3.3.2.4.1-2.

**Table 16.7.3.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | | | |

##### 16.7.3.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.2.2.4.2 with following exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 16.7.3.3.2.5-1;
- Table 6.7.3.2.2.5-2 is replaced by Table 16.7.3.3.2.5-1.

##### 16.7.3.3.2.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.2.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.2.2-1 applies to test configuration 16.7.3.3.2-4.

#### 16.7.3.3.2.5 Test requirement

Same as the test requirements given in clause 6.7.3.2.2.5 with followings exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 16.7.3.3.2.5-1;
- Table 6.7.3.2.2.5-2 is replaced by Table 16.7.3.3.2.5-1.

**Table 16.7.3.3.2.5-1: SS-SINR Inter-frequency relative accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| **Extreme Conditions** | | | |

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | SS-SINR_x -11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| NOTE: SS-SINR_x is the reported value of Cell 1. | | | |

## 16.7.3.4 Inter-frequency measurement accuracy for 2 Rx UE

### 16.7.3.4.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 2 Rx UE

#### 16.7.3.4.1.1 Test purpose

To verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.12.1.1.

#### 16.7.3.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting SS-SINR measurement.

#### 16.7.3.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.4.

#### 16.7.3.4.1.4 Test description

##### 16.7.3.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.1 with followings exceptions:

- Table 6.7.3.2.1.4.1-1 is replaced by Table 16.7.3.4.1.4.1-1;
- Table 6.7.3.2.1.4.1-2 is replaced by Table 16.7.3.4.1.4.1-2.

**Table 16.7.3.4.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.4.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.4.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

#### 16.7.3.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.2.1.4.2 with following exceptions:

- Table 6.7.3.2.1.5-1 is replaced by Table 16.7.3.4.1.5-1;
- Table 6.7.3.2.1.5-2 is replaced by Table 16.7.3.4.1.5-2.

#### 16.7.3.4.1.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.1.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.2.1-1 applies to test configuration 16.7.3.4.1-4.

### 16.7.3.4.1.5 Test requirement

Same as the test requirements in clause 6.7.3.2.1.5 with followings exceptions:

- Table 6.7.3.2.1.5-1 is replaced by Table 16.7.3.4.1.5-1;
- Table 6.7.3.2.1.5-2 is replaced by Table 16.7.3.4.1.5-2.

**Table 16.7.3.4.1.5-1: NR cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | freq2 | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2, 3 | | TDD | | | | | |
| | Config 4 | | HD-FDD | | | | | |
| TDD configuration | Config 1, 4 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| Downlink initial BWP configuration | | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | | ULBWP.1.1 | | | | | |
| DRX Cycle configuration | | ms | Not Applicable | | | | | |
| Gap pattern ID | | | 0 | - | 0 | - | 0 | - |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | TRS.1.1 FDD | | TRS.1.1 FDD | |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.2.1 TDD | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDSCH RMC | Config 1, 4 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC | Config 1, 4 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1, 4 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SS-RSSI-Measurement | | | Not Applicable | | | | | |
| Time offset with Cell 1 | Config 1, 4 | ms | - | 3 | - | 3 | - | 3 |
| | Config 2, 3 | µs | - | 3 | - | 3 | - | 3 |
| SMTC configuration | Config 1, 4 | | SMTC.2 | | | | | |
| | Config 2, 3 | | SMTC.1 | | | | | |
| SSB configuration | Config 1, 2, 4 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.1 RedCap FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4 | kHz | 15 | | | | | |
| | Config 3 | | 30 | | | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | dB | 0 | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -88 | | -108.5 | | -119.5 + $\Delta_{BG_offset}$ | |
| $N_{oc}$ Note2 | Config 1, 2, 4 | dBm/SCS | -88 | | -108.5 | | -119.5 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -85 | | -105.5 | | -116.5 + $\Delta_{BG_offset}$ | |
| $\hat{E}_s / I_{ot}$ | | dB | -1.75 | | 20 | | -3.20 | |
| $\hat{E}_s / N_{oc}$ | | dB | -1.75 | | 20 | | -3.20 | |
| SS-RSRP Note3 | Config 1, 2, 4 | dBm/SCS | -89.75 | | -88.5 | | -122.7 + $\Delta_{BG_offset}$ | |
| | Config 3 | | -86.75 | | -85.5 | | -119.7 + $\Delta_{BG_offset}$ | |
| SS-SINR Note3 | | dB | -1.75 | | 20 | | -3.20 | |
| Io Note3 | Config 1, 2, 4 | dBm/9.36 MHz | -57.83 | | -60.5 | | -89.85 + $\Delta_{BG_offset}$ | |
| | Config 3 | dBm/18.36 MHz | -54.87 | | -57.57 | | -86.92 + $\Delta_{BG_offset}$ | |
| Propagation condition | | - | AWGN | | | | | |
| Antenna configuration | | - | 1x2 | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in TS 38.133 [6] clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.3.4.1.5-2: SS-SINR Inter-frequency absolute accuracy requirements for the reported values**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SINR_35 | SINR_79 | SINR_32 |
| Highest reported value (Cell 2) | SINR_51 | SINR_94 | SINR_49 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SINR_33 | SINR_77 | SINR_31 |
| Highest reported value (Cell 2) | SINR_53 | SINR_96 | SINR_40 |

### 16.7.3.4.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 2 Rx UE

#### 16.7.3.4.2.1 Test purpose

To verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands. This test will verify the requirements in TS 38.133 [6] clause 10.1A.12.1.2.

#### 16.7.3.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting SS-SINR measurement.

#### 16.7.3.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.3.4.

#### 16.7.3.4.2.4 Test description

##### 16.7.3.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.2 with followings exceptions:

- Table 6.7.3.2.2.4.1-1 is replaced by Table 16.7.3.4.2.4.1-1;
- Table 6.7.3.2.2.4.1-2 is replaced by Table 16.7.3.4.2.4.1-2.

**Table 16.7.3.4.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 16.7.3.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.3.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.3.4.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.3.4.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band. | |

**Table 16.7.3.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.3.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | | | |

##### 16.7.3.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.2.2.4.2 with following exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 16.7.3.4.2.5-1;
- Table 6.7.3.2.2.5-2 is replaced by Table 16.7.3.4.2.5-1.

#### 16.7.3.4.2.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.2.4.3 with following exceptions:

- Specific message contents exceptions for test configuration 6.7.3.2.2-1 applies to test configuration 16.7.3.4.2-4.

#### 16.7.3.4.2.5 Test requirement

Same as the test requirements in clause 6.7.3.2.2.5 with followings exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 16.7.3.4.2.5-1;
- Table 6.7.3.2.2.5-2 is replaced by Table 16.7.3.4.2.5-1;

**Table 16.7.3.4.2.5-1: SS-SINR Inter-frequency relative accuracy requirements for the reported values**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| | All bands | All bands | All bands |
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 10 | SS-SINR_x - 10 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 10 | SS-SINR_x + 10 | SS-SINR_x + 11 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | SS-SINR_x - 11 | SS-SINR_x - 11 | SS-SINR_x - 11 |
| Highest reported value (Cell 2) | SS-SINR_x + 11 | SS-SINR_x + 11 | SS-SINR_x + 11 |
| NOTE: SS-SINR_x is the reported value of Cell 1. | | | |

## 16.7.4 L1-RSRP measurement for beam reporting for RedCap

### 16.7.4.0 Minimum conformance requirements

#### 16.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.4.0.1 shall apply.

When RedCap UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.4.1 for a corresponding band for each relevant SSB.

**Table 16.7.4.0.1-1: SSB based L1-RSRP absolute accuracy for 1 Rx RedCap UE in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB $\hat{E}_s/I_{ot}$** | **Io [Note 1] range** | | | | |
| | | | **NR operating band groups [Note 2]** | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±8.0 | ±12.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | N/A | -70 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -70 |
| ±11.5 | ±14.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H, | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.14.1.1.

### 16.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 4.7.4.0.2 shall apply.

When RedCap UE is only required to support 1 Rx, the relative accuracy requirements in Table 16.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.4.1 for a corresponding band for each relevant SSB.

**Table 16.7.4.0.2-1: SSB based L1-RSRP relative accuracy for 1 Rx RedCap UE in FR1**

| **Accuracy** | | **Conditions** | | | | | |
|---|---|---|---|---|---|---|---|
| **Normal condition** | **Extreme condition** | **SSB Ês/Iot** Note 2 | **Io** Note 1 **range** | | | | |
| | | | **NR operating band groups** Note 4 | **Minimum Io** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | | **dBm / $SCS_{SSB}$** | | **dBm/$BW_{Channel}$** | **dBm/$BW_{Channel}$** |
| | | | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | | |
| ±6 | ±7 | ≥-3 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | -121 | -118 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | N/A | -50 |
| | | | NR_FDD_FR1_D<br>NR_TDD_FR1_D | -119.5 | -116.5 | N/A | -50 |
| | | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | -119 | -116 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.<br>NOTE 3: Void<br>NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3.5.2. | | | | | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 10.1A.14.1.2.

### 16.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

The accuracy requirements in clause 4.7.4.0.3 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.2 for a corresponding band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 16.7.4.0.3-1.

**Table 16.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io [Note 1] range | | | | | |
| | | | NR operating band groups [Note 2] | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±8.0 | ±12.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -70 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -70 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -70 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -70 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±11.5 | ±14.5 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H | N/A | N/A | N/A | -70 | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3A.4.

### 16.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

The accuracy requirements in clause 4.7.4.0.4 shall apply when RedCap UE is capable of 2 Rx. When UE is only required to support 1 Rx, the absolute accuracy requirements in Table 16.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3I of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to TS 38.133 [6] Annex B.2.4.2 for a corresponding band for each relevant CSI-RS.

- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 16.7.4.0.4-1.

**Table 16.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy for 1 Rx RedCap UE in FR1**

| Accuracy | | Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range | | | | | |
| | | | NR operating band groups Note 4 | Minimum Io | | | | Maximum Io |
| dB | dB | dB | | dBm / $SCS_{CSI-RS}$ | | | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| | | | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | | |
| ±6 | ±7 | ≥-3 | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -121 | -118 | -115 | N/A | -50 |
| | | | NR_FDD_FR1_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| | | | NR_TDD_FR1_C | -120 | -117 | -114 | N/A | -50 |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | -119 | -116 | -113 | N/A | -50 |
| | | | NR_FDD_FR1_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| | | | NR_FDD_FR1_G | -118 | -115 | -112 | N/A | -50 |
| | | | NR_FDD_FR1_H | -117.5 | -114.5 | -111.5 | N/A | -50 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in TS 38.133 [6] clause 3A.4.

## 16.7.4.1 SSB based L1-RSRP measurements for 1 Rx UE

### 16.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 1 Rx UE

#### 16.7.4.1.1.1 Test purpose

To verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.4.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.1.

#### 16.7.4.1.1.4 Test description

##### 16.7.4.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.1.1.4.1 with following exceptions:

- Table 6.7.4.1.1.4.1-1 is replaced by Table 16.7.4.1.1.4.1-1;
- Table 6.7.4.1.1.4.1-2 is replaced by Table 16.7.4.1.1.4.1-2.

**Table 16.7.4.1.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.1.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.1.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

##### 16.7.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.1.4.2.

##### 16.7.4.1.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.1.4.3.

#### 16.7.4.1.1.5 Test requirement

Same as the thest requirements given in clause 6.7.4.1.1.5 with following exceptions:

- Table 6.7.4.1.1.5-1 is replaced by Table 16.7.4.1.1.5-1;
- Table 6.7.4.1.1.5-2 is replaced by Table 16.7.4.1.1.5-2;
- Table 6.7.4.1.1.5-3 is replaced by Table 16.7.4.1.1.5-3.

**Table 16.7.4.1.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | |
| Duplex mode | 1 | | FDD | |
| | 2, 3 | | TDD | |
| | 4 | | HD-FDD | |
| TDD Configuration | 1, 4 | | N/A | |
| | 2 | | TDDConf.1.1 | |

| | | | | |
|---|---|---|---|---|
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH RMC | 1, 4 | | SR.1.1 FDD | |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET RMC | 1, 4 | | CR.1.1 FDD | |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET RMC | 1, 4 | | CCR.1.1 FDD | |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 | |
| | 3 | | SSB.2 RedCap FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | |
| TRS configuration | 1, 4 | | TRS.1.1 FDD | |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | |
| *reportConfigType* | 1~4 | | periodic | |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP | |
| Number of reported RS | 1~4 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ ote2 | 1~4 | dBm/15 kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -91.65 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | -2.65 |
| SS-RSRP Note3 | 1, 2, 4 | dBm/SCS | -84.65 | -119.65 + $\Delta_{BG_offset}$ |
| | 3 | | -81.65 | -116.65 + $\Delta_{BG_offset}$ |

| | | | | |
|---|---|---|---|---|
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -56.28 | -87.16 + $\Delta_{BG_offset}$ |
| | 3 | dBm/18.36 MHz | -53.36 | -84.24 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | -2.65 |
| Propagation condition | 1~4 | | AWGN | |
| Antenna configuration | 1~4 | | 1x1 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Band Group | Test 2 |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_27 |
| | | NR_FDD_FR1_B | RSRP_28 |
| | | NR_TDD_FR1_C | RSRP_28 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_29 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_29 |
| | | NR_FDD_FR1_F | RSRP_30 |
| | | NR_FDD_FR1_G | RSRP_30 |
| | | NR_FDD_FR1_H | RSRP_31 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_46 |
| | | NR_FDD_FR1_B | RSRP_47 |
| | | NR_TDD_FR1_C | RSRP_47 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_48 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_48 |
| | | NR_FDD_FR1_F | RSRP_49 |
| | | NR_FDD_FR1_G | RSRP_49 |
| | | NR_FDD_FR1_H | RSRP_50 |
| **Extreme Conditions** | **Test 1 All bands** | **Band Group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_56 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_23 |
| | | NR_FDD_FR1_B | RSRP_23 |
| | | NR_TDD_FR1_C | RSRP_24 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_24 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_25 |
| | | NR_FDD_FR1_F | RSRP_25 |
| | | NR_FDD_FR1_G | RSRP_26 |
| | | NR_FDD_FR1_H | RSRP_26 |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_51 |
| | | NR_FDD_FR1_B | RSRP_51 |
| | | NR_TDD_FR1_C | RSRP_52 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_52 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_53 |
| | | NR_FDD_FR1_F | RSRP_53 |
| | | NR_FDD_FR1_G | RSRP_54 |
| | | NR_FDD_FR1_H | RSRP_54 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 16.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| **Normal Conditions** | **Test 1 All bands** | **Band Group** | **Test 2** |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_30 |
| | | NR_FDD_FR1_B | RSRP_31 |
| | | NR_TDD_FR1_C | RSRP_31 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_32 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_32 |
| | | NR_FDD_FR1_F | RSRP_33 |
| | | NR_FDD_FR1_G | RSRP_33 |
| | | NR_FDD_FR1_H | RSRP_34 |
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_49 |
| | | NR_FDD_FR1_B | RSRP_50 |
| | | NR_TDD_FR1_C | RSRP_50 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_51 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_51 |
| | | NR_FDD_FR1_F | RSRP_52 |
| | | NR_FDD_FR1_G | RSRP_52 |
| | | NR_FDD_FR1_H | RSRP_53 |
| **Extreme Conditions** | **Test 1 All bands** | **Band Group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_26 |
| | | NR_FDD_FR1_B | RSRP_26 |
| | | NR_TDD_FR1_C | RSRP_27 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_27 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_28 |
| | | NR_FDD_FR1_F | RSRP_28 |
| | | NR_FDD_FR1_G | RSRP_29 |
| | | NR_FDD_FR1_H | RSRP_29 |
| Highest reported value (Cell 1) | RSRP_91 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_54 |
| | | NR_FDD_FR1_B | RSRP_54 |
| | | NR_TDD_FR1_C | RSRP_55 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_55 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_56 |
| | | NR_FDD_FR1_F | RSRP_56 |
| | | NR_FDD_FR1_G | RSRP_57 |
| | | NR_FDD_FR1_H | RSRP_57 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

### 16.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 1 Rx UE

#### 16.7.4.1.2.1 Test purpose

To verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.4.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.1.

#### 16.7.4.1.2.4 Test description

##### 16.7.4.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.1.1.4.1 with following exceptions:

- Table 6.7.4.1.2.4.1-1 is replaced by Table 16.7.4.1.2.4.1-1;
- Table 6.7.4.1.2.4.1-2 is replaced by Table 16.7.4.1.2.4.1-2.

**Table 16.7.4.1.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.1.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.1.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.1.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.1.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

#### 16.7.4.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.2.4.2.

#### 16.7.4.1.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.2.4.3.

#### 16.7.4.1.2.5 Test requirement

Same as the thest requirements given in clause 6.7.4.1.2.5 with following exceptions:

- Table 6.7.4.1.2.5-1 is replaced by Table 16.7.4.1.1.5-1;
- Table 6.7.4.1.2.5-2 is replaced by Table 16.7.4.1.2.5-2.

**Table 16.7.4.1.2.5-1: Void**

**Table 16.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 3 | 3 |
| **Extreme Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 3 | 3 |

## 16.7.4.2 SSB based L1-RSRP measurements for 2 Rx UE

### 16.7.4.2.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 2 Rx UE

#### 16.7.4.2.1.1 Test purpose

To verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.4.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.2.

#### 16.7.4.2.1.4 Test description

##### 16.7.4.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.1.1.4.1 with following exceptions:

- Table 6.7.4.1.1.4.1-1 is replaced by Table 16.7.4.2.1.4.1-1;
- Table 6.7.4.1.1.4.1-2 is replaced by Table 16.7.4.2.1.4.1-2.

**Table 16.7.4.2.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.2.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

### 16.7.4.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.1.4.2.

### 16.7.4.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.1.4.3.

### 16.7.4.2.1.5 Test requirement

Same as the thest requirements given in clause 6.7.4.1.1.5 with following exceptions:

- Table 6.7.4.1.1.5-1 is replaced by Table 16.7.4.2.1.5-1;
- Table 6.7.4.1.1.5-2 is replaced by Table 16.7.4.2.1.5-2.

**Table 16.7.4.2.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | |
| Duplex mode | 1 | | FDD | |
| | 2, 3 | | TDD | |
| | 4 | | HD-FDD | |
| TDD Configuration | 1, 4 | | N/A | |
| | 2 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH RMC | 1, 4 | | SR.1.1 FDD | |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET RMC | 1, 4 | | CR.1.1 FDD | |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET RMC | 1, 4 | | CCR.1.1 FDD | |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 | |
| | 3 | | SSB.2 RedCap FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | |
| TRS configuration | 1, 4 | | TRS.1.1 FDD | |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |

| | | | | |
|---|---|---|---|---|
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | |
| *reportConfigType* | 1~4 | | periodic | |
| *reportQuantity* | 1~4 | | ssb-Index-RSRP | |
| Number of reported RS | 1~4 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/15 kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -94.65 | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -91.65 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | -2.2 |
| SS-RSRP Note3 | 1, 2, 4 | dBm/SCS | -84.65 | -119.2 + $\Delta_{BG_offset}$ |
| | 3 | | -81.65 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | 3 | dBm/18.36 MHz | -53.36 | -84.07 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | -2.2 |
| Propagation condition | 1~4 | | AWGN | |
| Antenna configuration and Correlation matrix | 1~4 | | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| | |
|---|---|
| Note 3: | RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |

**Table 16.7.4.2.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Band group | Test 2 |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_31 |
| | | NR_FDD_FR1_B | RSRP_31 |
| | | NR_TDD_FR1_C | RSRP_32 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_32 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_33 |
| | | NR_FDD_FR1_F | RSRP_33 |
| | | NR_FDD_FR1_G | RSRP_34 |
| | | NR_FDD_FR1_H | RSRP_34 |
| Highest reported value (Cell 1) | RSRP_82 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_44 |
| | | NR_FDD_FR1_B | RSRP_45 |
| | | NR_TDD_FR1_C | RSRP_45 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_46 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_46 |
| | | NR_FDD_FR1_F | RSRP_47 |
| | | NR_FDD_FR1_G | RSRP_47 |
| | | NR_FDD_FR1_H | RSRP_48 |
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_26 |
| | | NR_FDD_FR1_B | RSRP_27 |
| | | NR_TDD_FR1_C | RSRP_27 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_28 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_28 |
| | | NR_FDD_FR1_F | RSRP_29 |
| | | NR_FDD_FR1_G | RSRP_29 |
| | | NR_FDD_FR1_H | RSRP_30 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_49 |
| | | NR_FDD_FR1_B | RSRP_49 |
| | | NR_TDD_FR1_C | RSRP_50 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_51 |
| | | NR_FDD_FR1_F | RSRP_51 |
| | | NR_FDD_FR1_G | RSRP_52 |
| | | NR_FDD_FR1_H | RSRP_52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 16.7.4.2.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 1 | Band group | Test 2 |
|---|---|---|---|

| | All bands | | |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_65 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_34 |
| | | NR_FDD_FR1_B | RSRP_34 |
| | | NR_TDD_FR1_C | RSRP_35 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_35 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_36 |
| | | NR_FDD_FR1_F | RSRP_36 |
| | | NR_FDD_FR1_G | RSRP_37 |
| | | NR_FDD_FR1_H | RSRP_37 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_47 |
| | | NR_FDD_FR1_B | RSRP_48 |
| | | NR_TDD_FR1_C | RSRP_48 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_49 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_49 |
| | | NR_FDD_FR1_F | RSRP_50 |
| | | NR_FDD_FR1_G | RSRP_50 |
| | | NR_FDD_FR1_H | RSRP_51 |
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_29 |
| | | NR_FDD_FR1_B | RSRP_30 |
| | | NR_TDD_FR1_C | RSRP_30 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_31 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_31 |
| | | NR_FDD_FR1_F | RSRP_32 |
| | | NR_FDD_FR1_G | RSRP_32 |
| | | NR_FDD_FR1_H | RSRP_33 |
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_52 |
| | | NR_FDD_FR1_B | RSRP_52 |
| | | NR_TDD_FR1_C | RSRP_53 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_53 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_54 |
| | | NR_FDD_FR1_F | RSRP_54 |
| | | NR_FDD_FR1_G | RSRP_55 |
| | | NR_FDD_FR1_H | RSRP_55 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

### 16.7.4.2.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 2 Rx UE

#### 16.7.4.2.2.1 Test purpose

To verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.4.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.2.

### 16.7.4.2.2.4 Test description

#### 16.7.4.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.1.2.4.1 with following exceptions:

- Table 6.7.4.1.2.4.1-1 is replaced by Table 16.7.4.2.2.4.1-1;
- Table 6.7.4.1.2.4.1-2 is replaced by Table 16.7.4.2.2.4.1-2.

**Table 16.7.4.2.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.2.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.2.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.2.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.2.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

#### 16.7.4.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.2.4.2.

#### 16.7.4.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.2.4.3.

### 16.7.4.2.2.5 Test requirement

Same as the thest requirements given in clause 6.7.4.1.2.5 with following exceptions:

- Table 6.7.4.1.2.5-1 is replaced by Table 16.7.4.2.1.5-1;
- Table 6.7.4.1.2.5-2 is replaced by Table 16.7.4.2.2.5-2.

**Table 16.7.4.2.2.5-1: Void**

**Table 16.7.4.2.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |

| | | |
|---|---|---|
| Highest DIFF RSRP reported value | 2 | 2 |
| **Extreme Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

## 16.7.4.3 CSI-RS based L1-RSRP measurements for 1 Rx UE

### 16.7.4.3.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 1 Rx UE

#### 16.7.4.3.1.1 Test purpose

To verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 16.7.4.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.4.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.3.

#### 16.7.4.3.1.4 Test description

##### 16.7.4.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.1.4.1 with following exceptions:

- Table 6.7.4.2.1.4.1-1 is replaced by Table 16.7.4.3.1.4.1-1;
- Table 6.7.4.2.1.4.1-2 is replaced by Table 16.7.4.3.1.4.1-2.

**Table 16.7.4.3.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.3.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.3.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.3.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.3.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

#### 16.7.4.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.1.4.2.

#### 16.7.4.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.1.4.3.

### 16.7.4.3.1.5 Test requirement

Same as the thest requirements given in clause 6.7.4.2.1.5 with following exceptions:

- Table 6.7.4.2.1.5-1 is replaced by Table 16.7.4.3.1.5-1;
- Table 6.7.4.2.1.5-2 is replaced by Table 16.7.4.3.1.5-2.

**Table 16.7.4.3.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | |
| Duplex mode | 1 | | FDD | |
| | 2, 3 | | TDD | |
| | 4 | | HD-FDD | |
| TDD Configuration | 1, 4 | | N/A | |
| | 2 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH RMC | 1, 4 | | SR.1.1 FDD | |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET RMC | 1, 4 | | CR.1.1 FDD | |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET RMC | 1, 4 | | CCR.1.1 FDD | |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 | |
| | 3 | | SSB.2 RedCap FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | |
| TRS configuration | 1, 4 | | TRS.1.1 FDD | |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | |
| CSI-RS configuration | 1, 4 | | CSI-RS 1.2 FDD | |
| | 2 | | CSI-RS 1.2 TDD | |
| | 3 | | CSI-RS 2.2 TDD | |
| *reportConfigType* | 1~4 | | periodic | |
| *reportQuantity* | 1~4 | | cri-RSRP | |
| Number of reported RS | 1~4 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15 kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -91.65 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | -2.65 |
| CSI-RSRP Note3 | 1, 2, 4 | dBm/SCS | -84.65 | -119.65 + $\Delta_{BG_offset}$ |
| | 3 | | -81.65 | -116.65 + $\Delta_{BG_offset}$ |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -56.28 | -87.16 + $\Delta_{BG_offset}$ |
| | 3 | dBm/18.36 MHz | -53.36 | -84.24 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | -2.65 |
| Propagation condition | 1~4 | | AWGN | |
| Antenna configuration | 1~4 | | 1x1 | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.4.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Band group | Test 2 |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_27 |
| | | NR_FDD_FR1_B | RSRP_28 |
| | | NR_TDD_FR1_C | RSRP_28 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_29 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_29 |
| | | NR_FDD_FR1_F | RSRP_30 |

| | | | |
|---|---|---|---|
| | | NR_FDD_FR1_G | RSRP_30 |
| | | NR_FDD_FR1_H | RSRP_31 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_46 |
| | | NR_FDD_FR1_B | RSRP_47 |
| | | NR_TDD_FR1_C | RSRP_47 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_48 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_48 |
| | | NR_FDD_FR1_F | RSRP_49 |
| | | NR_FDD_FR1_G | RSRP_49 |
| | | NR_FDD_FR1_H | RSRP_50 |
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_56 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_23 |
| | | NR_FDD_FR1_B | RSRP_23 |
| | | NR_TDD_FR1_C | RSRP_24 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_24 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_25 |
| | | NR_FDD_FR1_F | RSRP_25 |
| | | NR_FDD_FR1_G | RSRP_26 |
| | | NR_FDD_FR1_H | RSRP_26 |
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_51 |
| | | NR_FDD_FR1_B | RSRP_51 |
| | | NR_TDD_FR1_C | RSRP_52 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_52 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_53 |
| | | NR_FDD_FR1_F | RSRP_53 |
| | | NR_FDD_FR1_G | RSRP_54 |
| | | NR_FDD_FR1_H | RSRP_54 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 16.7.4.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| **Normal Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_30 |
| | | NR_FDD_FR1_B | RSRP_31 |
| | | NR_TDD_FR1_C | RSRP_31 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_32 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_32 |
| | | NR_FDD_FR1_F | RSRP_33 |
| | | NR_FDD_FR1_G | RSRP_33 |
| | | NR_FDD_FR1_H | RSRP_34 |
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_49 |
| | | NR_FDD_FR1_B | RSRP_50 |
| | | NR_TDD_FR1_C | RSRP_50 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_51 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_51 |
| | | NR_FDD_FR1_F | RSRP_52 |
| | | NR_FDD_FR1_G | RSRP_52 |

| | | NR_FDD_FR1_H | RSRP_53 |
|---|---|---|---|
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_26 |
| | | NR_FDD_FR1_B | RSRP_26 |
| | | NR_TDD_FR1_C | RSRP_27 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_27 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_28 |
| | | NR_FDD_FR1_F | RSRP_28 |
| | | NR_FDD_FR1_G | RSRP_29 |
| | | NR_FDD_FR1_H | RSRP_29 |
| Highest reported value (Cell 1) | RSRP_91 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_54 |
| | | NR_FDD_FR1_B | RSRP_54 |
| | | NR_TDD_FR1_C | RSRP_55 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_55 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_56 |
| | | NR_FDD_FR1_F | RSRP_56 |
| | | NR_FDD_FR1_G | RSRP_57 |
| | | NR_FDD_FR1_H | RSRP_57 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

### 16.7.4.3.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 1 Rx UE

#### 16.7.4.3.2.1 Test purpose

To verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.4.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

#### 16.7.4.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.3.

#### 16.7.4.3.2.4 Test description

##### 16.7.4.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.2.4.1 with following exceptions:

- Table 6.7.4.2.2.4.1-1 is replaced by Table 16.7.4.3.2.4.1-1;
- Table 6.7.4.2.2.4.1-2 is replaced by Table 16.7.4.3.2.4.1-2.

**Table 16.7.4.3.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.3.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.3.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.3.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.3.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

16.7.4.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.2.4.2.

16.7.4.3.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.2.4.3.

16.7.4.3.2.5 Test requirement

Same as the thest requirements given in clause 6.7.4.2.2.5 with following exceptions:

- Table 6.7.4.2.2.5-1 is replaced by Table 16.7.4.3.1.5-1;
- Table 6.7.4.2.2.5-2 is replaced by Table 16.7.4.3.2.5-2.

**Table 16.7.4.3.2.5-1: Void**

**Table 16.7.4.3.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 3 | 3 |
| **Extreme Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 3 | 3 |

## 16.7.4.4 CSI-RS based L1-RSRP measurements for 2 Rx UE

### 16.7.4.4.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 2 Rx UE

16.7.4.4.1.1 Test purpose

To verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

16.7.4.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.4.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.4.

#### 16.7.4.4.1.4 Test description

##### 16.7.4.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.1.4.1 with following exceptions:

- Table 6.7.4.2.1.4.1-1 is replaced by Table 16.7.4.4.1.4.1-1;
- Table 6.7.4.2.1.4.1-2 is replaced by Table 16.7.4.4.1.4.1-2.

**Table 16.7.4.4.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.4.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.4.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.4.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.4.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

#### 16.7.4.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.1.4.2.

#### 16.7.4.4.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.1.4.3.

#### 16.7.4.4.1.5 Test requirement

Same as the thest requirements given in clause 6.7.4.2.1.5 with following exceptions:

- Table 6.7.4.2.1.5-1 is replaced by Table 16.7.4.4.1.5-1;
- Table 6.7.4.2.1.5-2 is replaced by Table 16.7.4.4.1.5-2.

**Table 16.7.4.4.1.5-1: Cell specific test parameters**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 | |
| Duplex mode | 1 | | FDD | |

| | | | | |
|---|---|---|---|---|
| | 2, 3 | | TDD | |
| | 4 | | HD-FDD | |
| TDD Configuration | 1, 4 | | N/A | |
| | 2 | | TDDConf.1.1 | |
| | 3 | | TDDConf.2.1 | |
| $BW_{channel}$ | 1, 2, 4 | MHz | 10: $N_{RB,c}$ = 52 | |
| | 3 | | 20: $N_{RB,c}$ = 51 | |
| PDSCH RMC | 1, 4 | | SR.1.1 FDD | |
| | 2 | | SR.1.1 TDD | |
| | 3 | | SR.2.1 TDD | |
| RMSI CORESET RMC | 1, 4 | | CR.1.1 FDD | |
| | 2 | | CR.1.1 TDD | |
| | 3 | | CR.2.1 TDD | |
| Dedicated CORESET RMC | 1, 4 | | CCR.1.1 FDD | |
| | 2 | | CCR.1.1 TDD | |
| | 3 | | CCR.2.1 TDD | |
| SSB configuration | 1, 2, 4 | | SSB.3 FR1 | |
| | 3 | | SSB.2 RedCap FR1 | |
| OCNG Patterns | 1~4 | | OP.1 | |
| TRS configuration | 1, 4 | | TRS.1.1 FDD | |
| | 2 | | TRS.1.1 TDD | |
| | 3 | | TRS.1.2 TDD | |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 | |
| SMTC configuration | 1~4 | | SMTC.1 | |
| CSI-RS configuration | 1, 4 | | CSI-RS 1.2 FDD | |
| | 2 | | CSI-RS 1.2 TDD | |
| | 3 | | CSI-RS 2.2 TDD | |
| *reportConfigType* | 1~4 | | periodic | |
| *reportQuantity* | 1~4 | | cri-RSRP | |
| Number of reported RS | 1~4 | | 2 | |
| L1-RSRP reporting period | 1~4 | | slot80 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/15 kHz | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -94.65 | |
| $N_{oc}$ Note2 | 1, 2, 4 | dBm/SCS | -94.65 | -117+ $\Delta_{BG_offset}$ |
| | 3 | | -91.65 | -114+ $\Delta_{BG_offset}$ |
| $\hat{E}_s / I_{ot}$ | 1~4 | dB | 10 | -2.2 |

| | | | | |
|---|---|---|---|---|
| CSI-RSRP Note3 | 1, 2, 4 | dBm/SCS | -84.65 | -119.2+ $\Delta_{BG_offset}$ |
| | 3 | | -81.65 | -116.2 + $\Delta_{BG_offset}$ |
| Io Note3 | 1, 2, 4 | dBm/9.36 MHz | -56.28 | -87.00 + $\Delta_{BG_offset}$ |
| | 3 | dBm/18.36 MHz | -53.36 | -84.07 + $\Delta_{BG_offset}$ |
| $\hat{E}_s / N_{oc}$ | 1~4 | dB | 10 | -2.2 |
| Propagation condition | 1~4 | | AWGN | |
| Antenna configuration and Correlation matrix | 1~4 | | 1x2 Low | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

**Table 16.7.4.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2 and 4**

| Normal Conditions | Test 1 All bands | Band group | Test 2 |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_31 |
| | | NR_FDD_FR1_B | RSRP_31 |
| | | NR_TDD_FR1_C | RSRP_32 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_32 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_33 |
| | | NR_FDD_FR1_F | RSRP_33 |
| | | NR_FDD_FR1_G | RSRP_34 |
| | | NR_FDD_FR1_H | RSRP_34 |
| Highest reported value (Cell 1) | RSRP_82 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_44 |
| | | NR_FDD_FR1_B | RSRP_45 |
| | | NR_TDD_FR1_C | RSRP_45 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_46 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_46 |
| | | NR_FDD_FR1_F | RSRP_47 |
| | | NR_FDD_FR1_G | RSRP_47 |
| | | NR_FDD_FR1_H | RSRP_48 |
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_59 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_26 |
| | | NR_FDD_FR1_B | RSRP_27 |
| | | NR_TDD_FR1_C | RSRP_27 |

| | | | |
|---|---|---|---|
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_28 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_28 |
| | | NR_FDD_FR1_F | RSRP_29 |
| | | NR_FDD_FR1_G | RSRP_29 |
| | | NR_FDD_FR1_H | RSRP_30 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_49 |
| | | NR_FDD_FR1_B | RSRP_49 |
| | | NR_TDD_FR1_C | RSRP_50 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_50 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_51 |
| | | NR_FDD_FR1_F | RSRP_51 |
| | | NR_FDD_FR1_G | RSRP_52 |
| | | NR_FDD_FR1_H | RSRP_52 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2. | | | |

**Table 16.7.4.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 1 All bands | Band group | Test 2 |
|---|---|---|---|
| Lowest reported value (Cell 1) | RSRP_65 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_34 |
| | | NR_FDD_FR1_B | RSRP_34 |
| | | NR_TDD_FR1_C | RSRP_35 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_35 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_36 |
| | | NR_FDD_FR1_F | RSRP_36 |
| | | NR_FDD_FR1_G | RSRP_37 |
| | | NR_FDD_FR1_H | RSRP_37 |
| Highest reported value (Cell 1) | RSRP_85 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_47 |
| | | NR_FDD_FR1_B | RSRP_48 |
| | | NR_TDD_FR1_C | RSRP_48 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_49 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_49 |
| | | NR_FDD_FR1_F | RSRP_50 |
| | | NR_FDD_FR1_G | RSRP_50 |
| | | NR_FDD_FR1_H | RSRP_51 |
| **Extreme Conditions** | **Test 1 All bands** | **Band group** | **Test 2** |
| Lowest reported value (Cell 1) | RSRP_62 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_29 |
| | | NR_FDD_FR1_B | RSRP_30 |
| | | NR_TDD_FR1_C | RSRP_30 |
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_31 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_31 |
| | | NR_FDD_FR1_F | RSRP_32 |
| | | NR_FDD_FR1_G | RSRP_32 |
| | | NR_FDD_FR1_H | RSRP_33 |
| Highest reported value (Cell 1) | RSRP_88 | NR_FDD_FR1_A, NR_TDD_FR1_A | RSRP_52 |
| | | NR_FDD_FR1_B | RSRP_52 |
| | | NR_TDD_FR1_C | RSRP_53 |

| | | | |
|---|---|---|---|
| | | NR_FDD_FR1_D, NR_TDD_FR1_D | RSRP_53 |
| | | NR_FDD_FR1_E, NR_TDD_FR1_E | RSRP_54 |
| | | NR_FDD_FR1_F | RSRP_54 |
| | | NR_FDD_FR1_G | RSRP_55 |
| | | NR_FDD_FR1_H | RSRP_55 |
| Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2 | | | |

### 16.7.4.4.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 2 Rx UE

#### 16.7.4.4.2.1 Test purpose

To verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 16.7.4.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

#### 16.7.4.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.4.4.

#### 16.7.4.4.2.4 Test description

##### 16.7.4.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.2.4.1 with following exceptions:

- Table 6.7.4.2.2.4.1-1 is replaced by Table 16.7.4.4.2.4.1-1;
- Table 6.7.4.2.2.4.1-2 is replaced by Table 16.7.4.4.2.4.1-2.

**Table 16.7.4.4.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 16.7.4.4.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 16.7.4.4.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 16.7.4.4.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 16.7.4.4.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.4.4.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.4.4.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

#### 16.7.4.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.2.4.2.

#### 16.7.4.4.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.2.4.3.

#### 16.7.4.4.2.5 Test requirement

Same as the thest requirements given in clause 6.7.4.2.2.5 with following exceptions:

- Table 6.7.4.2.2.5-1 is replaced by Table 16.7.4.4.1.5-1;
- Table 6.7.4.2.2.5-2 is replaced by Table 16.7.4.4.2.5-2.

**Table 16.7.4.4.2.5-1: Void**

**Table 16.7.4.4.2.5-2: L1-RSRP relative accuracy requirements for the reported values**

| | Test 1 | Test 2 |
|---|---|---|
| | All bands | All bands |
| **Normal Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |
| **Extreme Conditions** | | |
| Lowest DIFF RSRP reported value | 0 | 0 |
| Highest DIFF RSRP reported value | 2 | 2 |

## 16.7.5 E-UTRAN RSRP for RedCap

### 16.7.5.0 Minimum conformance requirements

#### 16.7.5.0.1 E-UTRAN RSRP absolute accuracy

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 6.7.5.0.1 shall apply.

When RedCap UE is only required to support 1 Rx, the requirements for absolute accuracy of RSRP in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 16.7.5.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in TS 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to TS 36.133 [23] Annex B.3.3 for a corresponding band.

**Table 16.7.5.0.1-1: E-UTRAN RSRP absolute accuracy for 1 Rx RedCap UE**

| Accuracy | | Conditions | | | | |
|---|---|---|---|---|---|---|
| | | | Io Note 1 range | | | |
| Normal condition | Extreme condition | Ês/Iot | E-UTRA operating band groups Note 3 | Minimum Io | | Maximum Io |
| dB | dB | dB | | dBm/15 kHz Note 2 | $dBm/BW_{Channel}$ | $dBm/BW_{Channel}$ |
| ±5.5 | ±10 | ≥-6 | FDD_A, TDD_A | -121 | N/A | -70 |
| | | | FDD_B1 | -120.5 | N/A | -70 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | FDD_C, TDD_C | -120 | N/A | -70 |
| | | | FDD_D | -119.5 | N/A | -70 |
| | | | FDD_E, TDD_E | -119 | N/A | -70 |
| | | | FDD_F | -118.5 | N/A | -70 |
| | | | FDD_G | -118 | N/A | -70 |
| | | | FDD_H | -117.5 | N/A | -70 |
| | | | FDD_N | -114.5 | N/A | -70 |
| ±9 | ±12 | ≥-6 | FDD_A, TDD_A, FDD_B1, FDD_C, TDD_C, FDD_D, FDD_E, TDD_E, FDD_F, FDD_G, FDD_H, FDD_N | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.<br>NOTE 2: The condition level is increased by $\Delta > 0$, when applicable, as described in TS 36.133 [23] clauses B.4.2 and B.4.3.<br>NOTE 3: E-UTRA operating band groups are as defined in TS 36.133 [23] clause 3.5. | | | | | | |

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [23] shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 10.2A.2 and TS 36.133 [23] clause 9.1.3.3.

## 16.7.5.1 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 1 Rx UE

### 16.7.5.1.1 Test purpose

To verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 10.2A.2 for SA inter-RAT E-UTRAN RSRP measurements.

### 16.7.5.1.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards and supporting E-UTRA.

### 16.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.5.1.

### 16.7.5.1.4 Test description

#### 16.7.5.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.5.1.4.1 with following exceptions:

- Table 6.7.5.1.4.1-1 is replaced by Table 16.7.5.1.4.1-1;
- Table 6.7.5.1.4.1-2 is replaced by Table 16.7.5.1.4.1-2.

**Table 16.7.5.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.7.5.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD |
| 16.7.5.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.5.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.5.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD |
| 16.7.5.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.5.1-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.5.1-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN FDD |
| 16.7.5.1-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.5.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.5.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

### 16.7.5.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.5.1.4.2.

### 16.7.5.1.4.3 Message contents

Same as the message contents given in clause 6.7.5.1.4.3.

### 16.7.5.1.5 Test requirement

Same as the test requirements given in clause 6.7.5.1.5 with following exceptions:

- Table 6.7.5.1.5-1 is replaced by Table 16.7.5.1.5-1;
- Table 6.7.5.1.5-2 is replaced by Table 16.7.5.1.5-2;
- Table 6.7.5.1.5-3 is replaced by Table 16.7.5.1.5-3.

**Table 16.7.5.1.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| | Config 7, 8 | | HD-FDD |
| TDD Configuration | Config 1, 4, 7, 8 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 |
| Gap pattern Id | | | 0 |
| PDSCH RMC | Config 1, 4, 7, 8 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET RMC | Config 1, 4, 7, 8 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET RMC | Config 1, 4, 7, 8 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| Initial DL BWP | | | DLBWP.0.1 |
| Dedicated DL BWP | | | DLBWP.1.1 |
| Initial UL BWP | | | ULBWP.0.1 |
| Dedicated UL BWP | | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |

| | | | |
|---|---|---|---|
| SSB configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.1 RedCap FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104 |
| $N_{oc}$ Note2 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$ Note3 | | dB | 17 |
| SS-RSRP Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/18.36 MHz | -56.03 |
| Propagation condition | | | AWGN |
| Antenna Configuration | | | 1x1 |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.7.5.1.5-2: E-UTRAN Cell specific test parameters (Cell 2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | Test 1 | Test 2 |
| E-UTRA RF channel number | | | 2 | |
| Duplex mode | Config 1, 2, 3, 7 | | FDD | |
| | Config 4, 5, 6, 8 | | TDD | |
| TDD special subframe configuration Note1 | Config 1, 2, 3, 7 | | N/A | |
| | Config 4, 5, 6, 8 | | 6 | |
| TDD uplink-downlink configuration Note1 | Config 1, 2, 3, 7 | | N/A | |
| | Config 4, 5, 6, 8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note2 | | | - | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | Config 1, 2, 3, 7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4, 5, 6, 8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |

| | | | | |
|---|---|---|---|---|
| OCNG Patterns[Note2] | Config 1, 2, 3, 7 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | |
| | Config 4, 5, 6, 8 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -91.65 | -117 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | dB | 10 | -3.65 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | 10 | -3.65 |
| RSRP[Note5] | | dBm/15 kHz | -81.65 | -120.65 + $\Delta_{BG_offset}$ |
| SCH_RP[Note5] | | dBm/15 kHz | -81.65 | -120.65 + $\Delta_{BG_offset}$ |
| Io[Note5] | | dBm/Ch BW | -53.45 + 10log($N_{RB,c}$/50) | -87.66 + 10log($N_{RB,c}$/50) + $\Delta_{BG_offset}$ |
| Propagation Condition | | | AWGN | |
| Antenna Configuration | | | 1x1 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
Note 8: Except Band 29.
Note 9: Except Band 32, Band 75 and Band 76.
Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

**Table 16.7.5.1.5-3: E-UTRA RSRP absolute accuracy requirements for the reported values**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 48 | FDD_A, TDD_A | 13 |
| | | FDD_B | 13 |
| | | TDD_C | 14 |
| | | FDD_D, TDD_D | 14 |
| | | FDD_E, TDD_E | 15 |
| | | FDD_G | 16 |
| | | FDD_H | 16 |
| Highest reported value (Cell 2) | 69 | FDD_A, TDD_A | 27 |
| | | FDD_B | 27 |
| | | TDD_C | 28 |
| | | FDD_D, TDD_D | 28 |
| | | FDD_E, TDD_E | 29 |
| | | FDD_G | 30 |
| | | FDD_H | 30 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 45 | FDD_A, TDD_A | 8 |

| | | | |
|---|---|---|---|
| | | FDD_B | 9 |
| | | TDD_C | 9 |
| | | FDD_D, TDD_D | 10 |
| | | FDD_E, TDD_E | 10 |
| | | FDD_G | 11 |
| | | FDD_H | 12 |
| Highest reported value (Cell 2) | 72 | FDD_A, TDD_A | 31 |
| | | FDD_B | 32 |
| | | TDD_C | 32 |
| | | FDD_D, TDD_D | 33 |
| | | FDD_E, TDD_E | 33 |
| | | FDD_G | 34 |
| | | FDD_H | 35 |
| Note 1: E-UTRA operating band groups are as defined in TS 36.521-3 [26] clause 3.5.1. | | | |

## 16.7.5.2 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 2 Rx UE

### 16.7.5.2.1 Test purpose

To verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 10.2A.2 for SA inter-RAT E-UTRAN RSRP measurements.

### 16.7.5.2.2 Test applicability

This test applies to all types of NR RedCap UEs with 2 Rx from Release 17 onwards and supporting E-UTRA.

### 16.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.5.2.

### 16.7.5.2.4 Test description

#### 16.7.5.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.5.1.4.1 with following exceptions:

- Table 6.7.5.1.4.1-1 is replaced by Table 16.7.5.2.4.1-1;
- Table 6.7.5.1.4.1-2 is replaced by Table 16.7.5.2.4.1-2.

**Table 16.7.5.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.7.5.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD |
| 16.7.5.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.5.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.5.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD |
| 16.7.5.2-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.5.2-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.5.2-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN FDD |
| 16.7.5.2-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.5.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

### 16.7.5.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.5.1.4.2.

### 16.7.5.2.4.3 Message contents

Same as the message contents given in clause 6.7.5.1.4.3.

### 16.7.5.2.5 Test requirement

Same as the test requirements given in clause 6.7.5.1.5 with following exceptions:

- Table 6.7.5.1.5-1 is replaced by Table 16.7.5.2.5-1;
- Table 6.7.5.1.5-2 is replaced by Table 16.7.5.2.5-2;
- Table 6.7.5.1.5-3 is replaced by Table 16.7.5.2.5-3.

**Table 16.7.5.2.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| | Config 7, 8 | | HD-FDD |
| TDD Configuration | Config 1, 4, 7, 8 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 |
| Gap pattern Id | | | 0 |
| PDSCH RMC | Config 1, 4, 7, 8 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET RMC | Config 1, 4, 7, 8 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET RMC | Config 1, 4, 7, 8 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| Initial DL BWP | | | DLBWP.0.1 |
| Dedicated DL BWP | | | DLBWP.1.1 |
| Initial UL BWP | | | ULBWP.0.1 |
| Dedicated UL BWP | | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.1 RedCap FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104 |
| $N_{oc}$ Note2 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$ Note3 | | dB | 17 |
| SS-RSRP Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io Note3 | Config 1, 2, 4, 5, 7, 8 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/18.36 MHz | -56.03 |
| Propagation condition | | | AWGN |
| Antenna Configuration and Correlation Matrix | | | 1x2 Low |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |
| Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table 16.7.5.2.5-2: E-UTRAN Cell specific test parameters (Cell 2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | Test 1 | Test 2 |
| E-UTRA RF channel number | | | 2 | |
| Duplex mode | Config 1, 2, 3, 7 | | FDD | |
| | Config 4, 5, 6, 8 | | TDD | |
| TDD special subframe configuration Note1 | Config 1, 2, 3, 7 | | N/A | |
| | Config 4, 5, 6, 8 | | 6 | |
| TDD uplink-downlink configuration Note1 | Config 1, 2, 3, 7 | | N/A | |
| | Config 4, 5, 6, 8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel Note2 | | | - | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2 | Config 1, 2, 3, 7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4, 5, 6, 8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns Note2 | Config 1, 2, 3, 7 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | |
| | Config 4, 5, 6, 8 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |

| | | | |
|---|---|---|---|
| PHICH_RB | | | |
| PDCCH_RA | | | |
| PDCCH_RB | | | |
| PDSCH_RA | | | |
| PDSCH_RB | | | |
| OCNG_RA[Note3] | | | |
| OCNG_RB[Note3] | | | |
| $N_{oc}$[Note4] | dBm/15 kHz | -91.65 | -117 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | dB | 10 | -3.2 |
| $\hat{E}_s/I_{ot}$[Note5] | dB | 10 | -3.2 |
| RSRP[Note5] | dBm/15 kHz | -81.65 | -120.2 + $\Delta_{BG_offset}$ |
| SCH_RP[Note5] | dBm/15 kHz | -81.65 | -120.2 + $\Delta_{BG_offset}$ |
| Io[Note5] | dBm/Ch BW | -53.45 + 10log($N_{RB,c}$/50) | -87.52 + 10log($N_{RB,c}$/50) + $\Delta_{BG_offset}$ |
| Propagation Condition | | AWGN | |
| Antenna Configuration and Correlation Matrix | | 1x2 Low | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
Note 8: Except Band 29.
Note 9: Except Band 32, Band 75 and Band 76.
Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

**Table 16.7.5.2.5-3: E-UTRA RSRP absolute accuracy requirements for the reported values**

| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 49 | FDD_A, TDD_A | 14 |
| | | FDD_B | 15 |
| | | TDD_C | 15 |
| | | FDD_D, TDD_D | 16 |
| | | FDD_E, TDD_E | 16 |
| | | FDD_G | 17 |
| | | FDD_H | 18 |
| Highest reported value (Cell 2) | 69 | FDD_A, TDD_A | 27 |
| | | FDD_B | 27 |
| | | TDD_C | 28 |
| | | FDD_D, TDD_D | 28 |
| | | FDD_E, TDD_E | 29 |
| | | FDD_G | 30 |
| | | FDD_H | 30 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 2) | 46 | FDD_A, TDD_A | 10 |
| | | FDD_B | 10 |
| | | TDD_C | 11 |
| | | FDD_D, TDD_D | 11 |
| | | FDD_E, TDD_E | 12 |
| | | FDD_G | 13 |
| | | FDD_H | 13 |
| Highest reported value (Cell 2) | 72 | FDD_A, TDD_A | 31 |
| | | FDD_B | 32 |
| | | TDD_C | 32 |
| | | FDD_D, TDD_D | 33 |
| | | FDD_E, TDD_E | 33 |
| | | FDD_G | 34 |

| | | | |
|---|---|---|---|
| | | FDD_H | 35 |
| Note 1: E-UTRA operating band groups are as defined in TS 36.521-3 [26] clause 3.5.1. | | | |

# 16.7.6 E-UTRAN RSRQ for RedCap

## 16.7.6.0 Minimum conformance requirements

### 16.7.6.0.1 E-UTRAN RSRQ absolute accuracy

When RedCap UE is capable of 2 Rx, the minimum requirements given in clause 6.7.6.0.1 shall apply.

When RedCap UE is only required to support 1 Rx, the requirements for absolute accuracy of RSRQ in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 16.7.6.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in TS 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to TS 36.133 [23] Annex B.3.1 for a corresponding band.

**Table 16.7.6.0.1-1: E-UTRAN RSRQ absolute accuracy for 1 Rx RedCap UE**

| Accuracy | | Conditions | | | |
|---|---|---|---|---|---|
| | | | Io Note 1 range | | |
| Normal condition | Extreme condition | Ês/Iot | E-UTRA operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB | | dBm/15 kHz Note 3 | $dBm/BW_{Channel}$ |
| ±3.5 | ±5 | ≥-3 dB | FDD_A, TDD_A | -121 | -50 |
| | | | FDD_B1 | -120.5 | -50 |
| | | | FDD_C, TDD_C | -120 | -50 |
| | | | FDD_D | -119.5 | -50 |
| | | | FDD_E, TDD_E | -119 | -50 |
| | | | FDD_F | -118.5 | -50 |
| | | | FDD_G | -118 | -50 |
| | | | FDD_H | -117.5 | -50 |
| | | | FDD_N | -114.5 | -50 |
| ±4.5 | ±5 | ≥-6 dB | Note 2 | Note 2 | Note 2 |

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The condition level is increased by $\Delta > 0$, when applicable, as described in TS 36.133 [23] clauses B.4.2 and B.4.3.
NOTE 4: E-UTRA operating band groups are as defined in TS 36.133 [23] clause 3.5.

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [23] shall apply.

The normative reference for this requirement is TS 38.133 [6] clauses 10.2A.3 and TS 36.133 [23] clause 9.1.5.5.

## 16.7.6.1 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 1 Rx UE

### 16.7.6.1.1 Test purpose

To verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 10.2A.2 for SA inter-RAT E-UTRAN RSRP measurements.

#### 16.7.6.1.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards and supporting E-UTRA.

#### 16.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.6.1.

#### 16.7.6.1.4 Test description

##### 16.7.6.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.6.1.4.1 with following exceptions:

- Table 6.7.6.1.4.1-1 is replaced by Table 16.7.6.1.4.1-1;
- Table 6.7.6.1.4.1-2 is replaced by Table 16.7.6.1.4.1-2.

**Table 16.7.6.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.7.6.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD |
| 16.7.6.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.6.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.6.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD |
| 16.7.6.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.6.1-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.6.1-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN FDD |
| 16.7.6.1-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.6.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.2.1 | |
| Exceptions to connection diagram | N/A | | |

##### 16.7.6.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.6.1.4.2.

##### 16.7.6.1.4.3 Message contents

Same as the message contents given in clause 6.7.6.1.4.3.

#### 16.7.6.1.5 Test requirement

Same as the test requirements given in clause 6.7.6.1.5 with following exceptions:

- Table 6.7.6.1.5-1 is replaced by Table 16.7.6.1.5-1;
- Table 6.7.6.1.5-2 is replaced by Table 16.7.6.1.5-2;

- Table 6.7.6.1.5-3 is replaced by Table 16.7.6.1.5-3.

**Table 16.7.6.1.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| | Config 7, 8 | | HD-FDD |
| TDD Configuration | Config 1, 4, 7, 8 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 |
| Gap pattern Id | | | 0 |
| PDSCH RMC | Config 1, 4, 7, 8 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET RMC | Config 1, 4, 7, 8 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET RMC | Config 1, 4, 7, 8 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| Initial DL BWP | | | DLBWP.0.1 |
| Dedicated DL BWP | | | DLBWP.1.1 |
| Initial UL BWP | | | ULBWP.0.1 |
| Dedicated UL BWP | | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.1 RedCap FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | -104 |
| $N_{oc}$[Note2] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 17 |
| SS-RSRP[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/18.36 MHz | -56.03 |
| Propagation condition | | | AWGN |
| Antenna Configuration | | | 1x1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.7.6.1.5-2: E-UTRAN Cell specific test parameters (Cell 2)**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | | | 2 | | |
| Duplex mode | Config 1, 2, 3, 7 | | FDD | | |
| | Config 4, 5, 6, 8 | | TDD | | |
| TDD special subframe configuration[Note1] | Config 1, 2, 3, 7 | | N/A | | |
| | Config 4, 5, 6, 8 | | 6 | | |
| TDD uplink-downlink configuration[Note1] | Config 1, 2, 3, 7 | | N/A | | |
| | Config 4, 5, 6, 8 | | 1 | | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | | - | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1, 2, 3, 7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | Config 4, 5, 6, 8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note2] | Config 1, 2, 3, 7 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | | |
| | Config 4, 5, 6, 8 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | | |
| PBCH_RA | | dB | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA[Note3] | | | | | |
| OCNG_RB[Note3] | | | | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -83 | -104.70 | -119.5 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | dB | -1.75 | -3.65 | -3.65 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | -1.75 | -3.65 | -3.65 |
| RSRP[Note5] | | dBm/15 kHz | -84.75 | -108.35 | -123.15 + $\Delta_{BG_offset}$ |
| RSRQ[Note5] | | dB | -14.76 | -16.00 | -16.00 |
| Io[Note5] | | dBm/Ch BW | -53 + 10log($N_{RB,c}$/50) | -75.36 + 10log($N_{RB,c}$/50) | -90.16 + 10log($N_{RB,c}$/50) + $\Delta_{BG_offset}$ |
| Propagation Condition | | | AWGN | | |
| Antenna Configuration | | | 1x1 | | |

| | |
|---|---|
| Note 1: | Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24]. |
| Note 2: | DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively. |
| Note 3: | OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 4: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 5: | $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 6: | E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23]. |
| Note 7: | For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz. |
| Note 8: | Except Band 29. |
| Note 9: | Except Band 32, Band 75 and Band 76. |
| Note 10: | For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz. |

**Table 16.7.6.1.5-3: E-UTRA RSRQ absolute accuracy requirements for the reported values**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 All bands |
|---|---|---|---|
| Lowest reported value (Cell 2) | 3 | 0 | 0 |
| Highest reported value (Cell 2) | 17 | 17 | 17 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | 0 | 0 | 0 |
| Highest reported value (Cell 2) | 20 | 18 | 18 |

## 16.7.6.2 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 2 Rx UE

### 16.7.6.2.1 Test purpose

To verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 10.2A.2 for SA inter-RAT E-UTRAN RSRP measurements.

### 16.7.6.2.2 Test applicability

This test applies to all types of NR RedCap UEs with 2 Rx from Release 17 onwards and supporting E-UTRA.

### 16.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.7.6.2.

### 16.7.6.2.4 Test description

#### 16.7.6.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.6.1.4.1 with following exceptions:

- Table 6.7.6.1.4.1-1 is replaced by Table 16.7.6.2.4.1-1;
- Table 6.7.6.1.4.1-2 is replaced by Table 16.7.6.2.4.1-2.

**Table 16.7.6.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 16.7.6.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN FDD |
| 16.7.6.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.6.2-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN FDD |
| 16.7.6.2-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, E-UTRAN TDD |
| 16.7.6.2-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.6.2-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, E-UTRAN TDD |
| 16.7.6.2-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN FDD |
| 16.7.6.2-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. E-UTRAN TDD |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 16.7.6.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.14-2 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 16.7.6.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.7.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

### 16.7.6.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.6.1.4.2.

### 16.7.6.2.4.3 Message contents

Same as the message contents given in clause 6.7.6.1.4.3.

### 16.7.6.2.5 Test requirement

Same as the test requirements given in clause 6.7.6.1.5 with following exceptions:

- Table 6.7.6.1.5-1 is replaced by Table 16.7.6.2.5-1;
- Table 6.7.6.1.5-2 is replaced by Table 16.7.6.2.5-2;
- Table 6.7.6.1.5-3 is replaced by Table 16.7.6.2.5-3.

**Table 16.7.6.2.5-1: NR Cell specific test parameters (Cell 1)**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| NR RF channel number | | | 1 |
| Duplex mode | Config 1, 4 | | FDD |
| | Config 2, 3, 5, 6 | | TDD |
| | Config 7, 8 | | HD-FDD |
| TDD Configuration | Config 1, 4, 7, 8 | | N/A |
| | Config 2, 5 | | TDDConf.1.1 |
| | Config 3, 6 | | TDDConf.2.1 |
| $BW_{channel}$ | Config 1, 2, 4, 5, 7, 8 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 20: $N_{RB,c}$ = 51 |
| Gap pattern Id | | | 0 |
| PDSCH RMC | Config 1, 4, 7, 8 | | SR.1.1 FDD |
| | Config 2, 5 | | SR.1.1 TDD |
| | Config 3, 6 | | SR.2.1 TDD |
| RMSI CORSET RMC | Config 1, 4, 7, 8 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |

| | | | |
|---|---|---|---|
| | Config 3, 6 | | CR.2.1 TDD |
| Dedicated CORSET RMC | Config 1, 4, 7, 8 | | CCR.1.1 FDD |
| | Config 2, 5 | | CCR.1.1 TDD |
| | Config 3, 6 | | CCR.2.1 TDD |
| CSI-RS for tracking | Config 1, 4, 7, 8 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| Initial DL BWP | | | DLBWP.0.1 |
| Dedicated DL BWP | | | DLBWP.1.1 |
| Initial UL BWP | | | ULBWP.0.1 |
| Dedicated UL BWP | | | ULBWP.1.1 |
| OCNG pattern[Note1] | | | OP.1 |
| SMTC configuration | | | SMTC.1 |
| SSB configuration | Config 1, 2, 4, 5, 7, 8 | | SSB.1 FR1 |
| | Config 3, 6 | | SSB.1 RedCap FR1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | |
| $N_{oc}$[Note2] | | dBm/15 kHz | -104 |
| $N_{oc}$[Note2] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -104 |
| | Config 3, 6 | | -101 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $\hat{E}_s/I_{ot}$[Note3] | | dB | 17 |
| SS-RSRP[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| SSB_RP[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/SCS | -87 |
| | Config 3, 6 | | -84 |
| Io[Note3] | Config 1, 2, 4, 5, 7, 8 | dBm/9.36 MHz | -58.96 |
| | Config 3, 6 | dBm/18.36 MHz | -56.03 |
| Propagation condition | | | AWGN |
| Antenna Configuration and Correlation Matrix | | | 1x2 Low |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 16.7.6.2.5-2: E-UTRAN Cell specific test parameters (Cell 2)**

| Parameter | | Unit | Cell 2 | | |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 |
| E-UTRA RF channel number | | | 2 | | |
| Duplex mode | Config 1, 2, 3, 7 | | FDD | | |
| | Config 4, 5, 6, 8 | | TDD | | |
| TDD special subframe configuration[Note1] | Config 1, 2, 3, 7 | | N/A | | |
| | Config 4, 5, 6, 8 | | 6 | | |
| | Config 1, 2, 3, 7 | | N/A | | |

| | | | | | |
|---|---|---|---|---|---|
| TDD uplink-downlink configuration[Note1] | Config 4, 5, 6, 8 | | 1 | | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | | - | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1, 2, 3, 7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | Config 4, 5, 6, 8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note2] | Config 1, 2, 3, 7 | | 5 MHz: OP.19 FDD<br>10 MHz: OP.6 FDD<br>20 MHz: OP.14 FDD | | |
| | Config 4, 5, 6, 8 | | 5 MHz: OP.10 TDD<br>10 MHz: OP.2 TDD<br>20 MHz: OP.8 TDD | | |
| PBCH_RA<br>PBCH_RB<br>PSS_RA<br>SSS_RA<br>PCFICH_RB<br>PHICH_RA<br>PHICH_RB<br>PDCCH_RA<br>PDCCH_RB<br>PDSCH_RA<br>PDSCH_RB<br>OCNG_RA[Note3]<br>OCNG_RB[Note3] | | dB | 0 | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -83 | -104.70 | -119.5 + $\Delta_{BG_offset}$ |
| $\hat{E}_s/N_{oc}$ | | dB | -1.75 | -3.2 | -3.2 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | -1.75 | -3.2 | -3.2 |
| RSRP[Note5] | | dBm/15 kHz | -84.75 | -107.90 | -122.7 + $\Delta_{BG_offset}$ |
| RSRQ[Note5] | | dB | -14.76 | -15.69 | -15.69 |
| Io[Note5] | | dBm/Ch BW | -53 + 10log($N_{RB,c}$/50) | -75.22 + 10log($N_{RB,c}$/50) | -90.02 + 10log($N_{RB,c}$/50) + $\Delta_{BG_offset}$ |
| Propagation Condition | | | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1x2 Low | | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
Note 8: Except Band 29.
Note 9: Except Band 32, Band 75 and Band 76.
Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

**Table 16.7.6.2.5-3: E-UTRA RSRQ absolute accuracy requirements for the reported values**

| Normal Conditions | Test 1<br>All bands | Test 2<br>All bands | Test 3<br>All bands |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Lowest reported value (Cell 2) | 4 | 0 | 0 |
| Highest reported value (Cell 2) | 16 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | 1 | 0 | 0 |
| Highest reported value (Cell 2) | 19 | 17 | 17 |

# 17 NR standalone tests in FR2 for RedCap

## 17.1 RRC_IDLE state mobility for RedCap

### 17.1.1 NR cell re-selection for RedCap

#### 17.1.1.0 Minimum conformance requirements

##### 17.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection for RedCap

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the re-selection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra_RedCap}$ when that Treselection = 0. An intra-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.4 for a corresponding band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra_RedCap}$ for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra_RedCap}/2$.

The UE shall not consider a NR neighbour cell in cell re-selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met re-selection criterion defined in TS 38.304 [30] within $T_{evaluate,NR_Intra_RedCap}$ when $T_{reselection} = 0$ provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 4.5 dB better ranked in FR2 for 2 Rx RedCap.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

- if there are multiple such cells, the cell has the highest rank among them.

- the cell is at least 4.5 dB better ranked in FR2 if the current serving cell is among them for 2 Rx RedCap.

When evaluating cells for re selection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the re-selection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

For 2 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 17.1.1.0.1-1.

For 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 17.1.1.0.1-2 for FR2, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ when multiple PTWs are used.

**Table 17.1.1.0.1-1: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 (36 x N1 x M2) | 1.28 x N1 x M2 (4 x N1 x M2) | 5.12 x N1 x M2 (16 x N1 x M2) |
| 0.64 | | 5 | 17.92 x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |

Note 1: Applies for RedCap UE of all FR2 power class.
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra_RedCap}$ is expected.

**Table 17.1.1.0.1-2: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range 2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 4]) | $T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 4]) | $T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 4]) |
|---|---|---|---|---|---|---|
| 2.56 | - | - | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | - | - | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 | - | - | 3 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |
| 20.48 ≤ eDRX_IDLE cycle length ≤10485.76 | 0.32 | ≥5.12 (4) | 8 | $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1) | 0.32 x N1 (1 x N1) | 0.64 x N1 (2 x N1) |
| | 0.64 | ≥6.4 (5) | 5 | | 0.64 x N1 (1 x N1) | 1.28 x N1 (2 x N1) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 1.28 | ≥10.24 (8) | 4 | | 1.28 x N1 (1 x N1) | 2.56 x N1 (2 x N1) |
| | 2.56 | ≥15.36 (12) | 3 | | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |
| NOTE 1: Applies for RedCap UE of all power class.<br>NOTE 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>NOTE 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].<br>NOTE 4: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56 s, 5.12 s and 10.24 s. Otherwise, number of DRX cycles.<br>NOTE 5: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.<br>NOTE 6: When eDRX = 20.48 s and DRX = 0.32 s, UE is allowed to perform cell evaluation within PTW in every 2 eDRX cycles. | | | | | | |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

### 17.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection for RedCap

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] in clause 4.2.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible re-selection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the re-selection criteria defined in TS 38.304 [30] within $K_{carrier_RedCap} * T_{detect,NR_Inter_RedCap}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the re-selection criteria is met

For 2 Rx RedCap by a margin of at least

5 dB in FR1 or 6.5 dB in FR2 for re-selections based on ranking or

7.5 dB in FR2 for SS-RSRP re-selections based on absolute priorities or

4 dB in FR2 for SS-RSRQ re-selections based on absolute priorities

The parameter $K_{carrier_RedCap}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] in Annex B.1.5 for a corresponding band. When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter_RedCap}$. If, after detecting a cell in a higher priority search, it is determined that re-selection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of re-selection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier_RedCap} * T_{measure,NR_Inter_RedCap}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell re-selection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met re-selection criterion defined TS 38.304 [30] within $K_{carrier} * T_{evaluate,NR_Inter_RedCap}$ when $T_{reselection} = 0$ provided that the re-selection criteria is met by

- the condition when performing equal priority re-selection and
  - when *rangeToBestCell* is not configured:
    - the cell is at least 6.5 dB better ranked in FR2 for 2 Rx RedCap.
  - when *rangeToBestCell* is configured:
    - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value defined in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
      - if there are multiple such cells, the cell has the highest rank among them
      - the cell is at least 6.5 dB better ranked in FR2 if the current serving cell is among them, or 7.5 dB in FR2 for SS-RSRP re-selections based on absolute priorities for 2 Rx RedCap or 4 dB in FR2 for SS-RSRQ re-selections based on absolute priorities for 2 Rx RedCap.

When evaluating cells for re-selection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the re-selection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the re-selection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle = 320 ms defined in TS 38.133 [6] in Table 17.1.1.0.2-1 for 2 Rx RedCap under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where $T_{SMTC_intra}$ and $T_{SMTC_inter}$ are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion defined in TS 38.304 [30].

For Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 17.1.1.0.2-1.

For 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 17.1.1.0.2-2 for FR2. The requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ when multiple PTWs are used.

**Table 17.1.1.0.2-1: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 (36 x N1 x 1.5) | 1.28 x N1 x 1.5 (4 x N1 x 1.5) | 5.12 x N1 x 1.5 (16 x N1 x 1.5) |
| 0.64 | | 5 | 17.92x N1 (28 x N1) | 1.28 x N1 (2 x N1) | 5.12 x N1 (8 x N1) |
| 1.28 | | 4 | 32 x N1 (25 x N1) | 1.28 x N1 (1 x N1) | 6.4 x N1 (5 x N1) |
| 2.56 | | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| Note 1: Applies for RedCap UE of all FR2 power class. | | | | | |

**Table 17.1.1.0.2-2: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range 2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|
| 2.56 | - | - | 3 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | - | - | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 | - | - | 3 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |
| 20.48 ≤ eDRX_IDLE cycle length ≤ 10485.76 | 0.32 | ≥5.12 (4) | 8 | $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1) | 0.32 x N1 (1 x N1) | 0.64 x N1 (2 x N1) |
| | 0.64 | ≥6.4 (5) | 5 | | 0.64 x N1 (1 x N1) | 1.28 x N1 (2 x N1) |
| | 1.28 | ≥10.24 (8) | 4 | | 1.28 x N1 (1 x N1) | 2.56 x N1 (2 x N1) |
| | 2.56 | ≥15.36 (12) | 3 | | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |

NOTE 1: Applies for RedCap UE of all power class.
NOTE 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
NOTE 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
NOTE 4: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56 s, 5.12 s and 10.24 s. Otherwise, number of DRX cycles.
NOTE 5: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
NOTE 6: When eDRX = 20.48 s and DRX = 0.32 s, UE is allowed to perform cell evaluation within PTW in every 2 eDRX cycles.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

### 17.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and UE has fulfilled that criterion, or

- UE is configured with both *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and *combineRelaxedMeasCondition2* defined in TS 38.331 [13] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion

The requirements defined in clause 17.1.1.0.3 apply for this clause except that:

- $T_{detect,NR_Intra_RedCap_Relax}$ as specified in Table 17.1.1.0.3-1 for 2 Rx RedCap.

- $T_{measure,NR_Intra_RedCap_Relax}$ as specified in Table 17.1.1.0.3-1 for 2 Rx RedCap.

- $T_{evaluate,NR_Intra_RedCap_Relax}$ as specified in Table 17.1.1.0.3-1 for 2 Rx RedCap.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 17.1.1.0.3-2 are applicable for eDRX cycle up to 10.24 s in FR2.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s in FR2, then the requirements in Table 17.1.1.0.3-3 apply provided eDRX cycle is ≤ 163.84 sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

**Table 17.1.1.0.3-1: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UEs fulfilling stationary criterion for 2 Rx RedCap UE**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2 Note1 | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K3 (36 x N1 x M2 x K3) | 1.28 x N1 x M2 x K3 (4 x N1 x M2 x K3) | 5.12 x N1 x M2 x K3 (16 x N1 x M2 x K3) |
| 0.64 | | 5 | 17.92 x N1 x K3 (28 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) | 5.12 x N1 x K3 (8 x N1 x K3) |
| 1.28 | | 4 | 32 x N1 x K3 (25 x N1 x K3) | 1.28 x N1 x K3 (1 x N1 x K3) | 6.4 x N1 x K3 (5 x N1 x K3) |
| 2.56 | | 3 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x N1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |

Note 1: Applies for RedCap UE of all supporting FR2 power classes.
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2 = 1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra}$ is expected.
Note 3: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

**Table 17.1.1.0.3-2: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles) |
|---|---|---|---|
| 2.56 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x N1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |
| 5.12 | 117.76 x N1 x K3 (23 x N1 x K3) | 5.12 x N1 x K3 (1 x N1 x K3) | 10.24 x N1 x K3 (2 x N1 x K3) |
| 10.24 | 235.52 x N1 x K3 (23 x N1 x K3) | 10.24 x N1 x K3 (1 x N1 x K3) | 20.48 x N1 x K3 (2 x N1 x K3) |

Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

**Table 17.1.1.0.3-3: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2)**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤ 163.84 | 0.32 | ≥30.72 (24) | 8 | K3 x $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1 x K3) | 0.32 x N1 x K3 (1 x N1 x K3) | 0.64 x N1 x K3 (2 x N1 x K3) |
| | 0.64 | ≥38.4 (30) | 5 | | 0.64 x N1 x K3 (1 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) |
| | 1.28 | 40.96 (32) | 4 | | 1.28 x N1 x K3 (1 x N1 x K3) | 2.56 x N1 x K3 (2 x N1 x K3) |
| | 2.56 | 40.96 (32) | 3 | | 20.48 | 40.96 |

Note 1: Applies for RedCap UE of all supporting FR2 power classes.
Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].
Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap_Relax * DRX_cycle}{1.28} \right\rceil * 1.28.$
Note 5: The measurement shall not be performed across PTW's. In this case the measurement is performed in the next available PTW.
Note 6: The evaluation shall not be performed across PTW's. In this case the evaluation is performed in the next available PTW.
Note 7: For DRX cycle length is 0.32 s, 0.64 s, and 2.56 s, K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. For DRX cycle length is 1.28 s, K3 = 4 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion.

### 17.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and UE has fulfilled that criterion, or
- UE is configured with both *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion and *cellEdgeEvaluationWhileStationary* defined in TS 38.331 [13] criterion and *combineRelaxedMeasCondition2* defined in TS 38.331 [13] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion, and

The requirements defined in clause17.1.1.0.4 apply for this clause except that:

- $T_{detect,NR_Inter_RedCap_Relax}$ as specified in Table 17.1.1.0.4-1 for 2 Rx RedCap.
- $T_{measure,NR_Inter_RedCap_Relax}$ as specified in Table 17.1.1.0.4-1 for 2 Rx RedCap.
- $T_{evaluate,NR_Inter_RedCap_Relax}$ as specified in Table 17.1.1.0.4-1 and for 2 Rx RedCap.
- When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every K2*$T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] in clause 4.2.2.7 and, K2 = 240.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 17.1.1.0.4-2 are applicable for eDRX cycle up to 10.24 s in FR2.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s FR2, then the requirements in Table 17.1.1.0.4-3 apply provided that eDRX cycle is ≤ 163.84 sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

**Table 17.1.1.0.4-1: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for 2 Rx RedCap UE**

| DRX cycle length [s] | Scaling Factor (N1) | | $T_{detect,NR_Inter_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|---|---|
| | FR1 | FR2[Note1] | | | |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K4 (36 x N1 x 1.5 x K4) | 1.28 x N1 x 1.5 x K4 (4 x N1 x 1.5 x K4) | 5.12 x N1 x 1.5 x K4 (16 x N1 x 1.5 x K4) |

| | | | | | |
|---|---|---|---|---|---|
| 0.64 | | 5 | 17.92x N1 x K4 (28 x N1 x K4) | 1.28 x N1 x K4 (2 x N1 x K4) | 5.12 x N1 x K4 (8 x N1 x K4) |
| 1.28 | | 4 | 32 x N1 x K4 (25 x N1 x K4) | 1.28 x N1 x K4 (1 x N1 x K4) | 6.4 x N1 x K4 (5 x N1 x K4) |
| 2.56 | | 3 | 58.88 x N1 x K4 (23 x N1 x K4) | 2.56 x N1 x K4 (1 x N1 x K4) | 7.68 x N1 x K4 (3 x N1 x K4) |
| Note 1: Applies for RedCap UE of all supporting power class.<br>Note 2: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | |

**Table 17.1.1.0.4-2: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle up to 10.24 s**

| eDRX_IDLE cycle length [s] | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles) |
|---|---|---|---|
| 2.56 | 58.88 x N1 x K3 (23 x N1 x K3) | 2.56 x N1 x K3 (1 x N1 x K3) | 7.68 x N1 x K3 (3 x N1 x K3) |
| 5.12 | 117.76 x N1 x K3 (23 x N1 x K3) | 5.12 x N1 x K3 (1 x N1 x K3) | 10.24 x N1 x K3 (2 x N1 x K3) |
| 10.24 | 235.52 x N1 x K3 (23 x N1 x K3) | 10.24 x N1 x K3 (1 x N1 x K3) | 20.48 x N1 x K3 (2 x N1 x K3) |
| Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | |

**Table 17.1.1.0.4-3: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range 2) for eDRX_IDLE cycle larger than 10.24 s**

| eDRX_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Scaling Factor (N1) Note1 | $T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) | $T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3) |
|---|---|---|---|---|---|---|
| 20.48 ≤ eDRX_IDLE cycle length ≤[163.84] | 0.32 | ≥30.72 (24) | 8 | K3 x $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1 x K3) | 0.32 x N1 x K3 (1 x N1 x K3) | 0.64 x N1 x K3 (2 x N1 x K3) |
| | 0.64 | ≥38.4 (30) | 5 | | 0.64 x N1 x K3 (1 x N1 x K3) | 1.28 x N1 x K3 (2 x N1 x K3) |
| | 1.28 | 40.96 (32) | 4 | | 1.28 x N1 x K3 (1 x N1 x K3) | 2.56 x N1 x K3 (2 x N1 x K3) |
| | 2.56 | 40.96 (32) | 3 | | 20.48 | 40.96 |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.<br>Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.<br>Note 3: The eDRX_IDLE cycle lengths are as specified in clause 10.5.5.32 of TS 24.008 [34].<br>Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.<br>Note 5: For DRX cycle length is 0.32 s, 0.64 s and 2.56 s, K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. For DRX cycle length is 1.28 s, K3 = 4 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* defined in TS 38.331 [13] criterion. | | | | | | |

### 17.1.1.1 NR SA FR2 Cell reselection for 2 Rx UE

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 17.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.3.

#### 17.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

#### 17.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.1.

#### 17.1.1.1.4 Test description

##### 17.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.1.4.1-1.

**Table 17.1.1.1.4.1-1: Supported test configurations for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx**

| Configuration | Description |
|---|---|
| 17.1.1.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.1.1.1-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.1.4.1-2.

**Table 17.1.1.1.4.1-2: Initial conditions for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 17.1.1.1.4.1-3.
2. Message contents are defined in clause 17.1.1.1.4.3.
3. The test scenario comprises of 1 NR carrier and 2 cells. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 17.1.1.1.4.1-3: General test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 1 | |
| T2 end condition | Active cell | | 1, 2 | Cell 2 | |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| Final condition | Active cell | | 1, 2 | Cell 1 | |
| | Neighbour cell | | 1, 2 | Cell 2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | > 7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, the intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1, 2 | 135 | T2 needs to be defined so that cell reselection reaction time is taken into account. |
| T3 | | s | 1, 2 | 35 | T3 needs to be defined so that cell reselection reaction time is taken into account. |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell | | 1, 2 | Cell1 | |
| T2 end condition | Active cell | | 1, 2 | Cell2 | |
| | Neighbour cell | | 1, 2 | Cell1 | |
| Final condition | Active cell | | 1, 2 | Cell1 | |
| | Neighbour cell | | 1, 2 | Cell2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, the intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |

| | | | | |
|---|---|---|---|---|
| T2 | s | 1, 2 | 135 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | s | 1, 2 | 35 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 17.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. Only Cell 1 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSETUPREQUEST* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 17.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 3) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 17.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 130 seconds from the beginning of time period T2, then count a success for the event "Re-select newly detected Cell 2". Otherwise, count a failure for the event "Re-select newly detected Cell 2".

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 8. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 14.

8. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

9. The SS shall switch the power setting from T2 to T3 as specified in Table 17.1.1.1.5-1.

10. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

11. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 27 seconds from the beginning of time period T3, then count a success for the event "Re-select already detected Cell 1". Otherwise, count a fail for the event "Re-select already detected Cell 1".

12. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 13. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 14.

13. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

14. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

15. Repeat steps 2-14 until a test verdict has been achieved.
    Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require

different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

#### 17.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.1.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 17.1.1.1.4.3-1A: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -69 | Actual value is -60*2 = -138 dBm | 17.1.1.1-1 |
| | -68 | Actual value is -68*2+1 = -135 dBm | 17.1.1.1-2 |
| } | | | |
| } | | | |

**Table 17.1.1.1.4.3-1B: *SIB2* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -60 | Actual value is -60*2 = -120 dBm | 17.1.1.1-1 |
| | -58 | Actual value is -58*2 = -116 dBm | 17.1.1.1-2 |
| s-IntraSearchP | 25 | Actual value is 25*2 = 50 dB | |
| } | | | |
| } | | | |

**Table 17.1.1.1.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

#### 17.1.1.1.5 Test requirement

Table 17.1.1.1.5-1 defines the primary level settings including test tolerances for NR SA cell re-selection test case in AWGN for 2 Rx UE.

**Table 17.1.1.1.5-1: Cell specific test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| | | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| | | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| | | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration | | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
| | | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern | | 1, 2 | OP.4 | | | OP.4 | | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1, 2 | 66 | | | 66 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | | -120 Note 6 | | |
| | | 2 | -117 Note 6 | | | -117 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| $\hat{E}_s/I_{ot\,\mathrm{BB}}$ Note 5 | dB | 1 | 7.56 | -3.34 | 1.61 | -infinity | 1.61 | -3.34 |
| | | 2 | | | | | | |
| Beam assumption Note 4 | | 1,2 | Rough | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | | | |
| | | 2 | -90 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | | | |
| | | 2 | | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 8 | -2.9 | 2.05 | -infinity | 2.05 | -2.9 |
| | | 2 | | | | | | |
| SSB_RP Note3 | dBm/SCS | 1 | -85 | -95.9 | -90.9 | -infinity | -90.9 | -95.9 |
| | | 2 | -82 | -92.9 | -87.9 | -infinity | -87.9 | -92.9 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -60.53 | -67.37 | -65.01 | -69.17 | -65.01 | -67.37 |
| | | 2 | -57.52 | -64.39 | -62.33 | -66.16 | -62.33 | -64.39 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition | | 1, 2 | AWGN | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SSB_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 5: | Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. |
| Note 6: | Including the test tolerance given in Annex F. |

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 130 s.

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 27 s.

NOTE: The cell reselection delay to a newly detectable cell can be expressed as: $T_{detect, NR_Intra} + T_{SI-NR}$, and to an already detected cell can be expressed as: $T_{evaluate, NR_intra} + T_{SI-NR}$,

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 17.1.1.2 NR SA FR2-FR2 Cell reselection for 2 Rx UE

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 17.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA inter-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.4.

#### 17.1.1.2.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

#### 17.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.2.

#### 17.1.1.2.4 Test description

##### 17.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.2.4.1-1.

**Table 17.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx**

| Configuration | Description for serving cell | Description for target cell |
|---|---|---|
| 17.1.1.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.1.1.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.2.4.1-2.

**Table 17.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 17.1.1.2.4.1-3.
2. Message contents are defined in clause 17.1.1.2.4.3.
3. The test scenario comprises of 2 cells on 2 different NR carriers. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

**Table 17.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 2 | The UE camps on Cell 2 in the initial phase and during T1 period the UE reselects to Cell 1. |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| T1 end condition | Active cell | | 1, 2 | Cell 1 | The UE shall perform reselection to Cell 1 during T1. |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| T3 end condition | Active cell | | 1, 2 | Cell 2 | The UE shall perform reselection to Cell 2 with higher priority during T3. |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |

| | | | | | |
|---|---|---|---|---|---|
| *rangeToBestCell* | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 35 | T1 needs to be defined so that cell reselection reaction time is taken into account. |
| T2 | | s | 1, 2 | > 7 | During T2, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 95 | T3 needs to be defined so that cell reselection reaction time is taken into account. |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
| Initial condition | Active cell | | 1, 2 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1 |
| | Neighbour cell | | 1, 2 | Cell1 | |
| T1 end condition | Active cell | | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T1 |
| | Neighbour cells | | 1, 2 | Cell2 | |
| T3 end condition | Active cell | | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3 |
| | Neighbour cell | | 1, 2 | Cell1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR2 | |
| | | | 2 | SSB.2 FR2 | |
| SMTC configuration | | | 1, 2 | SMTC.1 | |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | | | 1, 2 | Not configured | |
| T1 | | s | 1, 2 | 35 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 95 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

### 17.1.1.2.4.2 Test procedure

Two cells on two RF channels are deployed in the test, which are one FR2 NR PCell (Cell 2) on RF channel 1 and an NR neighbour cell (Cell 1) on RF channel 2. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. Only Cell 2 is already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSETUPREQUEST* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. Set Cell 1 physical cell identity = initial Cell 1 physical cell identity.

2. Set the parameters according to T1 in Table 17.1.1.2.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 27 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise, count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 17.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 17.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 87 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise, count a fail for the event “Re-select higher priority Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 12. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

14. Repeat steps 2-13 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

### 17.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.1.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.2-1 for NR Cell 1 |
| Default RRC messages and information elements contents exceptions | |

**Table 17.1.1.2.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 17.1.1.2.4.3-3: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -62*2 = -140 dBm | 17.1.1.2-1 |
| | -68 | Actual value is -62*2 = -136 dBm | 17.1.1.2-2 |
| } | | | |
| } | | | |

**Table 17.1.1.2.4.3-4: SIB2 (Cell 2)**

| Derivation Path: Table H.2.2-1 with condition NR Cell 2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 25 | Actual value is 25*2 = 50 dBm | |
| threshServingLowP | 22 | Actual value is 22*2 = 44 dBm | |
| } | | | |
| } | | | |

**Table 17.1.1.2.4.3-5: *SIB4* (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140 dBm | 17.1.1.2-1 |
| | -68 | Actual value = -68*2 = -136 dBm | 17.1.1.2-2 |
| threshX-HighP | 24 | Actual value is 24*2 = 48 dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.1.1.2.4.3-6: *SIB4* (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |

| | | | |
|---|---|---|---|
| q-RxLevMin | -70 | Actual value = -70*2 = -140 dBm | 17.1.1.2-1 |
| | -68 | Actual value = -68*2 = -136 dBm | 17.1.1.2-2 |
| threshX-LowP | 25 | Actual value =25*2 = 50 dBm | |
| } | | | |
| } | | | |
| } | | | |

17.1.1.2.5 Test requirement

Table 17.1.1.2.5-1 defines the primary level settings including test tolerances for NR SAcell reselection test case in AWGN for 2 Rx UE.

**Table 17.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -124 Note 6 | | |
| | | 2 | -137 | | | -121 Note 6 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | | Setup 1 defined in A.9.1 | | |
| Beam assumption Note 4 | | 1,2 | Rough | | | Rough | | |
| $\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5 | dB | 1 | 10.06 | 10.06 | 7.56 | -3.34 | -infinity | 8.06 |
| | | 2 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | -93 | | |
| | | 2 | -90 | | | -90 | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | -102 | | |
| | | 2 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 10.5 | 10.5 | 8 | 2.9 | -infinity | 8.5 |
| | | 2 | | | | | | |
| SSB_RP Note3 | dBm/SCS | 1 | -82.5 | -82.5 | -85 | 95.9 | -infinity | 84.5 |
| | | 2 | -79.5 | -79.5 | -82 | -92.9 | -infinity | -91.5 |
| Io | dBm/95.04 MHz | 1, 2 | -53.11 | -53.11 | -55.34 | -62.18 | -63.98 | -54.91 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 62 Note 6 | | |
| $Thresh_{x,\ highP}$ | dB | 1, 2 | 32 Note 6 | | | 48 | | |
| $Thresh_{serving,\ lowP}$ | dB | 1, 2 | 44 | | | 62 Note 6 | | |
| $Thresh_{x,\ lowP}$ | dB | 1, 2 | 50 | | | 18 Note 6 | | |

| | | | | |
|---|---|---|---|---|
| Propagation Condition | | 1, 2 | AWGN | AWGN |

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

The cell re-selection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to a higher priority cell shall be less than 87 s.

The cell re-selection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The cell re-selection delay to a lower priority cell shall be less than 27 s.

The rate of correct cell re-selections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate,\ NR_inter} + T_{SI\text{-}NR}$,

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 17.1.1.3 NR SA FR2 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 17.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.9.2.

#### 17.1.1.3.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward supporting Rel-17 relaxed RRM measurements of neighbour cells in RRC_IDLE/RRC_INACTIVE.

#### 17.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.3.

17.1.1.3.4 Test description

17.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.3.4.1-1.

**Table 17.1.1.3.4.1-1: Supported test configurations for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Configuration | Description |
|---|---|
| 17.1.1.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.1.1.3-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.3.4.1-2.

**Table 17.1.1.3.4.1-2: Initial conditions for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.1.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 17.1.1.3.4.1-3.
2. Message contents are defined in clause 17.1.1.3.4.3.
3. The test scenario comprises of 1 NR carrier and 2 cells. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. During T1 and T2, only criteria *stationaryMobilityEvaluation* is configured and fulfilled. UE has not registered with network for the tracking area containing Cell 2.

**Table 17.1.1.3.4.1-3: General test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 1 | The UE camps on Cell 1 in the initial phase. |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| T1 end condition | Active cell | | 1, 2 | Cell 2 | The UE reselects to Cell 2 during T1 period. |
| | Neighbour cells | | 1, 2 | Cell 1 | |
| Final condition | Active cell | | 1, 2 | Cell 1 | The UE reselects to Cell 1 during T2 period |
| | Neighbour cells | | 1, 2 | Cell 2 | |
| RF Channel Number | | | 1, 2 | 1 | |
| Time offset between cells | | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | | | 1, 2 | SMTC.1 | |

| | | | | |
|---|---|---|---|---|
| DRX cycle length | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | 1, 2 | Not configured | |
| T1 | s | 1, 2 | 100 | |
| T2 | s | 1, 2 | 100 | |

#### 17.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1 and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *stationaryMobilityEvaluation-r17* defined in TS 38.331 [13] is configured according to the parameters listed in Table 17.1.1.3.5-1;
- cellEdgeEvaluationWhileStationary-r17 defined in TS 38.331 [13] is not configured;
- combineRelaxedMeasCondition2-r17 defined in TS 38.331 [13] is not configured.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSETUPREQUEST* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 17.1.1.3.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 155 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise, count a fail for cell reselection.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 17.1.1.3.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.
9. If the UE responds to Cell 1 during time duration T2 within 155 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise, count a fail for cell reselection.
10. If T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 11.
11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
12. Repeat steps 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 17.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.1.1.3.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | Table H.2.1-2 |
| Default RRC messages and information elements contents exceptions | |

**Table 17.1.1.3.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 17.1.1.3.4.3-2A: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -70*2 = -140 dBm | 17.1.1.3-1 |
| | -68 | Actual value is -68*2 = -136 dBm | 17.1.1.3-2 |
| } | | | |
| } | | | |

**Table 17.1.1.3.4.3-3: *SIB2***

| Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -70*2 = -140 dBm | 17.1.1.3-1 |
| | -68 | Actual value is -68*2 = -136 dBm | 17.1.1.3-2 |
| s-IntraSearchP | 25 | Actual value is 25*2 = 50 dB | |
| } | | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB6 | | |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

### 17.1.1.3.5 Test requirement

Table 17.1.1.3.5-1 defines the primary level settings including test tolerances for NR SA cell reselection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

**Table 17.1.1.3.5-1: Cell specific test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | SR.3.1 TDD | |
| | | 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | CR.3.1 TDD | |
| | | 2 | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| SSB configuration | | 1 | SSB.3 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.4 FR2 | | SSB.8 FR2 | |
| OCNG Pattern | | 1, 2 | OP.4 | | OP.4 | |
| Initial DL BWP configuration | | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Initial UL BWP configuration | | 1, 2 | 66 | | 66 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -120 Note 6 | | -120 Note 6 | |
| | | 2 | -117 Note 6 | | -117 Note 6 | |
| $S_{SearchDeltaP-Stationary}$ | dB | 1, 2 | 6 | | 6 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1,2 | 5 | | 5 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1, 2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot\,\mathrm{BB}}$ Note 5 | dB | 1 | -3.34 | 1.61 | 1.61 | -3.64 |
| | | 2 | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | | |
| | | 2 | -90 | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -102 | | | |
| | | 2 | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | -2.9 | 2.05 | 2.05 Note 6 | -2.9 |
| | | 2 | | | | |
| SSB_RP Note3 | dBm/SCS | 1 | -95.9 | -90.9 | -90.9 | -95.9 |
| | | 2 | -92.9 | -87.9 | -87.9 | -92.9 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -67.37 | -65.01 | -65.01 | -67.37 |
| | | 2 | -64.36 | -62.00 | -62.00 | -64.36 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | 50 | |
| Propagation Condition | | 1, 2 | AWGN | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SSB_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 5: | Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [3] Table 6.2.1.3-4. |
| Note 6: | Including the test tolerance given in Annex F. |

The cell re-selection delay to an already detected cell for UE fulfilling stationary relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to an already detected cell shall be less than 155 s.

The rate of correct cell re-selections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to an already detectable cell can be expressed as: $T_{evaluate,NR_Intra_RedCap_Relax} + T_{SI-NR}$,

Where:

$T_{evaluate,NR_Intra_RedCap_Relax}$ See Table 4.2B.2.9.2-2 in clause 4.2B.2.9.2,

$T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 154.88 s, allow 155 s for the cell reselection delay to an already detected cell for UE fulfilling stationary criterion in the test case.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

### 17.1.1.4 NR SA FR2-FR2 Cell reselection for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Editor's Note: This test case is complete for the following configurations:

Test frequency f ≤ 40.8 GHz.

UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

#### 17.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA inter-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.10.2.

#### 17.1.1.4.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward supporting Rel-17 relaxed RRM measurements of neighbour cells in RRC_IDLE/RRC_INACTIVE.

#### 17.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.4.

17.1.1.4.4 Test description

17.1.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.4.4.1-1.

**Table 17.1.1.4.4.1-1: Supported test configurations for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE**

| Configuration | Description for serving cell | Description for target cell |
|---|---|---|
| 17.1.1.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.1.1.4-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.4.4.1-2.

**Table 17.1.1.4.4.1-2: Initial conditions for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.1.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 17.1.1.4.4.1-3.
2. Message contents are defined in clause 17.1.1.4.4.3.
3. The test scenario comprises of 2 cells (Cell 1 and Cell 2) on 2 different NR carriers respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. Cell 2 is of higher priority than Cell 1. The UE is configured with *stationaryMobilityEvaluation* criterion.

**Table 17.1.1.4.4.1-3: General test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2 | Cell 2 | The UE camps on Cell 2 and fulfils stationary (*stationaryMobilityEvaluation* defined in TS 38.331 [13]) criterion. |
| | Neighbour cell | | 1, 2 | Cell 1 | |
| T1 final condition | Active cell | | 1, 2 | Cell 1 | The UE reselects to low priority Cell 1 during T1. |
| | Neighbour cell | | 1, 2 | Cell 2 | |
| T2 final condition | Active cell | | 1, 2 | Cell 2 | The UE reselects to high priority Cell 2 during T2. |
| | Neighbour cell | | | Cell 1 | |
| RF Channel Number | | | 1, 2 | 1, 2 | |

| | | | | |
|---|---|---|---|---|
| Time offset between cells | | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | TBD | |
| | | 2 | TBD | |
| SMTC configuration | | 1, 2 | TBD | |
| DRX cycle length | s | 1, 2 | 0.64 | The value shall be used for all cells in the test. |
| PRACH configuration index | | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2. |
| *rangeToBestCell* | | 1, 2 | Not configured | |
| T1 | s | 1, 2 | 85 | T1 needs to be long enough to allow cell reselection to already known Cell 1. |
| T2 | s | 1, 2 | 85 | T2 needs to be long enough to allow cell reselection to already known Cell 2. |

#### 17.1.1.4.4.2 Test procedure

The test consists of one active cell and one neighbour cell on two different NR RF channels. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *stationaryMobilityEvaluation-r17* defined in TS 38.331 [13] is configured according to the parameters listed in Table 17.1.1.4.5-1;
- *cellEdgeEvaluationWhileStationary-r17* defined in TS 38.331 [13] is not configured;
- *combineRelaxedMeasCondition2-r17* defined in TS 38.331 [13] is not configured.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSETUPREQUEST* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 17.1.1.4.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell reselection to Cell 1.
4. If the UE responds on lower priority Cell 1 during time duration T1 within 155 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise, count a fail for the event “Re-select lower priority Cell 1”.
5. If the UE has re-selected Cell 1 within T1, after the reselection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.
6. The SS shall send an *RRCRelease* to ensure that the UE is in state RRC_IDLE.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 17.1.1.4.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell reselection to an already detected cell, Cell 2.
9. If the UE responds to higher priority Cell 2 during time duration T2 within 155 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise, count a fail for the event “Re-select higher priority Cell 2”.

10. If T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 11.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

#### 17.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.1.1.4.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

**Table 17.1.1.4.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-130 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 190 | | |
| } | | | |

**Table 17.1.1.4.4.3-2A: *SIB1* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | Actual value is -62*2 = -140 dBm | 17.1.1.4-1 |
| | -68 | Actual value is -62*2 = -136 dBm | 17.1.1.4-2 |
| } | | | |
| } | | | |

**Table 17.1.1.4.4.3-3: *SIB2* (Cell 1 and Cell 2)**

| Derivation Path: Table H.2.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 25 | Actual value is 25*2 = 50 | Cell 2 |
| threshServingLowP | 22 | Actual value is 22*2 = 44 | |
| cellReselectionPriority | 4 | | Cell 1 |
| | 5 | | Cell 2 |
| } | | | |
| relaxedMeasurement-r17 SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| stationaryMobilityEvaluation-r17 SEQUENCE { | | | |
| s-SearchDeltaP-Stationary-r17 | dB6 | | |
| t-SearchDeltaP-Stationary-r17 | s5 | | |
| } | | | |
| cellEdgeEvaluationWhileStationary-r17 | Not present | | |
| combineRelaxedMeasCondition2-r17 | Not present | | |
| } | | | |
| } | | | |

**Table 17.1.1.4.4.3-4: *SIB4* (Cell 1)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140 dBm | 17.1.1.4-1 |
| | -68 | Actual value = -68*2 = -136 dBm | 17.1.1.4-2 |
| threshX-HighP | 24 | Actual value is 24*2 = 48 dBm | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.1.1.4.4.3-5: *SIB4* (Cell 2)**

| Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo { | 1 Entry | | |
| InterFreqCarrierFreqInfo[1] SEQUENCE { | | Entry 1 | |
| q-RxLevMin | -70 | Actual value = -70*2 = -140 dBm | 17.1.1.4-1 |
| | -68 | Actual value = -68*2 = -136 dBm | 17.1.1.4-2 |
| threshX-LowP | 25 | Actual value = 25*2 = 50 dBm | |
| } | | | |
| } | | | |
| } | | | |

17.1.1.4.5 Test requirement

Table 17.1.1.4.5-1 defines the primary level settings including test tolerances for NR SA cell reselection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

**Table 17.1.1.4.5-1: Cell specific test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1, 2 | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters | | 1, 2 | CR.3.1 TDD | | CR.3.1 TDD | |

| | | | | | | |
|---|---|---|---|---|---|---|
| RMSI CORESET RMC configuration | | 1, 2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Pattern | | 1, 2 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration | | 1, 2 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration | | 1, 2 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | -124 Note6 | |
| | | 2 | -137 | | -121 Note6 | |
| Pcompensation | dB | 1, 2 | 0 | | 0 | |
| $Qhyst_s$ | dB | 1, 2 | 0 | | 0 | |
| $Qoffset_{s,n}$ | dB | 1, 2 | 0 | | 0 | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2 | SS-RSRP | | SS-RSRP | |
| AoA setup | | 1, 2 | Setup 1 defined in A.9.1 | | Setup 1 defined in A.9.1 | |
| Beam assumption Note 4 | | 1, 2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5 | dB | 1, 2 | 10.06 | 7.56 | -3.34 | -8.06 |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -93 | | -93 | |
| | | 2 | -90 | | -90 | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 2 | -102 | | -102 | |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 10.5 | 8 | -2.9 | 8.5 |
| SSB_RP Note3 | dBm/SCS | 1 | -82.5 | -85 | -95.9 | -84.5 |
| | | 2 | -79.5 | -82 | -92.9 | -81.5 |
| Io | dBm/95.04 MHz | 1 | -53.14 | -55.37 | -62.18 | -54.91 |
| | | 2 | -58.10 | -60.189 | -62.18 | -54.91 |
| TreselectionNR | s | 1, 2 | 0 | | 0 | |
| SnonintrasearchP | dB | 1, 2 | 50 | | Not sent | |
| $S_{SearchDeltaP-Stationary}$ | dB | 1, 2 | 12 Note6 | | 12 Note6 | |
| $T_{SearchDeltaP-Stationary}$ | s | 1, 2 | 5 | | 5 | |
| $Thresh_{x,\ highP}$ | dB | 1, 2 | 32 Note6 | | 48 | |
| $Thresh_{serving,\ lowP}$ | dB | 1, 2 | 44 | | 62 Note6 | |
| $Thresh_{x,\ lowP}$ | dB | 1, 2 | 50 | | 18 Note6 | |
| Propagation Condition | | 1, 2 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SSB_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell re-selection delay to an already detected low priority cell (Cell 1) for UE fulfilling stationary criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 155 s.

The cell re-selection delay to an already detected high priority cell (Cell 2) for UE fulfilling stationary criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to

send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 155 s.

The rate of correct cell re-selections observed during repeated tests shall be at least 90%.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax} + T_{SI\text{-}NR}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax} + T_{SI\text{-}NR}$

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

# 17.2 RRC_INACTIVE state mobility for RedCap

## 17.2.1 Configured Grant based Small Data Transmissions for RedCap

### 17.2.1.0 Minimum conformance requirements

#### 17.2.1.0.1 Minimum conformance requirements for TA validation using CG-SDT

The requirements in this clause are applicable when the UE is configured with timing alignment (TA) validation using *cg-SDT-RSRP-ChangeThreshold* for transmitting in uplink using CG-SDT as specified in TS 38.331 [13].

The requirements in this clause are applicable for the UE performing small data tranmissions using configured resources as TS 38.331 [13].

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available $N_{TA}$ value as specified in subclause 7.1.2) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration as specified in TS 38.331 [13].

When *cg-SDT-RSRP-ChangeThreshold* as specified in TS 38.331 [13] is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 in TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available $N_{TA}$ value as specified in TS 38.133 [6] subclause 7.1 provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 in TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 17.2.1.0.1-1 are met for FR2-1 regardless of whether the UE is configured with eDRX cycle by serving gNB or core network (AMF).

**Table 17.2.1.0.1-1: Valid measurement for FR2-1**

| Measurement | FR2-1 |
|---|---|
| $RSRP_1$ | (T1 – max{480 ms, 8*SMTC periodicity}) ≤ T1' ≤ (T1 + max{480 ms, 8*SMTC periodicity}) |
| $RSRP_2$ | (T2 – max{480 ms, 8*SMTC periodicity}) ≤ T2' ≤ T2 |

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, for the initial CG-SDT transmission, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when

- *RRCRelease* with CG-SDT configuration (TS 38.331 [13]) is received, or
- the latest TA is received if TA is received while in RRC_INACITVE state.

- T1' is the time when the UE has completed $RSRP_1$.
- T2 is the time when the UE performs TA validation as defined in TS 38.321 [12] clause 5.27.2 for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- $T_{DRX}$ is the DRX cycle length in ms.
- M1 the scaling factor as defined in TS 38.133 [6] clause 4.2.2.2.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* as specified in TS 38.331 [13] the following restrictions apply due to SS-RSRP/RSRQ measurement

- If *deriveSSB_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.
- If *deriveSSB_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH on all symbols within SMTC window duration.

For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* as specified in TS 38.331 [13] the following restrictions apply due to measurement of serving cell.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH on SSB symbols of the serving cell.

The UE is not required to meet the following measurement requirements during subsequent SDT transmissions:

- Measurements of inter-frequency NR cells in TS 38.133 [6] clause 5.1.2.4
- Measurements of inter-RAT E-UTRAN cells in TS 38.133 [6] clause 5.1.2.5
- Idle Mode CA/DC Measurements in TS 38.133 [6] clause 5.4

The UE is allowed to delay the reception of PRS resources on the positioning frequency layer until the SDT session is completed if the measurement using PRS resource overlaps with the SDT resources.

The normative reference for this requirement is TS 38.133 [6] clauses 5.2B.

### 17.2.1.1 NR SA FR2 TA validation for CG-SDT for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Test procedure needs further updates;
- TT analysis is still missing.

#### 17.2.1.1.1 Test purpose

To verify that the UE properly perform TA validation for CG-SDT transmission as specified in TS 38.133 [6] clause 5.2B.2.1.

#### 17.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting CG-SDT.

#### 17.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.2.1.1.

#### 17.2.1.1.4 Test description

##### 17.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.2.1.1.4.1 with following exceptions:

- Table 7.2.1.1.4.1-1 is replaced by Table 17.2.1.1.4.1-1;
- Table 7.2.1.1.4.1-2 is replaced by Table 17.2.1.1.4.1-2;
- Table 7.2.1.1.4.1-3 is replaced by Table 17.2.1.1.4.1-3.

**Table 17.2.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.2.1.1-1 | NR TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.2.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1-1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.2.1.1.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| Active PCell | | Cell 1 |
| RF Channel Number | | 1 |
| Duplex mode | | TDD |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 |
| DL initial BWP configuration | | DLBWP.0.1 |
| UL initial BWP configuration | | ULBWP.0.1 |
| TDD Configuration | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | CR.3.1 TDD |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 |
| PRACH Configuration | | PRACH.4 FR2 |

| | | |
|---|---|---|
| OCNG parameters | | OP.5 |
| CP length | | Normal |
| Correlation Matrix and Antenna Configuration | | 2x2 Low |
| DRX | s | 0.64 |
| *cg-SDT-RSRP-ThresholdSSB* | dBm | -110 |
| *cg-SDT-RSRP-ChangeThreshold* | dB | 8 |
| *cg-SDT-TimeAlignmentTime* | | infinity |
| CG-SDT resource period | ms | 320 |
| T_delay_modeB | s | 4 |
| T1 | s | 0.8 |
| T2 | s | 0.96 |
| T3 | s | 3.04 |
| T4 | s | 1.54 |
| T5 | s | 1.76 |
| T6 | s | 4.58 |

#### 17.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.2.1.1.4.2.

#### 17.2.1.1.4.3 Message contents

Same as the message contents given in clause 7.2.1.1.4.3.

### 17.2.1.1.5 Test requirements

Same as the test requirements given in clause 7.2.1.1.5 with following exceptions:

- Table 7.2.1.1.5-1 is replaced by Table 17.2.1.1.5-1.

**Table 17.2.1.1.5-1: Cell-specific test parameters (NR Cell 1)**

| Parameter | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 | T6 |
| AoA setup | | Setup 1 defined in A.3.15 | | | | | |
| Assumption for UE beams Note 4 | | Rough | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | | |
| $N_{oc}$ | dBm/15 kHz | -109+TT | | | | | |
| $N_{oc}$ | dBm/SCS | -100 +TT | | | | | |
| $\hat{E}_s / I_{ot}$ | dB | 0 +TT | 13 +TT | 0 +TT | 24.5 +TT | 24.5 +TT | 0 + TT |
| $\hat{E}_s / N_{oc}$ | dB | 0 +TT | 13 +TT | 0 +TT | 24.5 +TT | 24.5 +TT | 0 + TT |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SS-RSRP | dBm/SCS | -100 +TT | -87 +TT | -100 +TT | -75.5 +TT | -75.5 +TT | -100 + TT |
| Io | dBm/95.04 MHz | -68 +TT | -57.8 +TT | -68 +TT | -46.5 +TT | -46.5 +TT | -68 + TT |
| Propagation condition | | AWGN | | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | | |

# 17.3 RRC_CONNECTED state mobility for RedCap

## 17.3.1 Handover for RedCap

### 17.3.1.0 Minimum conformance requirements

#### 17.3.1.0.1 Minimum conformance requirements for NR FR2 – NR FR2 handover

The purpose of NR handover is to change the NR PCell to another NR cell for RedCap UE. The requirements in this clause are applicable to SA NR.

Handover for a RedCap UE is defined as intra-frequency handover if the center frequency and subcarrier spacing (SCS) of the reference SSB of the serving cell is same as the center frequency and SCS of the reference SSB of the target cell, where:

The reference SSB of the serving cell is the SSB in the active DL BWP of serving cell,

The reference SSB of the target cell is the SSB in the first active DL BWP of the target cell upon reconfiguration.

The requirements in this clause apply for the following handover scenarios:

Handover to a target cell's initial DL BWP associated with CD-SSB;

Handover to a target cell's Redcap specific DL BWP associated with NCD-SSB.

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR2 cell to NR FR2 cell.

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ msec from the end of the last TTI containing the RRC command.

Where:

$D_{handover}$ equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [13] plus the interruption time.

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell which depends on whether the target cell is already known when the handover command is received by the UE.

- If the target cell is a known intra-frequency cell, $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot ≥ -2 dB, then $T_{search}$ = 8*$T_{rs}$ ms.

- If the target cell is a known inter-frequency cell, then

  if the measured SSB is the target SSB for HO of the target cell, $T_{search}$ = 0 ms;

  if the measured SSB and the target SSB for HO belong to the same NR target cell and fulfil the following conditions, $T_{search}$ = $T_{rs}$ ms:

  - CD-SSB in initial DL BWP is the measured SSB and NCD-SSB in RedCap specific DL BWP is the target SSB for HO
  - NCD-SSB in RedCap specific DL BWP is the measured SSB and CD-SSB in initial DL BWP is the target SSB for HO
  - Both measured SSB and the target SSB for HO are NCD-SSBs within different RedCap specific DL BWPs

  Otherwise, the target cell is an unknown inter-frequency cell. In this case, if the target cell Es/Iot ≥ -2 dB, then $T_{search}$ = 24 * $T_{rs}$ ms.

Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta}$ = $T_{rs}$ for both known and unknown target cell.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20 ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2 ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the Table 8.1-1 of TS 38.213 [8].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise,

- $T_{rs}$ is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by *nonCellDefiningSSB-r17* if the first active DL BWP included in handover command is configured with *nonCellDefiningSSB-r17*, otherwise, as CD-SSB indicated by *absoluteFrequencySSB* in *frequencyInfoDL* in handover command.
- If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$ = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- At least one of the SSBs measured belongs to the same NR target cell,
- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - at least one of the SSBs measured which belongs to the same NR target cell remains detectable according to the cell identification requirements as described in TS 38.133 [6] clause 9.2B for intra-frequency measurements and TS 38.133 [6] clause 9.3B for inter-frequency measurements,
- The reference SSB of the NR target cell also remains detectable during the handover delay according to the cell identification requirements are described in TS 38.133 [6] clause 9.2B for intra-frequency handover and TS 38.133 [6] clause 9.3B for inter-frequency handover.

Otherwise, it is unknown.

The normative reference for this requirement is TS 38.133 [6] clauses 6.1D.1.1 and 6.1D.1.3.

## 17.3.1.1 NR SA FR2 handover with unknown target cell for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3.
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

### 17.3.1.1.1 Test purpose

To verify the requirement for the NR FR2 intra-frequency handover requirements specified in TS 38.133 [6] clause 6.1D.1.3.

### 17.3.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting FR2.

### 17.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.1.1.

### 17.3.1.1.4 Test description

#### 17.3.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.1.2.4.1 with following exceptions:

- Table 7.3.1.2.4.1-1 is replaced by Table 17.3.1.1.4.1-1;
- Table 7.3.1.2.4.1-2 is replaced by Table 17.3.1.1.4.1-2;
- Table 7.3.1.2.4.1-3 is replaced by Table 17.3.1.1.4.1-3.

**Table 17.3.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.3.1.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.3.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.3.1.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 10 | |

### 17.3.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.1.2.4.2.

### 17.3.1.1.4.3 Message contents

Same as the message contents given in clause 7.3.1.2.4.3.

### 17.3.1.1.5 Test requirements

Same as the test requirements given in clause 7.3.1.2.5 with following exceptions:

- Table 7.3.1.2.5-1 is replaced by Table 17.3.1.1.5-1.

**Table 17.3.1.1.5-1: Cell-specific test parameters (NR Cell 1)**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | | Rough | | Rough | |
| AoA setup | | | Setup 1 as defined in A.9 | | | |
| NR RF Channel Number | | | 1 | | | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | | 66 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | | | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/15 kHz | -104.7 | | | |
| $N_{oc}$ Note2 | dBm/SCS | -95.7 | | | |
| $\hat{E}_s / I_{ot}$ | dB | 6 | -1.8 | -Infinity | 0 |
| $\hat{E}_s / N_{oc}$ | dB | 6 | 6 | -Infinity | 7 |
| Io Note3 | dBm/BW | -59.7 | -56.7 | -59.7 | -56.7 |
| Propagation condition | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 6: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.

### 17.3.1.2 NR SA FR2-FR2 handover with unknown target cell for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3.
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.3.1.2.1 Test purpose

To verify the requirement for the NR FR2 NCD-SSB to NR FR2 NCD-SSB inter-frequency handover requirements specified in TS 38.133 [6] clause 6.1D.1.3.

#### 17.3.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting FR2.

#### 17.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.1.2.

#### 17.3.1.2.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively.

- At the start of time duration T1, the UE does not have any timing information of Cell 2.
- Starting T2, Cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to Cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP, where Cell 2's DL BWP is the Redcap specific BWP associated with NCD-SSB, then UE handover from Cell 1's NCD-SSB to Cell 2's specific Redcap BWP associated with NCD-SSB. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

#### 17.3.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.3.1.2.4.1-1.

**Table 17.3.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.3.1.2-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.3.1.2.4.1-2.

**Table 17.3.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 17.3.1.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 17.3.1.2.4.1-3 and 17.3.1.2.5-1 below.

**Table 17.3.1.2.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 10 | |

#### 17.3.1.2.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell and its RedCap-specific dedicated BWP is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency (in ARFCN value) of

$$f_{\mathrm{NCDSSB}} = f_{\mathrm{pointA}} + \frac{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}} \cdot \left[ \left(f_{\mathrm{CDSSB}} - f_{\mathrm{pointA}}\right) \cdot \frac{\Delta\mathrm{F}_{\mathrm{Global}}}{N_{\mathrm{SC}}^{\mathrm{RB}}\mathrm{SCS}_{\mathrm{SSB}}} \right] + \frac{N_{\mathrm{SC}}^{\mathrm{SSB}}\mathrm{SCS}_{\mathrm{SSB}}}{\Delta\mathrm{F}_{\mathrm{Global}}}$$

where,

- $f_{\mathrm{CDSSB}}$ is the absolute frequency of Cell 1 CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{\mathrm{pointA}}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;

- $\Delta F_{Global}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-2 [3] clause 5.4.2.1;
- $SCS_{SSB}$ is the subcarrier spacing of SSB (in kHz);
- $N_{SC}^{RB} = 12$, is the number of subcarriers in an RB;
- $N_{SC}^{SSB} = 240$, is the number of subcarriers in an SSB.

2. Set the parameters according to T1 in Table 17.3.1.2.5-1.
3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop.
4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.
5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 17.3.1.2.5-1. T2 starts. The SS transmits NCD-SSB on Cell 2 with an absolute frequency (in ARFCN value) of

$$f_{NCDSSB} = f_{pointA} + \frac{N_{SC}^{RB} SCS_{SSB}}{\Delta F_{Global}} \cdot \left[ \left( f_{CDSSB} - f_{pointA} \right) \cdot \frac{\Delta F_{Global}}{N_{SC}^{RB} SCS_{SSB}} \right] + \frac{N_{SC}^{SSB} SCS_{SSB}}{\Delta F_{Global}}$$

where,

- $f_{CDSSB}$ is the absolute frequency of Cell 2 CD-SSB (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $f_{pointA}$ is the absolute frequency of Point A (in ARFCN value) specified in TS 38.508-1 [14] clause 7.2.3.1;
- $\Delta F_{Global}$ is the granularity of the global frequency raster (in kHz) specified in TS 38.101-2 [3] clause 5.4.2.1;
- $SCS_{SSB}$ is the subcarrier spacing of SSB (in kHz);
- $N_{SC}^{RB} = 12$, is the number of subcarriers in an RB;
- $N_{SC}^{SSB} = 240$, is the number of subcarriers in an SSB.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 17.3.1.2.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall
   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.
8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and its RedCap-specific dedicated BWP is the activated BWP. The SS transmits NCD-SSB on Cell 1 with an absolute frequency given in step 1.
9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 17.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.3.1.2.4.3-1: *RRCReconfiguration* (Steps 1, 4 and 8, test procedure)**

| Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 17.3.1.2.4.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.3.1.2.4.3-2: *CellGroupConfig* (Table 17.3.1.2.4.3-1)**

| Derivation Path: Table H.3.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | Table 17.3.1.2.4.3-3 | |
| } | | | |
| } | | | |

**Table 17.3.1.2.4.3-3: *ServingCellConfig* (Table 17.3.1.2.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1 Table 17.3.1.2.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 17.3.1.2.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| } | | | |
| } | | | |

**Table 17.3.1.2.4.3-4: *BWP-Downlink* (Table 17.3.1.2.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap corresponding to NCD-SSB PRB index | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms80 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.3.1.2.4.3-5: *BWP-Uplink* (Table 17.3.1.2.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap.<br><br>The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP | | |
| } | | | |
| } | | | |
| } | | | |

17.3.1.2.5 Test requirement

Table 17.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

**Table 17.3.1.2.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Assumption for UE beams Note 6 | | Rough | | Rough | |
| AoA setup | | Setup 1 as defined in A.9.1 | | | |
| NR RF Channel Number | | 1 | | 2 | |
| Duplex mode | | TDD | | | |
| TDD configuration | | TDDConf.3.1 | | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | 66 | | | |
| DRX Cycle | ms | Not Applicable | | | |
| PDSCH RMC | | SR.3.1 TDD | | | |
| RMSI CORESET RMC | | CR.3.1 TDD | | | |
| Control Channel RMC | | CCR.3.1 TDD | | | |
| OCNG Patterns | | OP. 1 | | | |
| SMTC Configuration for CD-SSB | | SMTC.1 | | | |
| SMTC Configuration for NCD-SSB | | SMTC.2 RedCap | | | |
| CD-SSB Configuration | | SSB.3 FR2 | | | |
| NCD-SSB Configuration | | SSB.3 RedCap FR2 Note 7 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuraiton | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.3 RedCap Note 8 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.3 RedCap Note 9 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | 5 | 5 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 5 | 5 | -Infinity | 5 |
| Io Note3 | | dBm/Ch BW | -60.5 | -60.5 | -66.7 | -60.5+TT |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

Note 7: NCD-SSB is configured within dedicated RedCap DL BWP and CD-SSB is configured completely outside the dedicated RedCap DL BWP.

Note 8: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index.

Note 9: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index.

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2, which is calculated as follows:

Handover delay = RRC procedure delay + $T_{interrupt}$

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.
  - $T_{search}$ = 1920 ms, is the time required to search the unknown target cell;
  - $T_{IU}$ = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - $T_{\Delta}$ = 80 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - $T_{margin}$ = 2 ms, is time for SSB post-processing.

This gives a total of 2052 ms.

## 17.3.2 RRC connection mobility control for RedCap

### 17.3.2.1 RRC re-establishment for RedCap

#### 17.3.2.1.0 Minimum conformance requirements

The requirements in clause 7.3.2.1.0 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1B.

#### 17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

##### 17.3.2.1.1.1 Test purpose

To verify hat the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in TS 38.133 [6] clause 6.2.1B.

##### 17.3.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

##### 17.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.1.

##### 17.3.2.1.1.4 Test description

###### 17.3.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.1.1.4.1 with following exceptions:

- Table 7.3.2.1.1.4.1-2 is replaced by Table 17.3.2.1.1.4.1-1.

**Table 17.3.2.1.1.4.1-1: General test parameters**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell 1 | |
| | Neighbour cells | | 1 | Cell 2 | |
| Final condition | Active cell | | 1 | Cell 2 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |

| | | | | |
|---|---|---|---|---|
| T310 | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 RedCap FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| DRX cycle length | s | 1 | OFF | |
| PRACH configuration | | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 4.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | s | 1 | 5 | |

#### 17.3.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.1.4.2.

#### 17.3.2.1.1.4.3 Message contents

Same as the message contents given in clause 7.3.2.1.1.4.3.

### 17.3.2.1.1.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.1.5 with following exceptions:

- Table 7.3.2.1.1.5-1 is replaced by Table 17.3.2.1.1.5-1.

**Table 17.3.2.1.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams[Note 4] | | | Rough | | | Rough | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1 | 24 | | | 24 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 | | | OP.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| AoA setup | | 1 | Setup 1 | | | Setup 1 | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | -0.12 | -infinity | -infinity | -3.46 | 2 | 2 |
| $N_{oc}$ [Note2] | dBm/SCS | 1 | -104.7 | | | | | |
| $N_{oc}$ [Note2] | dBm/15 kHz | 1 | -95.7 | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | -infinity | -infinity | 2 | 2 | 2 |
| SS-RSRP [Note3] | dBm/SCS | 1 | -91.7 | -infinity | -infinity | -93.7 | -93.7 | -93.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Io | dBm/95.04 MHz | 1 | -64.00 | -66.95 | -66.95 | -64.00 | -66.95 | -66.95 |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

### 17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

#### 17.3.2.1.2.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 17.3.2.1.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

#### 17.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.2.

#### 17.3.2.1.2.4 Test description

##### 17.3.2.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.1.2.4.1 with following exceptions:

- Table 7.3.2.1.2.4.1-2 is replaced by Table 17.3.2.1.2.4.1-1.

**Table 17.3.2.1.2.4.1-1: General test parameters**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell 1 | |
| | Neighbour cells | | 1 | Cell 2 | |
| Final condition | Active cell | | 1 | Cell 2 | |
| RF Channel Number | | | 1 | 1, 2 | |
| Time offset between cells | | | 1 | 3 µs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |

| | | | | |
|---|---|---|---|---|
| N311 | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | ms | 1 | 0 | Radio link failure timer; T310 is disabled |
| T311 | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 RedCap FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| DRX cycle length | s | 1 | OFF | |
| PRACH configuration | | 1 | PRACH.1 FR2 | As specified in Annex A.7 |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 4.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6]) |
| T3 | s | 1 | 6 | |

#### 17.3.2.1.2.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.2.4.2.

#### 17.3.2.1.2.4.3 Message contents

Same as the message contents given in clause 7.3.2.1.2.4.3.

### 17.3.2.1.2.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.2.5 with following exceptions:

- Table 7.3.2.1.2.5-1 is replaced by Table 17.3.2.1.2.5-1.

**Table 17.3.2.1.2.5-1: Cell specific test parameters**

| Parameter | Unit | Test config | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 4 | | | Rough | | | Rough | | |
| AoA setup | | 1 | Setup 3 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| $BW_{channel}$ | MHz | 1 | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1 | 24 | | | 24 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -92.3 Note 6 | | | -92.3 Note 6 | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -83.3 | | | -83.3 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 1 | 0 | -infinity | -infinity | -infinity | -infinity | 0 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1 | -1.05 | -infinity | -infinity | -infinity | -infinity | -1.05 |
| SSB_RP Note3 | dBm/SCS | 1 | -83.3 | -infinity | -infinity | -infinity | -infinity | -83.3 |
| Io | dBm/95.04 MHz | 1 | -55.66 | -58.68 | -58.68 | -58.68 | -58.68 | -55.66 |
| Propagation Condition | | 1 | AWGN | | | AWGN | | |

Note 1: OCNG shall be used such that a constant total transmitted power is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

### 17.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.3.2.1.3.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in TS 38.133 [6] clause 6.2.1B.

#### 17.3.2.1.3.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.3.

#### 17.3.2.1.3.4 Test description

##### 17.3.2.1.3.4.1 Initial conditions

Same as the initial condition given in clause 7.3.2.1.3.4.1 with following exception:

- Table 7.3.2.1.3.4.1-1 is replaced by Table 17.3.2.1.3.4.1-1
- Table 7.3.2.1.3.4.1-2 is replaced by Table 17.3.2.1.3.4.1-2
- Table 7.3.2.1.3.4.1-3 is replaced by Table 17.3.2.1.3.4.1-3.

**Table 17.3.2.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|

| | |
|---|---|
| 17.3.2.1.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.3.2.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2 | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.1.3.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | | | |

**Table 17.3.2.1.3.4.1-3: General test parameters**

| Parameter | | Unit | Test config | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1 | Cell 1 | |
| | Neighbour cells | | 1 | Cell 2 | |
| Final condition | Active cell | | 1 | Cell 2 | |
| RF Channel Number | | | 1 | 1 | |
| Time offset between cells | | | 1 | 3 μs | Synchronous cells |
| N310 | | - | 1 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1 | 6000 | Radio link failure timer configured by *RLF-TimersAndConstants* |
| T311 | | ms | 1 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 RedCap FR2 | |
| SMTC configuration | | | 1 | SMTC.1 | |
| DRX cycle length | | s | 1 | OFF | |
| PRACH configuration | | | 1 | PRACH.1 FR2 | Table A.3.8.3.1-1 |
| T1 | | s | 1 | 5 | |
| T2 | | s | 1 | 10.84 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]) |
| T3 | | s | 1 | 5 | |

### 17.3.2.1.3.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.3.4.2.

### 17.3.2.1.3.4.3 Message contents

Same as the message contents given in clause 7.3.2.1.3.4.3.

#### 17.3.2.1.3.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.3.5 with following exceptions:

- Table 7.3.2.1.3.5-1 is replaced by Table 17.3.2.1.3.5-1.

**Table 17.3.2.1.3.5-1: Cell specific test parameters**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beams Note 4 | | | Rough | | | Rough | | |
| TDD configuration | | 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | | | N/A | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 FDD | | | CR.3.1 FDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 FDD | | | CCR.3.1 FDD | | |
| TRS configuration | | 1 | TRS.2.1 TDD | | | N/A | | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | | | N/A | | |
| OCNG Pattern | | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration | | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS | | 1 | SSB | | | SSB | | |
| AoA setup | | 1 | Setup 1 | | | Setup 1 | | |
| $\hat{E}_s / I_{ot}$ | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -104.7 | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -95.7 | | | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1 | 5 | -infinity | -infinity | -infinity | -infinity | 5 |
| SS-RSRP Note3 | dBm/SCS | 1 | -90.7 | -infinity | -infinity | -infinity | -infinity | -90.7 |
| Io | dBm/95.04 MHz | 1 | -60.52 | -66.71 | -60.52 | -60.52 | -66.71 | -60.52 |
| Propagation Condition | | 1 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

## 17.3.2.2 Random access for RedCap

### 17.3.2.2.0 Minimum conformance requirements

#### 17.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The minimum conformance requirements given in clause 7.3.2.2.0.1 are applicable for TDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2B.2.

#### 17.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The minimum conformance requirements given in clause 7.3.2.2.0.2 are applicable for TDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2B.2.

### 17.3.2.2.1 NR SA FR2 4-step RA type contention based random access for 2 Rx UE

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing.
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 17.3.2.2.1.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 17.3.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.1.

#### 17.3.2.2.1.4 Test description

##### 17.3.2.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.1.4.1 with following exceptions:

- Table 7.3.2.2.1.4.1-1 is replaced by Table 17.3.2.2.1.4.1-1.
- Table 7.3.2.2.1.4.1-2 is replaced by Table 17.3.2.2.1.4.1-2.

**Table 17.3.2.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.3.2.2.1-1 | NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 17.3.2.2.1.4.1-2: Test Environment**

| Parameter | Value | Comment |
|---|---|---|

| | | | |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.2.1.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | | | |

### 17.3.2.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.1.4.2.

### 17.3.2.2.1.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.1.4.3.

### 17.3.2.2.1.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.1.5 with following exception:

- Table 7.3.2.2.1.5-1 is replaced by Table 17.3.2.2.1.5-1.
- Table 7.3.2.2.1.5-2 is replaced by Table 17.3.2.2.1.5-2.

**Table 17.3.2.2.1.5-1: General test parameters**

| Parameter | Unit | Test-1 | Comments |
|---|---|---|---|
| SSB Configuration | | SSB.1 FR2 | As defined in A.3.2 |
| CSI-RS for tracking | | TRS.2.1 TDD | |
| Duplex Mode | | TDD | |
| TDD Configuration | | TDDConf.3.1 | As defined in A.1.5 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | |
| OCNG Pattern Note 1 | | OP.1 | As defined in A.2.1 |
| PDSCH Reference Channel Note 2 | | SR.3.1 TDD | As defined in A.1.1 |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | | 1 | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | |
| *ss-PBCH-BlockPower* | dBm/SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 of TS 38.101-2 [3] |
| PRACH Configuration | | PRACH.1 FR2 | As defined in A.7.2, with exceptions as defined below |
| *rsrp-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88 dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6 dBm/SCS applied, *preambleReceivedTargetPower* = -100 dBm and *ss-PBCH-BlockPower* = 20 dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
Note 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6 dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 17.3.2.2.1.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in A.9.1 |
| Assumption for UE beams[Note 2] | | | Rough | |
| SSB with index 0 | Es [Note1] | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es [Note1] | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

### 17.3.2.2.2 NR SA FR2 4-step RA type non-contention based random access for 2 Rx UE

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 17.3.2.2.2.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 17.3.2.2.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards. Additionally Test 2 is applicable to NR RedCap UEs that supports CSI-RS based Random Access Preamble.

#### 17.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.2.

#### 17.3.2.2.2.4 Test description

##### 17.3.2.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.2.4.1 with following exceptions:

- Table 7.3.2.2.2.4.1-1 is replaced by Table 17.3.2.2.2.4.1-1.
- Table 7.3.2.2.2.4.1-2 is replaced by Table 17.3.2.2.2.4.1-2.

**Table 17.3.2.2.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.3.2.2.2-1 | NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 17.3.2.2.2.4.1-2: Test Environment**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.2.2.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | | | |

##### 17.3.2.2.2.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.2.4.2.

##### 17.3.2.2.2.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.2.4.3.

#### 17.3.2.2.2.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.2.5 with following exception:

- Table 7.3.2.2.2.5-1 is replaced by Table 17.3.2.2.2.5-1.
- Table 7.3.2.2.2.5-2 is replaced by Table 17.3.2.2.2.5-2.

**Table 17.3.2.2.2.5-1: General test parameters**

| Parameter | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|
| SSB Configuration | | SSB.1 FR2 | SSB.1 FR2 | As defined in A.3.2 |
| CSI-RS for tracking | | TRS.2.1 TDD | TRS.2.1 TDD | |
| CSI-RS Configuration | | N/A | CSI-RS.3.1 TDD | As defined in A.1.4 |
| Duplex Mode | | TDD | TDD | |
| TDD Configuration | | TDDConf.3.1 | TDDConf.3.1 | As defined in A.1.5 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | 24 | |
| OCNG Pattern Note 1 | | OP.3 | OP.3 | As defined in A.2.1. |
| PDSCH Reference Channel Note 2 | | SR.3.1 TDD | SR.3.1 TDD | As defined in A.1.1. |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | CR.3.1 TDD | As defined in A.1.2 |
| NR RF Channel Number | | 1 | 1 | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| *ss-PBCH-BlockPower* | dBm/SCS | +20 +$\Delta_{UL}$ | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ( $P_{CMAX,\ f,\ c}$ ) | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| PRACH Configuration | | PRACH.2 FR2 | PRACH.3 FR2 | As defined in A.7.2, with exceptions as defined below. |
| *rsrp-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88 dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | dBm | -100 | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ is the measured first PRACH power with -80.6 dBm/SCS applied, *preambleReceivedTargetPower* = -100 dBm and *ss-PBCH-BlockPower* = 20 dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.

Note 4: The $\Delta_{DL}$ value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6 dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 17.3.2.2.2.5-2: OTA-related test parameters**

| Parameter | Unit | Test-1 | Test-2 | Comments |
|---|---|---|---|---|
| AoA setup | | Setup 1 | Setup 1 | As defined in A.9.1 |
| Assumption for UE beams Note 2 | | Rough | Rough | |

| | | | | | |
|---|---|---|---|---|---|
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

### 17.3.2.2.3 NR SA FR2 2-step RA type contention based random access for 2 Rx UE

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 17.3.2.2.3.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 17.3.2.2.3.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards supporting 2-step RACH.

#### 17.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.3.

#### 17.3.2.2.3.4 Test description

##### 17.3.2.2.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.3.4.1 with following exceptions:

- Table 7.3.2.2.3.4.1-1 is replaced by Table 17.3.2.2.3.4.1-1.
- Table 7.3.2.2.3.4.1-2 is replaced by Table 17.3.2.2.3.4.1-2.

**Table 17.3.2.2.3.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.3.2.2.3-1 | NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 17.3.2.2.3.4.1-2: Test Environment**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.2.3.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | | | |

### 17.3.2.2.3.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.3.4.2.

### 17.3.2.2.3.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.3.4.3.

### 17.3.2.2.3.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.3.5 with following exception:

- Table 7.3.2.2.3.5-1 is replaced by Table 17.3.2.2.3.5-1.
- Table 7.3.2.2.3.5-2 is replaced by Table 17.3.2.2.3.5-2.

**Table 17.3.2.2.3.5-1: General test parameters**

| Parameter | Unit | Test-1 | Comments |
|---|---|---|---|
| SSB Configuration | | SSB.1 RedCap FR2 | As defined in A.3.10 |
| Duplex Mode for Cell 1 | | TDD | |
| TDD Configuration | | TDDConf.3.1 | As defined in A.3.1.4 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | | SR.3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | As defined in A.3.1.2 |
| NR RF Channel Number | | 1 | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | |
| *ss-PBCH-BlockPower* | dBm/SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |

| | | | |
|---|---|---|---|
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| MsgA Configuration | | FR2 MsgA configuration 1 | As defined in A.3.20.3, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88 dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The $\Delta_{UL}$ value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6 dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100 dBm and *ss-PBCH-BlockPower* = 20 dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.

Note 4: The $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6 dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 17.3.2.2.3.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 2b | As defined in A.9.2 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | Es/Iot$_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | Es/Iot$_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |

Note 1: No artificial noise is applied in this test.

Note 2: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

### 17.3.2.2.4 NR SA FR2 2-step RA type non-contention based random access for 2 Rx UE

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing

- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

#### 17.3.2.2.4.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and clause 7.1A.2 in an AWGN model.

#### 17.3.2.2.4.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting 2-step RACH.

#### 17.3.2.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.4.

#### 17.3.2.2.4.4 Test description

##### 17.3.2.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.4.4.1 with following exceptions:

- Table 7.3.2.2.4.4.1-1 is replaced by Table 17.3.2.2.4.4.1-1.
- Table 7.3.2.2.4.4.1-2 is replaced by Table 17.3.2.2.4.4.1-2.

**Table 17.3.2.2.4.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.3.2.2.4-1 | NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability. | |

**Table 17.3.2.2.4.4.1-2: Test Environment**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.2.4.4.1-1. | | |
| Propagation conditions | No interference | | As specified in Annex C.2.1. |
| Connection Diagram | TE Part | FFS | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | FFS | |
| Exceptions to connection diagram | | | |

#### 17.3.2.2.4.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.4.4.2.

#### 17.3.2.2.4.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.4.4.3.

17.3.2.2.4.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.4.5 with following exception:

- Table 7.3.2.2.4.5-1 is replaced by Table 17.3.2.2.4.5-1.
- Table 7.3.2.2.4.5-2 is replaced by Table 17.3.2.2.4.5-2.

**Table 17.3.2.2.4.5-1: General test parameters**

| Parameter | Unit | Test-1 | Comments |
|---|---|---|---|
| SSB Configuration | | SSB.1 RedCap FR2 | As defined in A.3.10 |
| Duplex Mode for Cell 1 | | TDD | |
| TDD Configuration | | TDDConf.3.1 | As defined in A.3.1.4 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | | SR.3.1 TDD | As defined in A.3.1.1. |
| NR RF Channel Number | | 1 | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | dB | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | |
| *ss-PBCH-BlockPower* | dBm/ SCS | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [13]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ( $P_{CMAX,\ f,c}$ ) | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [3] |
| MsgA Configuration | | FR2 MsgA configuration 1 | As defined in A.3.20.3, with exceptions as defined below |
| *msgA-RSRP-ThresholdSSB* | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88 dBm. $\Delta_{DL}$ is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | dBm | -100 | As defined in TS 38.331 [13] |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The $\Delta_{UL}$ value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6 dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100 dBm and *ss-PBCH-BlockPower* = 20 dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.

Note 4: The $\Delta_{DL}$ value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6 dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

**Table 17.3.2.2.4.5-2: OTA-related test parameters**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 2b | As defined in A.9.2 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | dB | 21.09 | |
| | Io | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |

| | | | | |
|---|---|---|---|---|
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | No external noise (Note 3) | |
| Note 1: No artificial noise is applied in this test.<br>Note 2: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation<br>Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0. | | | | |

### 17.3.2.3 RRC Connection Release with Redirection for RedCap

#### 17.3.2.3.0 Minimum conformance requirements

##### 17.3.2.3.0.1 Minimum conformance requirements for FR2-FR2 RRC connection release with redirection

The minimum requirements given in clause 7.3.2.3.0.1 shall apply.

#### 17.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3.
- The test is incomplete for UE power classes other than PC3
- -- The test is incomplete for test frequencies > 40.8 GHz

##### 17.3.2.3.1.1 Test purpose

To verify RRC connection release with redirection from NR to NR requirements specified in TS 38.133 [6] clause 6.2.3A.2.1.

##### 17.3.2.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards and supporting FR2.

##### 17.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.17.3.2.3.1.

##### 17.3.2.3.1.4 Test description

###### 17.3.2.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.3.1.4.1 with following exceptions:

- Table 7.3.2.3.1.4.1-1 is replaced by Table 17.3.2.3.1.4.1-1;
- Table 7.3.2.3.1.4.1-2 is replaced by Table 17.3.2.3.1.4.1-2;

- Table 7.3.2.3.1.4.1-3 is replaced by Table 17.3.2.3.1.4.1-3.

**Table 17.3.2.3.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.3.2.3.1-1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode<br>Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.3.2.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.15 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.3.2.3.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.3.2.3.1.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 3.2 | |

### 17.3.2.3.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.3.1.4.2.

### 17.3.2.3.1.4.3 Message contents

Same as the message contents given in clause 7.3.2.3.1.4.3.

### 17.3.2.3.1.5 Test requirement

Same as the test requirements given in clause 7.3.2.3.1.5 with followings exception:

- Table 7.3.2.3.1.5-1 is replaced by Table 17.3.2.3.1.5-1.

**Table 17.3.2.3.1.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Assumption for UE beams[Note 6] | | Rough | | Rough | |
| AoA setup | | Setup 1 as defined in A.9 | | | |
| NR RF Channel Number | | 1 | | 2 | |
| Duplex mode | | TDD | | | |
| TDD configuration | | TDDConf.3.1 | | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 66 | | | |
| Data RBs allocated | | 66 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH RMC | | | SR.3.1 TDD | | | |
| RMSI CORESET RMC | | | CR.3.1 TDD | | | |
| Control Channel RMC | | | CCR.3.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | | | SMTC.1 | | | |
| SSB Configuration | | | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 | | | |
| PRACH configuration | | | PRACH.1 FR2 | | | |
| TRS configuration | | | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | | -95.7 | |
| $\hat{E}_s / I_{ot}$ | | dB | 5 | 5 | -Infinity | 5 |
| $\hat{E}_s / N_{oc}$ | | dB | 5 | 5 | -Infinity | 5 |
| Io Note3 | | dBm/BW | -60.5 | -60.5 | -66.7 | -60.5 |
| Propagation condition | | - | AWGN | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 6: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.

# 17.4 Timing for RedCap

## 17.4.1 UE transmit timing for RedCap

### 17.4.1.0 Minimum Conformance Requirements

#### 17.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE shall have capability to follow the frame timing change of the reference cell in connected state or when transmiting PUSCH on CG resources for SDT in RRC_Inactive. The uplink frame transmission takes place $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ before the reception of the first detected path (in time) of the corresponding downlink frame from

the reference cell. UE initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value $T_e$ is specified in Table 17.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS, or it is the PRACH transmission, or it is the msgA transmission.
- when it is the transmission for PUSCH on CG resources for SDT in RRC_Inactive.

The UE shall meet the $T_e$ requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE for acquiring the frame timing of the reference cell during the last 160 ms on the condition that:

- the SSB is within the UE's active BWP, or
- the SSB is not within the UE's active BWP, and the measurement gap is configured.

The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at UE antenna. $N_{\mathrm{TA}}$ for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$ (in $T_c$ units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3A was applied. $N_{\mathrm{TA}}$ for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table Table 17.4.1.0.1-2.

**Table 17.4.1.0.1-1: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 2 | 240 | 120 | $3*64*T_c$ |
| Note 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 17.4.1.0.1-2: The Value of $N_{\mathrm{TA\,offset}}$**

| Frequency range and band of cell used for uplink transmission | $N_{\mathrm{TA\,offset}}$ (Unit: $T_C$) |
|---|---|
| FR2 | 13792 |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3A is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$ then the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be $T_q$.
2) The minimum aggregate adjustment rate shall be $T_p$ per second.
3) The maximum aggregate adjustment rate shall be $T_q$ per 200 ms.

   where the maximum autonomous time adjustment step $T_q$ and the aggregate adjustment rate $T_p$ are specified in Table 17.4.1.0.1-3.

**Table 17.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | $T_q$ | $T_p$ |
|---|---|---|---|
| 2 | 120 | 2.5*64*$T_c$ | 2.5*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

The normative reference for this requirement is TS 38.133 [6] clauses 7.1A.1 and 7.1A.2.

## 17.4.1.1 NR SA FR2 NR UE Transmit Timing accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3.
- The test is incomplete for UE power classes other than PC3

-The test is incomplete for test frequencies > 40.8 GHz

### 17.4.1.1.1 Test purpose

To verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1A.2.

### 17.4.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onward and supporting FR2.

### 17.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.4.1.1

### 17.4.1.1.4 Test Description

#### 17.4.1.1.4.1 Initial Conditions

Same as the initial conditions given in clause 7.4.1.1.4.1 with following exceptions:

- Table 7.4.1.1.4.1-1 is replaced by Table 17.4.1.1.4.1-1;
- Table 7.4.1.1.4.1-2 is replaced by Table 17.4.1.1.4.1-2.

**Table 17.4.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.4.1.1-1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

**Table 17.4.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

#### 17.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.4.1.1.4.2.

#### 17.4.1.1.4.3 Message contents

Same as the message contents given in clause 7.4.1.1.4.3.

### 17.4.1.1.5 Test Requirements

Same as the test requirements given in clause 7.4.1.1.5 with following exceptions:

- Table 7.4.1.1.5-1 is replaced by Table 17.4.1.1.5-1;
- Table 7.4.1.1.5-2 is replaced by Table 17.4.1.1.5-2;
- Table 7.4.1.1.5-3 is replaced by Table 17.4.1.1.5-3;
- Table 7.4.1.1.5-4 is replaced by Table 17.4.1.1.5-4;
- Table 7.4.1.1.5-5 is replaced by Table 17.4.1.1.5-5.

**Table 17.4.1.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test1 | Test2 |
|---|---|---|---|
| SSB ARFCN | | Freq1 | Freq1 |
| Duplex Mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | |
| Initial BWP Configuration | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | DLBWP.1.1<br>ULBWP.1.1 | |
| TRS Configuration | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | TCI.State.2 | |
| DRx Cycle | ms | N/A | DRX.8[Note2] |
| PDSCH Reference measurement channel | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | | CCR.3.7 TDD | |
| OCNG Patterns | | OP.1 | |
| SSB Configuration | | SSB.4 FR2 | |
| SMTC Configuration | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS [Note 1] | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | |

| Propagation condition | | AWGN | |
|---|---|---|---|
| SRS Config | | SRSConf.1[Note3] | SRSConf.2[Note3] |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: DRX related parameters are given in Table A.5-1.<br>Note 3: SRS configs are given in TS 38.133 [6] Table A.17.4.1.1.5-2. | | | |

**Table 17.4.1.1.5-2: SRS Configurations**

| | Field | SRSConf.1 | SRSConf.2 | Comments |
|---|---|---|---|---|
| SRS-ResourceSet | *srs-ResourceSetId* | 0 | 0 | |
| | *srs-ResourceIdList* | 0 | 0 | |
| | *resourceType* | Periodic | Periodic | |
| | *Usage* | Codebook | Codebook | |
| SRS-Resource | *SRS-ResourceId* | 0 | 0 | |
| | *nrofSRS-Ports* | Port1 | Port1 | |
| | *transmissionComb* | n2 | n2 | |
| | *combOffset-n2* | 0 | 0 | |
| | *cyclicShift-n2* | 0 | 0 | |
| | *resourceMapping startPosition* | 0 | 0 | |
| | *resourceMapping nrofSymbols* | n1 | n1 | |
| | *resourceMapping repetitionFactor* | n1 | n1 | |
| | *freqDomainPosition* | 0 | 0 | |
| | *freqDomainShift* | 0 | 0 | |
| | *freqHopping c-SRS* | 17 | 17 | Matches $N_{RB,c}$ |
| | *freqHopping b-SRS* | 0 | 0 | |
| | *freqHopping b-hop* | 0 | 0 | |
| | *groupOrSequenceHopping* | Neither | Neither | |
| | *resourceType* | Periodic | Periodic | |
| | *periodicityAndOffset-p* | sl1, 0 | sl2560, 4 | Offset to align with DRx periodicity |
| | *sequenceId* | 0 | 0 | Any 10 bit number |

**Table 17.4.1.1.5-3: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in A.9.1 | |
| Assumption for UE beams[Note 5] | | Fine | |
| $N_{oc}$ [Note1] | dBm/15 kHz[Note3] | -112 | |
| $N_{oc}$ [Note1] | dBm/SCS | -100 | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | |
| SS-RSRP[Note2] | dBm/SCS [Note3] | -96 | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | |
| Io[Note2] | dBm/95.04 MHz [Note4] | -68.5 | |

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 4: As observed with 0 dBi gain antenna at the centre of the quiet zone.
NOTE 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

**Table 17.4.1.1.5-4: $T_e$ Timing Error Limit**

| Frequency Range | SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | $T_e$ |
|---|---|---|---|
| 2 | 240 | 120 | 3.75*64*$T_c$ |
| NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | |

**Table 17.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate**

| Frequency Range | SCS of uplink signals (kHz) | The Maximum timing change in one adjustment $T_q$ | The Minimum aggregate adjustment rate $T_p$ | The Maximum aggregate adjustment rate $T_q$ |
|---|---|---|---|---|
| 2 | 120 | 3.125*64*$T_c$ | -1.225*64*$T_c$ | +3.725*64*$T_c$ |
| NOTE: $T_c$ is the basic timing unit defined in TS 38.211 [7]. | | | | |

## 17.4.2 UE timer accuracy for RedCap

## 17.4.3 Timing advance for RedCap

### 17.4.3.0 Minimum conformance requirements

#### 17.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The minimum requirements given in clause 7.4.3.0.1 shall apply.

### 17.4.3.1 NR SA FR2 timing advance adjustment accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3.
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.4.3.1.1 Test purpose

To verify UE timing advance adjustment delay and accuracy requirement defined in TS 38.133 [6] clause 7.3A.

#### 17.4.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onward and supporting FR2.

#### 17.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.4.3.1.

#### 17.4.3.1.4 Test description

##### 17.4.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.4.3.1.4.1 with following exceptions:

- Table 7.4.3.1.4.1-1 is replaced by Table 17.4.3.1.4.1-1;
- Table 7.4.3.1.4.1-2 is replaced by Table 17.4.3.1.4.1-2;
- Table 7.4.3.1.4.1-3 is replaced by Table 17.4.3.1.4.1-3.

**Table 17.4.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.4.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.4.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.4.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.4.3.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF channel number | | 1 | |
| Initial DL BWP | | DLBWP.0.1 | As specified in Table A.8.1-1 |
| Dedicated DL BWP | | DLBWP.1.1 | As specified in Table A.8.1-2 |
| Initial UL BWP | | ULBWP.0.1 | As specified in Table A.8.2-1 |
| Dedicated UL BWP | | ULBWP.1.1 | As specified in Table A.8.2-2 |
| Timing Advance Command ($T_A$) value during T1 | | 31 | $N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | For 120 kHz SCS $N_{TA_new} = N_{TA_old} + 1024*T_c$ (based on equation in TS 38.213 [8] clause 4.2) |
| T1 | s | 5 | |
| T2 | s | 5 | |

##### 17.4.3.1.4.2 Test Procedure

Same as the test procedure given in clause 7.4.3.1.4.2

##### 17.4.3.1.4.3 Message Contents

Same as the message contents given in clause 7.4.3.1.4.3 with following exceptions:

- Table 7.3.1-3a is used with associated condition SSB.1 FR2.

### 17.4.3.1.5 Test Requirement

Same as the test requirement given in clause 7.4.3.1.5 with following exceptions:

- Table 7.4.3.1.5-1 is replaced by Table 17.4.3.1.5-1;
- Table 7.4.3.1.5-1a is replaced by Table 17.4.3.1.5-2;
- Table 7.4.3.1.5-2 is replaced by Table 17.4.3.1.5-3;
- Table 7.4.3.1.5-3 is replaced by Table 17.4.3.1.5-4.

**Table 17.4.3.1.5-1: Cell specific test parameters**

| Parameter | Unit | Test1 | |
|---|---|---|---|
| | | T1 | T2 |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | |
| CORESET Reference Channel | | CR.3.1 TDD | |
| OCNG Patterns | | OP.1 | |
| TRS configuration | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | TCI.State.2 | |
| SMTC configuration | | SMTC.1 | |
| SSB Configuration | | SSB.1 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

**Table 17.4.3.1.5-2: OTA specific test parameters**

| Parameter | Unit | Test 1 | |
|---|---|---|---|
| | | T1 | T2 |
| Angle of arrival configuration | | Setup 1 as defined in A.9 | |
| Assumption for UE beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15 kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -103 | |

| | | |
|---|---|---|
| $\hat{E}_s / N_{oc}$ | dB | 4 |
| SS-RSRP Note2 | dBm/SCS Note4 | -99 |
| $\hat{E}_s / I_{ot}$ | dB | 4 |
| Io Note2 | dBm/95.04 MHz Note4 | -68.5 |
| NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | |
| NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | |
| NOTE 5: As observed with 0 dBi gain antenna at the centre of the quiet zone. | | |
| NOTE 6: Information about types of UE beam is given in Annex B.2.1.3 of TS 38.133 [6] and does not limit UE implementation or test system implementation. | | |

**Table 17.4.3.1.5-3: Sounding Reference Symbol Configuration**

| Field | Value | Comment |
|---|---|---|
| *c-SRS* | 16 | Frequency hopping is disabled |
| *b-SRS* | 0 | |
| *b-hop* | 0 | |
| *freqDomainPosition* | 0 | Frequency domain position of SRS |
| *freqDomainShift* | 0 | |
| *groupOrSequenceHopping* | neither | No group or sequence hopping |
| *SRS-PeriodicityAndOffset* | sl5 = 4 | Once every 5 slots |
| *pathlossReferenceRS* | ssb-Index = 0 | SSB #0 is used for SRS path loss estimation |
| *usage* | Codebook | Codebook based UL transmission |
| *startPosition* | 0 | *resourceMapping* setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| *nrofSymbols* | n1 | |
| *repetitionFactor* | n1 | |
| *combOffset-n2* | 0 | transmissionComb setting |
| *cyclicShift-n2* | 0 | |
| *nrofSRS-Ports* | port1 | Number of antenna ports used for SRS transmission |
| NOTE: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

**Table 17.4.3.1.5-4: UE Timing Advance adjustment accuracy**

| UL Sub Carrier Spacing(kHz) | 120 |
|---|---|
| UE Timing Advance adjustment accuracy | ±72 $T_c$ |

# 17.5 Signalling characteristics for RedCap

## 17.5.1 Radio link monitoring for RedCap

### 17.5.1.0 Minimum requirements

#### 17.5.1.0.1 General

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [8]. The configured RLM-RS

resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out}$ and $Q_{in}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 17.5.1.0.1-1. For SSB based radio link monitoring, $Q_{out_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-2. For CSI-RS based radio link monitoring, $Q_{out_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-4.

The threshold $Q_{in}$ is defined as the level at which the downlink radio link quality can be significantly more reliably received than at $Q_{out}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 17.5.1.0.1-1. For SSB based radio link monitoring, $Q_{in_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-3. For CSI-RS based radio link monitoring, $Q_{in_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-5.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 17.5.1.0.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 17.5.1.0.1-1.

**Table 17.5.1.0.1-1: Out-of-sync and in-sync block error rates**

| Configuration | $BLER_{out}$ | $BLER_{in}$ |
|---|---|---|
| 0 | 10% | 2% |

UE shall be able to monitor up to $N_{RLM}$ RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number $L_{max}$ of SSBs per half frame according to TS 38.213 [8], where $N_{RLM}$ is specified in Table 17.5.1.0.1-6 according TS 38.213 [8], and meet the requirements as specified in TS 38.133 [6] clause 8.1B. UE is not required to meet the requirements in TS 38.133 [6] clause 8.1B if RLM-RS is not configured and no TCI state for PDCCH is activated.

**Table 17.5.1.0.1-2: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16; for RedCap UE with 1 Rx branch.<br>8; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 4 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 4 dB |
| Bandwidth (PRBs) | 48; for RedCap UE with 1 Rx branch.<br>24; for RedCap UE with 2 Rx branch. |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 17.5.1.0.1-3: PDCCH transmission parameters for in-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8; for RedCap UE with 1 Rx branch.<br>4; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0 dB |
| Bandwidth (PRBs) | 48; for RedCap UE with 1 Rx branch.<br>24; for RedCap UE with 2 Rx branch. |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 17.5.1.0.1-4: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 16; for RedCap UE with 1 Rx branch.<br>8; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 4 dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 4 dB |
| Bandwidth (PRBs) | 48 |
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 17.5.1.0.1-5: PDCCH transmission parameters for in-sync evaluation for RedCap UE**

| Attribute | Value for BLER Configuration #0 |
|---|---|
| DCI payload size | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8; for RedCap UE with 1 Rx branch.<br>4; for RedCap UE with 2 Rx branch. |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | 0 dB |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | 0 dB |
| Bandwidth (PRBs) | 48 |

| | |
|---|---|
| Sub-carrier spacing (kHz) | SCS of the active DL BWP |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |
| Note: SCS = 60 kHz is not applicable for FR1. | |

**Table 17.5.1.0.1-6: Maximum number of RLM-RS resources $X_{RLM-RS}$**

| Carrier frequency range of PCell | $L_{max}$ | Maximum number of RLM-RS resources, $N_{RLM}$ |
|---|---|---|
| FR1, ≤ 3 GHz[Note] | 4 | 2 |
| FR1, > 3 GHz[Note] | 8 | 4 |
| FR2 | 64 | 8 |
| NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3 GHz is replaced by 1.88 GHz, as specified in clause 4.1 in TS 38.213 [8]. | | |

When the UE transitions between RLM CD-SSB resource and RLM NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each RLM-RS resource.

The requirements in TS 38.133 [6] clause 8.1.4 shall also apply except the scenarios described above.

The requirements in TS 38.133 [6] clause 8.1.5 shall apply.

When the downlink radio link quality on all the configured RLM-RS resources is worse than $Q_{out}$, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in,RedCap}$, layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval,RedCap}$.

When DRX is not used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to $T_{SSB}$ specified in TS 38.133 [6] clause 8.1B.2 if the RLM-RS resource is SSB, or $T_{CSI-RS}$ specified in TS 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS.

In case DRX is used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10 ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM-RS,M}$)) if DRX cycle_length is less than or equal to 320 ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320 ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,

- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.1, 8.1B.2, 8.1B.3, 8.1B.4, 8.1B.5, 8.1B.6 and 8.1B.7.

### 17.5.1.0.2 Minimum conformance requirements for SSB-based RLM

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,RedCap}$ ms period becomes worse than the threshold $Q_{out_SSB,RedCap}$ within $T_{Evaluate_out_SSB,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,RedCap}$ ms period becomes better than the threshold $Q_{in_SSB,RedCap}$ within $T_{Evaluate_in_SSB,RedCap}$ ms evaluation period.

$T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ are defined in Table 17.5.1.0.2-1 and for FR2 with scaling factor N = 8 for 2 Rx RedCap.

**Table 17.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR2 for 2 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_SSB,RedCap}$ (ms) | $T_{Evaluate_in_SSB,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil(10 × P × N) × $T_{SSB}$) | Max(100, Ceil(5 × P × N) × $T_{SSB}$) |
| DRX cycle ≤ 320 ms | Max(200, Ceil(15 × P × N) × Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5 × P × N) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle > 320 ms | Ceil(10 × P × N) × $T_{DRX}$ | Ceil(5 × P × N) × $T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

For FR2,

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is $P_{sharing\ factor}$, when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MGRP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5 \times T_{SMTCperiod}$

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the RLM-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

  - not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR2, when the SSB for RLM measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 8.1B.2.

### 17.5.1.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI\text{-}RS,RedCap}$ ms period becomes worse than the threshold $Q_{out_CSI\text{-}RS,RedCap}$ within $T_{Evaluate_out_CSI\text{-}RS,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS,RedCap}$ ms period becomes better than the threshold $Q_{in_CSI-RS,RedCap}$ within $T_{Evaluate_in_CSI-RS,RedCap}$ ms evaluation period.

$T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ are defined in Table 17.5.1.0.3-1 for FR2 with scaling factor N = 1 for 2 Rx RedCap.

**Table 17.5.1.0.3-1: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR2 for 2 Rx RedCap UE**

| Configuration | $T_{Evaluate_out_CSI-RS,RedCap}$ (ms) | $T_{Evaluate_in_CSI-RS,RedCap}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil($M_{out,RedCap}$×P×N)×$T_{CSI-RS}$) | Max(100, Ceil($M_{in,RedCap}$×P×N) × $T_{CSI-RS}$) |
| DRX ≤ 320 ms | Max(200, Ceil(1.5×$M_{out,RedCap}$×P×N)× Max($T_{DRX}$, $T_{CSI-RS}$)) | Max(100, Ceil(1.5×$M_{in,RedCap}$×P×N)× Max($T_{DRX}$, $T_{CSI-RS}$)) |
| DRX > 320 ms | Ceil($M_{out,RedCap}$×P×N) × $T_{DRX}$ | Ceil($M_{in,RedCap}$×P×N) × $T_{DRX}$ |
| NOTE: $T_{CSI-RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI-RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | | |

For FR2,

- P = 1, when the RLM-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is not overlapped with SMTC occasion ($T_{CSI-RS}$ < MGRP)
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- $P = P_{sharing\ factor}$, when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor}$ = 1, if the RLM-RS resource outside measurement gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; 0therwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS for RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.

The values of $M_{out,RedCap}$ and $M_{in,RedCap}$ used in Table 17.5.1.0.3-1 for UE with 2 Rx are defined as:

- $M_{out,RedCap}$ = 20 and $M_{in,RedCap}$ = 10, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, or L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or

  - The other CSI-RS is configured in q1 and beam failure is detected, or

  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 8.1B.3.

## 17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

### 17.5.1.1.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 17.5.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

### 17.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.1.

### 17.5.1.1.4 Test description

Same as the test description given in clause 7.5.1.1.4.

#### 17.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.1.4.1 with following exceptions:

- Table 7.5.1.1.4.1-1 is replaced by Table 17.5.1.1.4.1-1.
- Table 7.5.1.1.4.1-2 is replaced by Table 17.5.1.1.4.1-2.
- Table 7.5.1.1.4.1-3 is replaced by Table 17.5.1.1.4.1-3.

**Table 17.5.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.1-1 | TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |

**Table 17.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.1.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 24 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.4 FR2 |
| SSB index assigned as RLM-RS | | Config 1 | | 0, 1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | gp0 |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | | periodic |
| *reportQuantity* | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |

| | |
|---|---|
| Note 1: | All configurations are assigned to the UE prior to the start of time period T1. |
| Note 2: | UE-specific PDCCH is not transmitted after T1 starts. |

#### 17.5.1.1.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.1.4.2.

#### 17.5.1.1.4.3 Message Contents

Same as the message contents given in clause 7.5.1.1.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

### 17.5.1.1.5 Test Requirement

Same as the test requirements given in clause 7.5.1.1.5 with following exceptions:

- Table 7.5.1.1.5-1 is replaced by Table 17.5.1.1.5-1.

**Table 17.5.1.1.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | | Setup 3 | | | | | |
| | | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1 Note 6,7 | -3.9 Note 6,7 | -15 | | | |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | 4.1 Note 6,7 | -15 | -15 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -94.8 Note 7 | | | -94.8 Note 7 | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 7.5.1.1.4-2 | | | | | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | | | TDL-A 30 ns 75 Hz | | |

Note 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1 dB degradation from applied SNR to UE baseband.
Note 7: Including test tolerance given in Annex F.

## 17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

#### 17.5.1.2.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

#### 17.5.1.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.2.

#### 17.5.1.2.4 Test description

Same as the test description given in clause 7.5.1.2.4.

##### 17.5.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.2.4.1 with following exceptions:

- Table 7.5.1.2.4.1-1 is replaced by Table 17.5.1.2.4.1-1.
- Table 7.5.1.2.4.1-2 is replaced by Table 17.5.1.2.4.1-2.
- Table 7.5.1.2.4.1-3 is replaced by Table 17.5.1.2.4.1-3.

**Table 17.5.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.2-1 | TDD, SSB SCS 120 kHz, data SCS 120kHz, BW 100 MHz |

**Table 17.5.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.2.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 24 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.1 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.4 FR2 |
| SSB index assigned as RLM-RS | | Config 1 | | 0, 1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX | | | | OFF |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | | periodic |
| *reportQuantity* | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |

| | | | |
|---|---|---|---|
| CSI reporting offset | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | TCI.State.2 |
| CSI-RS for tracking | Config 1 | | TRS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.88 |
| T4 | | s | 0.2 |
| T5 | | s | 3.84 |
| D1 | | s | 3.8 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 17.5.1.2.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.2.4.2.

### 17.5.1.2.4.3 Message Contents

Same as the message contents given in clause 7.5.1.2.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

### 17.5.1.2.5 Test Requirement

Same as the test requirements given in clause 7.5.1.2.5 with following exceptions:

- Table 7.5.1.2.5-1 is replaced by Table 17.5.1.2.5-1.

**Table 17.5.1.2.5-1: Cell specific test parameters**

| Parameter | | Unit | Test 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 3 defined in A.9 | | | | | | | | | |
| | | | AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beams Note 5 | | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | |
| ssb-Index 0 SNR | Config 1 | dB | 4.1 Note 6,7 | -3.9 Note 6,7 | -15 | -15 | -15 | Not sent | | | | |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | | | 4.1 Note 6,7 | -15 | -15 | -4.5 | 4.1 Note 6,7 |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ | Config 1 | dBm/15 kHz | -94.8 Note 7 | -94.8 Note 7 |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 7.5.1.2.1-2 | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | TDL-A 30 ns 75 Hz |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1 dB degradation from applied SNR to UE baseband.
Note 7: Including test tolerance given in Annex F.

## 17.5.1.3 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

### 17.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 17.5.1.3.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting long DRX cycle.

### 17.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.3.

### 17.5.1.3.4 Test description

Same as the test description given in clause 7.5.1.3.4.

#### 17.5.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.3.4.1 with following exceptions:

- Table 7.5.1.3.4.1-1 is replaced by Table 17.5.1.3.4.1-1.
- Table 7.5.1.3.4.1-2 is replaced by Table 17.5.1.3.4.1-2.
- Table 7.5.1.3.4.1-3 is replaced by Table 17.5.1.3.4.1-3.

**Table 17.5.1.3.4.1-1: Supported test configurations for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode**

| Configuration | Description |
|---|---|
| 17.5.1.3-1 | TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |

**Table 17.5.1.3.4.1-2: Initial conditions for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.3.4.1-3: General test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 24 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.4 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.1 FR2 |
| SSB index assigned as RLM-RS | | Config 1 | | 0, 1 |
| OCNG parameters | | | | OP.5 |
| CP length | | | | Normal |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |

| | | | |
|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX Configuration | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | periodic |
| *reportQuantity* | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | TCI.State.2 |
| CSI-RS for tracking | Config 1 | | TRS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 14.48 |
| T3 | | s | 14.48 |
| D1 | | s | 14.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 17.5.1.3.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.3.4.2.

### 17.5.1.3.4.3 Message Contents

Same as the message contents given in clause 7.5.1.3.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

### 17.5.1.3.5 Test Requirement

Same as the test requirements given in clause 7.5.1.3.5 with following exceptions:

- Table 7.5.1.3.5-1 is replaced by Table 17.5.1.3.5-1.

**Table 17.5.1.3.5-1: Cell specific test parameters for NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode**

| Parameter | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 defined in A.9 | | | | | |
| | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 5 | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ssb-Index 0 SNR | Config 1 | dB | 4.1 Note 6 | -3.9 Note 6 | -15 | | | |
| ssb-Index 1 SNR | Config 1 | | Not sent | | | 4.1 Note 6 | -15 | -15 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -94.8 | | | -94.8 | | |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 17.5.1.3.1-2 | | | | | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | | | TDL-A 30 ns 75 Hz | | |

Note 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

### 17.5.1.4.1 Test purpose

To verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1B.

### 17.5.1.4.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting long DRX cycle.

### 17.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.4.

### 17.5.1.4.4 Test description

Same as the test description given in clause 7.5.1.4.4.

#### 17.5.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.4.4.1 with following exceptions:

- Table 7.5.1.4.4.1-1 is replaced by Table 17.5.1.4.4.1-1.

- Table 7.5.1.4.4.1-2 is replaced by Table 17.5.1.4.4.1-2.
- Table 7.5.1.4.4.1-3 is replaced by Table 17.5.1.4.4.1-3.

**Table 17.5.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.4-1 | TDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |

**Table 17.5.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.4.4.1-3: General test parameters**

| Parameter | | | Unit | Value |
|---|---|---|---|---|
| | | | | Test 1 |
| Active PCell | | | | Cell 1 |
| RF Channel Number | | | | 1 |
| Duplex mode | | Config 1 | | TDD |
| $BW_{channel}$ | | Config 1 | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | Config 1 | | 66 |
| DL initial BWP configuration | | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1 | | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1 | | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1 | | ULBWP.1.1 |
| TDD Configuration | | Config 1 | | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 | | CCR.3.1 TDD |
| SSB Configuration | | Config 1 | | SSB.1 FR2 |
| SMTC Configuration | | Config 1 | | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 | | 120 kHz |
| PRACH Configuration | | Config 1 | | PRACH.4 FR2 |
| SSB index assigned as RLM-RS | | Config 1 | | 0, 1 |
| OCNG parameters | | | | OP.1 |
| CP length | | | | Normal |
| In-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| Out-of-sync transmission parameters | DCI format | | | 1-0 |
| | Number of Control OFDM symbols | | | 2 |
| | Aggregation level | | CCE | 8 |

| | | | | |
|---|---|---|---|---|
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| | DMRS precoder granularity | | | REG bundle size |
| | REG bundle size | | | 6 |
| DRX Configuration | | | | DRX.11 |
| Gap pattern ID | | | | N.A. |
| Layer 3 filtering | | | | Enabled |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | | | 1 |
| N311 | | | | 1 |
| CSI-RS for CSI reporting | | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | | periodic |
| *reportQuantity* | | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | | | TCI.State.2 |
| CSI-RS for tracking | | Config 1 | | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

#### 17.5.1.4.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.4.4.2.

#### 17.5.1.4.4.3 Message Contents

Same as the message contents given in clause 7.5.1.4.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

### 17.5.1.4.5 Test Requirement

Same as the test requirements given in clause 7.5.1.4.5 with following exceptions:

- Table 7.5.1.4.5-1 is replaced by Table 17.5.1.4.5-1.

**Table 17.5.1.4.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 | | | | |
| Assumption for UE beams Note 5 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ssb-Index 0 SNR | Config 1 | dB | 3.3 Note 6,7 | -4.7 Note 6,7 | -15.4 Note 7 | -4.9 Note 7 | 3.3 Note 6,7 |
| ssb-Index 1 SNR | Config 1 | | 3.3 Note 6,7 | -15.4 Note 7 | -15.4 Note 7 | -15.4 Note 7 | -15.4 Note 7 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1 dB degradation from applied SNR to UE baseband.
Note 7: Including the test tolerance given in Annex F.

## 17.5.1.5 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

Editor's Note: This test case is incomplete due to the following:

- Usage of 2 antenna ports in CSI-RS 3.1 TDD implies SS transmitting signal on both polarizations. Potential signal imbalance impact to the test verdict is under investigation

- Test Tolerances are available for the following configurations:

  - Test frequency f ≤ 40.8 GHz

  - UE PC3

  - The Test Tolerances are incomplete for UE power classes other than PC3

  - The Test Tolerances are incomplete for test frequencies > 40.8 GHz

### 17.5.1.5.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 17.5.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting FR2 and CSI-RS based RLM.

### 17.5.1.5.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.5.

### 17.5.1.5.4 Test description

Same as the test description given in clause 7.5.1.5.4.

#### 17.5.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.5.4.1 with following exceptions:

- Table 7.5.1.5.4.1-1 is replaced by Table 17.5.1.5.4.1-1,

- Table 7.5.1.5.4.1-2 is replaced by Table 17.5.1.5.4.1-2,
- Table 7.5.1.5.4.1-3 is replaced by Table 17.5.1.5.4.1-3.

**Table 17.5.1.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.5-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.1.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.5.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | | | TDD |
| $BW_{channel}$ | | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | | 24 |
| $BW_{occupied}$ | | | 24 |
| TDD Configuration | | | TDDConf.3.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.4 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | | CCR.3.4 TDD<br>CCR.3.6 TDD |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 |
| CSI-RS for RLM | | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |

| | | |
|---|---|---|
| Gap pattern ID | | gp0 |
| Layer 3 filtering | | Enabled |
| T310 timer | ms | *0* |
| T311 timer | ms | 1000 |
| N310 | | 1 |
| N311 | | 1 |
| CSI-RS for CSI reporting | | CSI-RS.3.1 TDD |
| *reportConfigType* | | periodic |
| *reportQuantity* | | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 40 |
| CSI reporting offset | slot | 4 |
| T1 | s | 0.2 |
| T2 | s | 0.35 |
| T3 | s | 0.35 |
| D1 | s | 0.31 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | |

### 17.5.1.5.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.5.4.2.

### 17.5.1.5.4.3 Message Contents

Same as the message contents given in clause 7.5.1.5.4.3

### 17.5.1.5.5 Test Requirement

Same as the test requirements given in clause 7.5.1.5.5 with following exceptions:

- Table 7.5.1.5.5-1 is replaced by Table 17.5.1.5.5-1,
- Table 7.5.1.5.5-2 is replaced by Table 17.5.1.5.5-2.

**Table 17.5.1.5.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | | Setup 3 defined in A.9.3 | | | | | |
| | | AoA1 | | | AoA2 | | |
| Assumption for UE beams Note 10 | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | | |
| SNR on RLM-RS1 | dB | 4.1 Note 11 | -3.9 Note 11 | -15 | Not sent | | |
| SNR on RLM-RS2 | dB | Not sent | | | 4.1 Note 11 | -15 | -15 |
| $N_{oc}$ | dBm/15 kHz | -94.8 | | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. |
| Note 4: | Measurement gap configuration is assigned to the UE prior to the start of time period T1. |
| Note 5: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 6: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 7: | SNR levels correspond to the signal to noise ratio over the SSS REs. |
| Note 8: | The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.1.5.4.1-1. |
| Note 9: | The SNR values are specified for testing a UE which supports 2 Rx on at least one band. |
| Note 10: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 11: | This value allows up to 1 dB degradation from applied SNR to UE baseband. |

## 17.5.1.6 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

Editor's Note: This test case is incomplete due to the following:

- Procedure to ensure signal balancing in 2AoA setups is still FFS

- Signal levels and propagation conditions need further evaluation

- Usage of 2 antenna ports in CSI-RS 3.1 TDD implies SS transmitting signal on both polarizations. Potential signal imbalance impact to the test verdict is under investigation

- Test Tolerances are available for the following configurations:

  - Test frequency f ≤ 40.8 GHz

  - UE PC3

  - The Test Tolerances are incomplete for UE power classes other than PC3

  - The Test Tolerances are incomplete for test frequencies > 40.8 GHz

### 17.5.1.6.1 Test purpose

To verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 17.5.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting FR2 and CSI-RS based RLM.

### 17.5.1.6.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.6.

### 17.5.1.6.4 Test description

Same as the test description given in clause 7.5.1.6.4.

#### 17.5.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.6.4.1 with following exceptions:

- Table 7.5.1.6.4.1-1 is replaced by Table 17.5.1.6.4.1-1,
- Table 7.5.1.6.4.1-2 is replaced by Table 17.5.1.6.4.1-2,
- Table 7.5.1.6.4.1-3 is replaced by Table 17.5.1.6.4.1-3.

**Table 17.5.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.6-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.1.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.6.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | | | TDD |
| $BW_{channel}$ | | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | | 24 |
| $BW_{occupied}$ | | | 24 |
| TDD Configuration | | | TDDConf.3.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.4 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.4 |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | 120 kHz |
| CSI-RS for RLM | | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |
| | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |

| | | | |
|---|---|---|---|
| Out-of-sync transmission parameters | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | OFF |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | periodic |
| *reportQuantity* | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 17.5.1.6.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.6.4.2.

### 17.5.1.6.4.3 Message Contents

Same as the message contents given in clause 7.5.1.6.4.3.

### 17.5.1.6.5 Test Requirement

Same as the test requirements given in clause 17.5.1.6.5 with following exceptions:

- Table 7.5.1.6.5-1 is replaced by Table 17.5.1.6.5-1.

**Table 17.5.1.6.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 3 defined in A.9.3 | | | | | | | | | |
| | | AoA1 | | | | | AoA2 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Assumption for UE beams Note 10 | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | | | | | | |
| SNR on RLM-RS1 | dB | 4.1 Note 11 | -3.9 Note 11 | -15 | -15 | -15 | | | | | |
| SNR on RLM-RS2 | dB | Not sent | | | | | 4.1 Note 11 | -15 | -15 | -4.5 | 4.1 Note 11 |
| $N_{oc}$ | dBm/15 kHz | -94.8 | | | | | | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | | | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 17.5.1.6.4.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.1.7 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 17.5.1.7.1 Test purpose

To verify that the UE properly detects the out-of-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

#### 17.5.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting FR2, CSI-RS based RLM and long DRX cycle.

#### 17.5.1.7.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.7.

#### 17.5.1.7.4 Test description

Same as the test description given in clause 7.5.1.7.4.

##### 17.5.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.7.4.1 with following exceptions:

- Table 7.5.1.7.4.1-1 is replaced by Table 17.5.1.7.4.1-1,
- Table 7.5.1.7.4.1-2 is replaced by Table 17.5.1.7.4.1-2,
- Table 7.5.1.7.4.1-3 is replaced by Table 17.5.1.7.4.1-3.

**Table 17.5.1.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.7-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.1.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.7.4.1-3: General test parameters**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| Active PCell | | Cell 1 |
| RF Channel Number | | 1 |
| Duplex mode | | TDD |
| $BW_{channel}$ | | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| $BW_{occupied}$ | | 24 |
| TDD Configuration | | TDDConf.3.1 |
| DL initial BWP configuration | | DLBWP.0.1 |
| DL dedicated BWP configuration | | DLBWP.1.1 |
| UL initial BWP configuration | | ULBWP.0.1 |
| UL dedicated BWP configuration | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | CCR.3.4 TDD<br>CCR.3.6 TDD |

| | | | |
|---|---|---|---|
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 |
| CSI-RS for RLM | | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.5 |
| CP length | | | Normal |
| Out-of-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | periodic |
| *reportQuantity* | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 17.5.1.7.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.7.4.2.

### 17.5.1.7.4.3 Message Contents

Same as the message contents given in clause 7.5.1.7.4.3.

### 17.5.1.7.5 Test Requirement

Same as the test requirements given in clause 7.5.1.7.5 with following exceptions:

- Table 7.5.1.7.5-1 is replaced by Table 17.5.1.7.5-1,
- Table 7.5.1.7.5-2 is replaced by Table 17.5.1.7.5-2.

**Table 17.5.1.7.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| AoA setup | dB | Setup 1 defined in A.3.15 | | |
| Assumption for UE beams Note 10 | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | |

| | | | | |
|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | |
| EPRE ratio of PSS to SSS | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | |
| SNR on RLM-RS1 | dB | 3.3 Note 11 | -4.7 Note 11 | -15.4 |
| SNR on RLM-RS2 | dB | 3.3 Note 11 | -15.4 | -15.4 |
| $N_{oc}$ | dBm/15 kHz | -104.7 | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.1.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 10: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.1.8 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

### 17.5.1.8.1 Test purpose

To verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1B.3.

### 17.5.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting FR2, CSI-RS based RLM and long DRX cycle.

### 17.5.1.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.8.

#### 17.5.1.8.4 Test description

Same as the test description given in clause 7.5.1.8.4.

#### 17.5.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.8.4.1 with following exceptions:

- Table 7.5.1.8.4.1-1 is replaced by Table 17.5.1.8.4.1-1,
- Table 7.5.1.8.4.1-2 is replaced by Table 17.5.1.8.4.1-2,
- Table 7.5.1.8.4.1-3 is replaced by Table 17.5.1.8.4.1-3.

**Table 17.5.1.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.8-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.1.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.8.4.1-3: General test parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | | | TDD |
| TDD Configuration | | | TDDConf.3.1 |
| DL initial BWP configuration | | | DLBWP.0.1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 |
| UL initial BWP configuration | | | ULBWP.0.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 |
| CSI-RS for RLM | | | Resource #4 in TRS.2.1 TDD<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |

| | | | |
|---|---|---|---|
| Out-of-sync transmission parameters | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In-sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | DRX.3 |
| Gap pattern ID | | | gp0 |
| Layer 3 filtering | | | Enabled |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS for CSI reporting | Config 1 | | CSI-RS.3.1 TDD |
| *reportConfigType* | | | periodic |
| *reportQuantity* | | | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.64 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 17.5.1.8.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.8.4.2.

### 17.5.1.8.4.3 Message Contents

Same as the message contents given in clause 7.5.1.8.4.3.

### 17.5.1.8.5 Test Requirement

Same as the test requirements given in clause 17.5.1.8.5 with following exceptions:

- Table 7.5.1.8.5-1 is replaced by Table 17.5.1.8.5-1.

**Table 17.5.1.8.5-1: Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | dB | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH DMRS to SSS | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR on RLM-RS1 | dB | 3.3 Note 11 | -4.7 Note 11 | -15.4 | -4.9 Note 11 | 3.3 Note 11 |
| SNR on RLM-RS2 | dB | 3.3 Note 11 | -15.4 | -15.4 | -15.4 | -15.4 |
| $N_{oc}$ | dBm/15 kHz | -104.7 | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 7.5.1.8.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 10: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions for 2 Rx UE

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3

The test is incomplete for test frequencies > 40.8 GHz

### 17.5.1.9.1 Test purpose

To verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1B.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

### 17.5.1.9.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

### 17.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.9.

#### 17.5.1.9.4 Test description

Same as the test description given in clause 7.5.1.9.4.

##### 17.5.1.9.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.9.4.1 with following exceptions:

- Table 7.5.1.9.4.1-1 is replaced by Table 17.5.1.9.4.1-1.
- Table 7.5.1.9.4.1-2 is replaced by Table 17.5.1.9.4.1-2.
- Table 7.5.1.9.4.1-3 is replaced by Table 17.5.1.9.4.1-3.

**Table 17.5.1.9.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.1.9-1 | 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.5.1.9.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.1.9.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.1.9.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1 | |
| SSB configuration | | SSB.1 FR2 | |
| SMTC configuration | | SMTC.3 | |
| DRX cycle length | s | OFF | |
| T1 | s | 5 | During T1 the UE is required to correctly transmit ACK/NACK. |

##### 17.5.1.9.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.9.4.2.

##### 17.5.1.9.4.3 Message Contents

Same as the message contents given in clause 7.5.1.9.4.3.

#### 17.5.1.9.5 Test Requirement

Same as the test requirements given in clause 7.5.1.9.5 with following exceptions:

- Table 7.5.1.9.5-1 is replaced by Table 17.5.1.9.5-1.

**Table 17.5.1.9.5-1: Cell specific test parameters**

| Parameter | Unit | Cell 1 | |
|---|---|---|---|
| AoA setup | | Setup 3 | |
| | | AoA1 | AoA2 |
| Assumption for UE beams Note 1 | | Rough | Rough |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | |
| PDSCH Reference measurement channel | | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration | | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration | | CCR.3.2 TDD | Not sent |
| TRS configuration | | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state | | TCI.State.2 | N/A |
| OCNG Pattern | | OP.5 | Not sent |
| Initial DL BWP configuration | | DLBWP.0.1 | |
| Initial UL BWP configuration | | ULBWP.0.1 | |
| RLM-RS | | SSB with index 0 | SSB with index 1 |
| $N_{oc}$ | dBm/15 kHz | -94.8 | -94.8 |
| $N_{oc}$ Note2 | dBm/SCS | -85.8 | -85.8 |
| $\hat{E}_s / N_{oc}$ | dB | 4.1 | 4.1 |
| $\hat{E}_s / I_{ot}$ BB Note 4 | dB | 2.37 | 2.37 |
| SSB_RP Note3 | dBm/SCS | -81.7 | -81.7 |
| Io | dBm/95.04 MHz | -55.65 | -55.65 |
| Time multiplexing of the downlink transmissions from each AoA | | Defined in Figure A.7.5.1.9.1-1 | |
| Propagation Condition | | AWGN | AWGN |

Note 1: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.

## 17.5.2 Beam Failure Detection and Link recovery procedures for RedCap

### 17.5.2.0 Minimum conformance requirements

#### 17.5.2.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

The minimum requirements given in clause 5.5.5.0.1 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.1, 8.5B.2, 8.5B.4, 8.5B.5 and 8.5B.9.

#### 17.5.2.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

The minimum requirements given in clause 5.5.5.0.2 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.1, 8.5B.3, 8.5B.4, 8.5B.6, 8.5B.9.

#### 17.5.2.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

The minimum requirements given in clause 5.5.5.0.3 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.1, 8.5B.2, 8.5B.4, 8.5B.5, 8.5B.7, 8.5B.8 and 8.5B.9.

### 17.5.2.1 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

#### 17.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

#### 17.5.2.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

#### 17.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.1.

#### 17.5.2.1.4 Test description

Same as the test description given in clause 7.5.5.1.4.

##### 17.5.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.1.4.1 with following exceptions:

- Table 7.5.5.1.4.1-1 is replaced by Table 17.5.2.1.4.1-1.
- Table 7.5.5.1.4.1-2 is replaced by Table 17.5.2.1.4.1-2.
- Table 7.5.5.1.4.1-3 is replaced by Table 17.5.2.1.4.1-3.

**Table 17.5.2.1.4.1-1: Supported test configurations for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode**

| Configuration | Description |
|---|---|
| 17.5.2.1-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.2.1.4.1-2: Initial conditions for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.2.1.4.1-1. | | |
| Propagation conditions | Multi-path fading | | As specified in Annex C.2.3. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.2.1.4.1-3: General test parameters for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode**

| Parameter | | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active PCell | | 1 | | Cell 1 | |
| RF Channel Number | | 1 | | 1 | |
| Duplex mode | | 1 | | TDD | |
| TDD Configuration | | 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 1 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | 1 | kHz | 120 | |
| DL initial BWP configuration | | 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | | 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | 1 | | ULBWP.1.1 | |
| PDSCH Reference Channel | | 1 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | 1 | | CR.3.1 TDD | |
| Dedicated CORESET Reference Channel | | 1 | | CCR.3.1 TDD | |
| OCNG parameters | | 1 | | OP.1 | |
| CP length | | 1 | | Normal | |
| PDSCH/PDCCH TCI state | | 1 | | TCI.State.0 | |
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | |
| SSB Configuration | | 1 | | SSB.1 FR2 | |
| SMTC Configuration | | 1 | | SMTC.3 | |
| PRACH Configuration | | 1 | | FR2 PRACH configuration 2 | |
| DRX configuration | | 1 | | OFF | |
| SSB index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| SSB index assigned as RLM-RS | | 1 | | 0, 1 | |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | gp0 | |

| | | | | |
|---|---|---|---|---|
| *gapOffset* | 1 | ms | 0 | |
| *rlmInSyncOutOfSyncThreshold* | 1 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | 1 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | 1 | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | 1 | | CSI-RS.3.1 TDD | |
| *reportConfigType* | 1 | | periodic | |
| *reportQuantity* | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | 1 | slot | 40 | |
| CSI reporting offset | 1 | slot | 4 | |
| T310 | 1 | ms | 1000 | |
| N310 | 1 | | 2 | |
| T1 | 1 | s | 1 | The UE shall be fully synchronized to Cell 1 during T1. |
| T2 | 1 | s | 2.61 | |
| T3 | 1 | s | 1.64 | |
| T4 | 1 | s | 0 | |
| T5 | 1 | s | 1.01 | |
| D1 | 1 | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2. | | | | |

#### 17.5.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.1.4.2.

#### 17.5.2.1.4.3 Message contents

Same as the message contents given in clause 7.5.5.1.4.3.

### 17.5.2.1.5 Test requirement

Same as the test requirements given in clause 7.5.5.1.5 with following exceptions:

- Table 7.5.5.1.5-1 is replaced by Table 17.5.2.1.5-1.

**Table 17.5.2.1.5-1: NR Cell specific test parameters for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 10 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR_SSB of set $q_0$ | dB | 13.7 Note11,12 | 5.7 Note11,12 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | dB | 0.2 | 0.2 | 20 Note12 | 20 Note12 | 20 Note12 |
| SSB_RP of set $q_1$ | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 10: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1 dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in Annex F.1.3.2.

## 17.5.2.2 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

### 17.5.2.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

### 17.5.2.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting long DRX cycle.

### 17.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.2.

#### 17.5.2.2.4 Test description

Same as the test description given in clause 7.5.5.2.4.

##### 17.5.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.2.4.1 with following exceptions:

- Table 7.5.5.2.4.1-1 is replaced by Table 17.5.2.2.4.1-1.
- Table 7.5.5.2.4.1-2 is replaced by Table 17.5.2.2.4.1-2.
- Table 7.5.5.2.4.1-3 is replaced by Table 17.5.2.2.4.1-3.

**Table 17.5.2.2.4.1-1: Supported test configurations for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode**

| Configuration | Description |
|---|---|
| 17.5.2.2-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.2.2.4.1-2: Initial conditions for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.2.2.4.1-1. | | |
| Propagation conditions | Multi-path fading | | As specified in Annex C.2.3. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.2.2.4.1-3: General test parameters for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode**

| Parameter | Test Config. | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active PCell | 1 | | Cell 1 | |
| RF Channel Number | 1 | | 1 | |
| Duplex mode | 1 | | TDD | |
| TDD Configuration | 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | 1 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | 1 | | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1 | kHz | 120 | |
| DL initial BWP configuration | 1 | | DLBWP.0.1 | |
| DL dedicated BWP configuration | 1 | | DLBWP.1.1 | |
| UL initial BWP configuration | 1 | | ULBWP.0.1 | |
| UL dedicated BWP configuration | 1 | | ULBWP.1.1 | |
| PDSCH Reference Channel | 1 | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD | |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD | |
| OCNG parameters | 1 | | OP.1 | |
| CP length | 1 | | Normal | |
| PDSCH/PDCCH TCI state | 1 | | TCI.State.0 | |

| | | | | | |
|---|---|---|---|---|---|
| CSI-RS for tracking | | 1 | | TRS.2.1 TDD | |
| SSB Configuration | | 1 | | SSB.1 FR2 | |
| SMTC Configuration | | 1 | | SMTC.3 | |
| PRACH Configuration | | 1 | | PRACH.2 FR2 | |
| DRX configuration | | 1 | | DRX.3 | |
| SSB index assigned as BFD RS ($q_0$) | | 1 | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | 1 | | 1 | |
| SSB index assigned as RLM-RS | | 1 | | 0, 1 | |
| Beam failure detection transmission parameters | DCI format | 1 | | 1-0 | |
| | Number of Control OFDM symbols | 1 | | 2 | |
| | Aggregation level | 1 | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1 | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1 | dB | 0 | |
| | DMRS precoder granularity | 1 | | REG bundle size | |
| | REG bundle size | 1 | | 6 | |
| Gap pattern ID | | 1 | | N/A | |
| *rlmInSyncOutOfSyncThreshold* | | 1 | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | | 1 | dBm/SCS | -109 Note 3 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | 1 | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | 1 | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | | 1 | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1 | | CSI-RS.3.1 TDD | |
| *reportConfigType* | | 1 | | periodic | |
| *reportQuantity* | | 1 | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | 1 | slot | 40 | |
| CSI reporting offset | | 1 | slot | 4 | |
| T310 | | 1 | ms | 1000 | |
| N310 | | 1 | | 2 | |
| T1 | | 1 | s | 1 | The UE shall be fully synchronized to Cell 1 during T1 |
| T2 | | 1 | s | 3.37 | |
| T3 | | 1 | s | 2.8 | |
| T4 | | 1 | s | 0 | |
| T5 | | 1 | s | 0.61 | |
| D1 | | 1 | s | 0.57 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>Note 3: Including test tolerance given in Annex F.1.3.2. | | | | | |

#### 17.5.2.2.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.2.4.2.

#### 17.5.2.2.4.3 Message contents

Same as the message contents given in clause 7.5.5.2.4.3.

#### 17.5.2.2.5 Test requirement

Same as the test requirements given in clause 7.5.5.2.5 with following exceptions:

- Table 7.5.5.2.5-1 is replaced by Table 17.5.2.2.5-1.

**Table 17.5.2.2.5-1: NR Cell specific test parameters for NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 9 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR_SSB of set $q_0$ | dB | 13.7 Note10,11 | 5.7 Note10,11 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | dB | 0.2 | 0.2 | 20 Note11 | 20 Note11 | 20 Note11 |
| SSB_RP of set $q_1$ | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.2.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1 dB degradation from applied SNR to UE baseband.
Note 11: Including test tolerance given in Annex F.1.3.2.

### 17.5.2.3 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3

- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

This test case is incomplete for test frequencies f > 40.8 GHz.

#### 17.5.2.3.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

#### 17.5.2.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS-based RLM and link recovery.

#### 17.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.3.

#### 17.5.2.3.4 Test description

Same as the test description given in clause 7.5.5.3.4.

##### 17.5.2.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.3.4.1 with following exceptions:

- Table 7.5.5.3.4.1-1 is replaced by Table 17.5.2.3.4.1-1.
- Table 7.5.5.3.4.1-2 is replaced by Table 17.5.2.3.4.1-2.
- Table 7.5.5.3.4.1-3 is replaced by Table 17.5.2.3.4.1-3.

**Table 17.5.2.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.2.3-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.2.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.2.3.4.1-1. | | |
| Propagation conditions | Multi-path fading | | As specified in Annex C.2.3. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.2.3.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD Configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| DL initial BWP configuration | | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | | DLBWP.1.1 | |
| UL initial BWP configuration | | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | | ULBWP.1.1 | |
| PDSCH Reference Channel | | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | |
| Dedicated CORESET Reference Channel | | | CCR.3.1 TDD | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| PDSCH/PDCCH TCI state | | | TCI.State.0 | |
| CSI-RS for tracking | | | TRS.2.1 TDD | |
| SSB Configuration | | | SSB.1 FR2 | |
| SMTC Configuration | | | SMTC.3 | |
| PRACH Configuration | | | PRACH.4 FR2 | A.3.8.3.4 |
| DRX configuration | | | OFF | |
| CSI-RS configuration for BFD/CBD/RLM | | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS ($q_0$) | | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | | 1 | |
| CSI-RS index assigned as RLM-RS | | | 0, 1 | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| Gap pattern ID | | | N/A | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | | dBm/SCS | -109 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | CSI-RS.3.1 TDD | A.3.14.2 |
| *reportConfigType* | | | periodic | |
| *reportQuantity* | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | slot | 40 | |
| CSI reporting offset | | slot | 4 | |
| T310 | | ms | 1000 | |
| N310 | | | 2 | |

| | | | |
|---|---|---|---|
| T1 | s | 1 | The UE shall be fully synchronized to Cell 1 during T1. |
| T2 | s | 1.17 | |
| T3 | s | 0.9 | |
| T4 | s | 0 | |
| T5 | s | 0.31 | |
| D1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 17.5.2.3.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.3.4.2.

#### 17.5.2.3.4.3 Message contents

Same as the message contents given in clause 7.5.5.3.4.3.

### 17.5.2.3.5 Test requirement

Same as the test requirements given in clause 7.5.5.3.5 with following exceptions:

- Table 7.5.5.3.5-1 is replaced by Table 17.5.2.3.5-1.

**Table 17.5.2.3.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 9 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | dB | 13.7Note | 5.7Note 10 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| $N_{oc}$ | dBm/ 120 kHz | -104.7 | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.3.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.2.4 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

This test case is incomplete for test frequencies f > 40.8 GHz.

### 17.5.2.4.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set $q_0$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

### 17.5.2.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS-based RLM, long DRX cycle and link recovery.

### 17.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.4.

### 17.5.2.4.4 Test description

Same as the test description given in clause 7.5.5.4.4.

#### 17.5.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.4.4.1 with following exceptions:

- Table 7.5.5.4.4.1-1 is replaced by Table 17.5.2.4.4.1-1.
- Table 7.5.5.4.4.1-2 is replaced by Table 17.5.2.4.4.1-2.
- Table 7.5.5.4.4.1-3 is replaced by Table 17.5.2.4.4.1-3.

**Table 17.5.2.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.2.4-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.2.4.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.2.4.4.1-1. | |

| | | | |
|---|---|---|---|
| Propagation conditions | Multi-path fading | | As specified in Annex C.2.3. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.2.4.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD Configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| DL initial BWP configuration | | | DLBWP.0.1 | |
| DL dedicated BWP configuration | | | DLBWP.1.1 | |
| UL initial BWP configuration | | | ULBWP.0.1 | |
| UL dedicated BWP configuration | | | ULBWP.1.1 | |
| PDSCH Reference Channel | | | SR.3.2 TDD | |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | |
| Dedicated CORESET Reference Channel | | | CCR.3.1 TDD | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| PDSCH/PDCCH TCI state | | | TCI.State.0 | |
| CSI-RS for tracking | | | TRS.2.1 TDD | |
| SSB Configuration | | | SSB.1 FR2 | |
| SMTC Configuration | | | SMTC.3 | |
| PRACH Configuration | | | PRACH.4 FR2 | A.3.8.3.4 |
| DRX configuration | | | DRX.3 | |
| CSI-RS configuration for BFD/CBD/RLM | | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS ($q_0$) | | | 0 | |
| CSI-RS index assigned as CBD RS ($q_1$) | | | 1 | |
| CSI-RS index assigned as RLM-RS | | | 0, 1 | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| Gap pattern ID | | | N/A | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | | dBm/SCS | -109 | Threshold used for $Q_{in_LR_SSB}$ |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |

| | | | |
|---|---|---|---|
| *beamFailureInstanceMaxCount* | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | CSI-RS.3.1 TDD | A.3.14.2 |
| *reportConfigType* | | periodic | |
| *reportQuantity* | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | slot | 40 | |
| CSI reporting offset | slot | 4 | |
| T310 | ms | 1000 | |
| N310 | | 2 | |
| T1 | s | 1 | The UE shall be fully synchronized to Cell 1 during T1. |
| T2 | s | 5.43 | |
| T3 | s | 5.16 | |
| T4 | s | 0 | |
| T5 | s | 0.31 | |
| D1 | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 17.5.2.4.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.4.4.2.

#### 17.5.2.4.4.3 Message contents

Same as the message contents given in clause 7.5.5.4.4.3.

### 17.5.2.4.5 Test requirement

Same as the test requirements given in clause 7.5.5.4.5 with following exceptions:

- Table 7.5.5.4.5-1 is replaced by Table 17.5.2.4.5-1.

**Table 17.5.2.4.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 9 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |
| EPRE ratio of PSS to SSS | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | dB | | | | | |
| SNR_CSI-RS of set $q_0$ | dB | 13.7 Note 10 | 5.7 Note 10 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| CSI-RS_RP of set $q_1$ | dBm/SCS | -104.5 | -104.5 | -84.7 5 | -84.7 | -84.7 |
| $N_{oc}$ | dBm/ 120 kHz | -104.7 | | | | |
| Propagation condition | | TDL-A 30 ns 75 Hz | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. |
| Note 3: | NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1. |
| Note 4: | The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. |
| Note 5: | The signal contains PDCCH for UEs other than the device under test as part of OCNG. |
| Note 6: | SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS. |
| Note 7: | The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.4.4-1. |
| Note 8: | The SNR values are specified for testing a UE which supports 2 Rx on at least one band. |
| Note 9: | Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation. |
| Note 10: | This value allows up to 1 dB degradation from applied SNR to UE baseband. |

## 17.5.2.5 NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

This test case is incomplete for test frequencies f > 40.8 GHz.

### 17.5.2.5.1 Test purpose

To test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in TS 38.133 [6] clauses 8.5B.7 and 8.5B.8.

### 17.5.2.5.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting link recovery.

### 17.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.5.

### 17.5.2.5.4 Test description

Same as the test description given in clause 7.5.5.5.4.

#### 17.5.2.5.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.2.5.4.1 with following exceptions:

- Table 7.5.5.5.4.1-1 is replaced by Table 17.5.2.5.4.1-1.
- Table 7.5.5.5.4.1-2 is replaced by Table 17.5.2.5.4.1-2.
- Table 7.5.5.5.4.1-3 is replaced by Table 17.5.2.5.4.1-3.

**Table 17.5.2.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.5.2.5-1 | TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 17.5.2.5-2 | TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |

**Table 17.5.2.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.2.5.4.1-1. | | |
| Propagation conditions | Multi-path fading | | As specified in Annex C.2.3. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.2.5.4.1-3: General test parameters**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | **Test 1** | |
| Active PCell | | | Cell 1 | |
| RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD Configuration | | | TDDConf.3.1 | Table A.1.5-3 |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | 66 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| DL initial BWP configuration | | | DLBWP.0.1 | Table A.8.1-1 |
| DL dedicated BWP configuration | | | DLBWP.1.1 | Table A.8.1-2 |
| UL initial BWP configuration | | | ULBWP.0.1 | Table A.8.2-1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 | Table A.8.2-2 |
| PDSCH Reference Channel | Config 1 | | SR.3.2 TDD | Table A.1.1.2-3 |
| | Config 2 | | SR.3.3 TDD | |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | Table A.1.2.2-3 |
| | Config 2 | | CR.3.2 TDD | |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD | Table A.1.3.2-3 |
| | Config 2 | | CCR.3.7 TDD | |
| OCNG parameters | | | OP.1 | Table A.2.1-1 |
| CP length | | | Normal | |
| PDSCH/PDCCH TCI state | | | TCI.State.0 | Table A.10.2-1 |
| CSI-RS for tracking | | | TRS.2.1 TDD | |
| SSB Configuration | Config 1 | | SSB.1 FR2 | Table A.3.2-1 |
| | Config 2 | | SSB.2 FR2 | |
| SMTC Configuration | | | SMTC.1 | Table A.4-1 |
| PRACH Configuration | | | PRACH.2 FR2 | Table A.7.2-1 |
| DRX configuration | | | OFF | |
| SSB index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | | 1 | |
| Beam failure detection transmission parameters | DCI format | | 1-0 | |
| | Number of Control OFDM symbols | | 2 | |
| | Aggregation level | CCE | 8 | |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 | |

| | | | | |
|---|---|---|---|---|
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 | |
| | DMRS precoder granularity | | REG bundle size | |
| | REG bundle size | | 6 | |
| Gap pattern ID | | | N/A | |
| *rlmInSyncOutOfSyncThreshold* | | | absent | Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1). |
| *rsrp-ThresholdSSB* | Config 1 | dBm/SCS | -109 | Threshold used for $Q_{in_LR_SSB}$ |
| | Config 2 | | -106 | |
| *powerControlOffsetSS* | | | db0 | Used for deriving *rsrp-ThresholdCSI-RS* |
| *beamFailureInstanceMaxCount* | | | n1 | see TS 38.321 [12], clause 5.17 |
| *beamFailureDetectionTimer* | | | pbfd4 | see TS 38.321 [12], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | CSI-RS.3.1 TDD | Table A.1.4.2-3 |
| *reportConfigType* | | | periodic | |
| *reportQuantity* | | | cri-RI-PMI-CQI | |
| CSI reporting periodicity | | slot | 40 | |
| CSI reporting offset | | slot | 4 | |
| T310 | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | The UE shall be fully synchronized to Cell 1 during T1. |
| T2 | | s | 2.6 | |
| T3 | | s | 1.64 | |
| T4 | | s | 0 | |
| T5 | | s | 1.01 | |
| D1 | | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

### 17.5.2.5.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.5.4.2.

### 17.5.2.5.4.3 Message contents

Same as the message contents given in clause 7.5.5.5.4.3.

### 17.5.2.5.5 Test requirement

Same as the test requirements given in clause 7.5.5.5.5 with following exceptions:

- Table 7.5.5.5.5-1 is replaced by Table 17.5.2.5.5-1.

**Table 17.5.2.5.5-1: NR Cell specific test parameters**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | Setup 1 defined in A.9 | | | | |
| Assumption for UE beams Note 9 | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSS | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | dB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR_SSB of set $q_0$ | | dB | 13.7 Note 10 | 5.7 Note 10 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | | dB | 0.2 | 0.2 | 20 | 20 | 20 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS | -104.5 | -104.5 | -84.7 | -84.7 | -84.7 |
| | Config 2 | | -101.5 | -101.5 | -81.7 | -81.7 | -81.7 |
| $N_{oc}$ | | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | | | TDL-A 30 ns 75 Hz | | | | |

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting is assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.5.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2 Rx on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1 dB degradation from applied SNR to UE baseband.

## 17.5.3 Active BWP switch delay for RedCap

### 17.5.3.1 DCI-based and time-based active BWP switch for RedCap

#### 17.5.3.1.0 Minimum conformance requirements for DCI-based and time-based active BWP switch

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with more than one BWP configurations configured.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ + Y which starts from the beginning of DL slot n. Where,

- Y = 0, if the serving cell where UE receives DCI for BWP switch request is same as the serving cell on which BWP switch occurs.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* defined in TS 38.331 [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* defined in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 17.5.3.1.0-1.

**Table 17.5.3.1.0-1: BWP switch delay**

| $\mu$ | NR Slot length (ms) | BWP switch delay $T_{BWPswitchDelay}$ (slots) | |
|---|---|---|---|
| | | Type 1[Note 1] | Type 2[Note 1] |
| 3 | 0.125 | 6 | 18 |
| Note 1: Depends on UE capability.<br>Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. | | | |

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] clause 8.10 in the new BWP.

The normative reference for this requirement is TS 38.133 [6] clause 8.6A.2.

### 17.5.3.1.1 NR SA FR2 DCI-based and Timer-based DL active BWP switch for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.5.3.1.1.1 Test purpose

To verify the DL BWP switch delay requirement defined in in TS 38.133 [6] clause 8.6A.

#### 17.5.3.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 17.5.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.3.1.1.

#### 17.5.3.1.1.4 Test description

##### 17.5.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.5.3.1.1.4.1-1.

**Table 17.5.3.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.3.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test equipment and the DUT according to the parameters in Table 17.5.3.1.1.4.1-2.

**Table 17.5.3.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 17.5.3.1.1.4.1-3.

2. Message contents are defined in clause 17.5.3.1.1.4.3.

3. The test scenario comprises of one NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 17.5.3.1.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| *bwp-InactivityTimer* | ms | 200 | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |
| T3 | s | 0.2 | |

### 17.5.3.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

The Cell 1 has constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 17.5.3.1.1.4.1-3, 17.5.3.1.1.5-1 and 17.5.3.1.1.5-2.

3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, which always include the bandwidth of the initial DL BWP and SSB. The SS indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*. UE is configured with a *bwp-InactivityTimer* timer value for Cell 1.

4. The SS sends a DCI format 1_1 to trigger Cell 1 DL BWP switch. T1 starts from the slot (denoted as slot #i) in which the UE receiving the DCI format 1_1.

5. If the UE,

   - starts to report valid ACK/NACK for Cell 1 on BWP-2 from the first UL slot that occurs after the beginning of DL slot ($i$+$T_{BWPswitchDelay}$+$k_1$),

   then count a success for the event "DCI-based", go to step 6. Otherwise, count a fail for the event "DCI-based", switch off/on the UE and go to step 1.

6. T2 starts. During T2 the SS stops scheduling DL reception on Cell 1 to let timer *bwp-InactivityTimer* expire.

7. T3 starts from the first slot (denoted as slot #j) of the DL half-frame immediately after the timer *bwp-InactivityTimer* expires. During T3 the SS restarts scheduling DL reception on Cell 1.

8. If the UE,

   - starts to report valid ACK/NACK for Cell1 on BWP 1 from the first UL slot that occurs after the beginning of DL slot ($j$+$T_{BWPswitchDelay}$+$k_1$). The number of successful subtests is increased by one and go to step 9 after T3 expires. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

   then count a success for the event "Timer-based", go to step 9. Otherwise, count a fail for the event "Timer-based", switch off/on the UE and go to step 1.

9. Repeat steps 4-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

If all events pass, the test passes. If one event fails, the test fails.

#### 17.5.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.5.3.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 17.5.3.1.1.4.3-2: *RRCReconfiguration* (Step 3)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 17.5.3.1.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.5.3.1.1.4.3-3: *CellGroupConfig* (Table 17.5.3.1.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 17.5.3.1.1.4.3-4 | |
| } | | | |
| } | | | |

**Table 17.5.3.1.1.4.3-4: *ServingCellConfig* (Table 17.5.3.1.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 2 entries | | |
| BWP-Downlink[1] | BWP-Downlink with condition BWP1 | entry 1 Table 17.5.3.1.1.4.3-5 | |
| BWP-Downlink[2] | BWP-Downlink with condition BWP2 | entry 2 Table 17.5.3.1.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | According to BWP-1 | |
| bwp-InactivityTimer | ms200 | | |
| defaultDownlinkBWP-Id | 1 | According to BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| BWP-Uplink[1] | BWP-Uplink with condition BWP1 | entry 1 Table 17.5.3.1.1.4.3-6 | |
| BWP-Uplink[2] | BWP-Uplink with condition BWP2 | entry 2 Table 17.5.3.1.1.4.3-6 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | According to BWP-1 | |
| } | | | |
| } | | | |

**Table 17.5.3.1.1.4.3-5: *BWP-Downlink* (Table 17.5.3.1.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | BWP2 |
| pdsch-ConfigCommon CHOICE { | | | |
| setup | PDSCH-ConfigCommon | Table 17.5.3.1.1.4.3-7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.5.3.1.1.4.3-6: *BWP-Uplink* (Table 17.5.3.1.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | BWP-1 | BWP1 |
| | 2 | BWP-2 | BWP2 |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | BWP-1 | BWP1 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | BWP-2 | BWP2 |
| } | | | |
| } | | | |

**Table 17.5.3.1.1.4.3-7: *PDSCH-ConfigCommon* (Table 17.5.3.1.1.4.3-5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-101 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon ::= SEQUENCE { | | | |
| pdsch-TimeDomainAllocationList | PDSCH-TimeDomainResourceAllocationList | Table 17.5.3.1.1.4.3-8 | |
| } | | | |

**Table 17.5.3.1.1.4.3-8: *PDSCH-TimeDomainResourceAllocationList* (Table 17.5.3.1.1.4.3-7)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-103 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation { | 4 entries | | |
| PDSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | entry 1 | |
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S) = 2, Length(L) = 12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | entry 2 | |

| | | | |
|---|---|---|---|
| k0 | Not present | | |
| mappingType | typeA | | |
| startSymbolAndLength | 72 | S = 2, L = 6 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[3] SEQUENCE { | | entry 3 | |
| k0 | $T_{BWPswitchDelay}$ | Defined in Table 17.5.3.1.0.1-1 | The DCI indicating BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S) = 2, Length(L) = 12 | |
| } | | | |
| PDSCH-TimeDomainResourceAllocation[4] SEQUENCE { | | entry 4 | |
| k0 | 1 | | First DCI right after DCI-based BWP switch |
| mappingType | typeA | | |
| startSymbolAndLength | 53 | Start symbol(S) = 2, Length(L) = 12 | |
| } | | | |
| } | | | |

### 17.5.3.1.1.5 Test requirements

Tables 17.5.3.1.1.4.1-3, 17.5.3.1.1.5-1 and 17.5.3.1.1.5-2 define the primary level settings including test tolerances.

**Table 17.5.3.1.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | 1, 2 |
| Initial DL BWP Configuration | | DLBWP.0.2 Note 2 |
| Active DL BWP-1 Configuration | | DLBWP.1.1 Note 2 |
| Active DL BWP-2 Configuration | | DLBWP.1.3 Note 2 |
| Initial UL BWP Configuration | | ULBWP.0.2 Note 2 |
| Active UL BWP-1 Configuration | | ULBWP.1.1 Note 2 |
| Active UL BWP-2 Configuration | | ULBWP.1.3 Note 2 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State | | TCI.State.0 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |

| | | |
|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | AWGN |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

**Table 17.5.3.1.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in clause A.9.1 |
| Assumption for UE beams Note 6 | | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 |
| $N_{oc}$ Note 1 | dBm/SCS | -103 |
| SS-RSRP Note 2 | dBm/SCS Note3 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot ($i + T_{BWPswitchDelay} + k_1$).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs right after the beginning of DL slot ($j + T_{BWPswitchDelay} + k_1$).

Where, $k_1$ is the timing between DL data receiving and acknowledgement as specified in TS 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* defined in TS 38.331 [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6A.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot ($i + T_{BWPswitchDelay}+k_1$), ($j + T_{BWPswitchDelay} + k_1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

## 17.5.3.2 RRC-based active BWP switch for RedCap

### 17.5.3.2.0 Minimum conformance requirements for RRC-based active BWP switch

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

Active BWP switch or parameter change of its active BWPs for PCell

Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCell

For RRC-based BWP switch, after the UE receives *RRCreconfiguration* involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$NR\ Slot\ length$ is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6\ ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where $T_{HARQ}$ is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6A.3.

### 17.5.3.2.1 NR SA FR2 RRC-based DL active BWP switch for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

#### 17.5.3.2.1.1 Test purpose

To verify the DL BWP switch delay requirement for RRC-based BWP switch defined in in TS 38.133 [6] clause 8.6A.3.

#### 17.5.3.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting BWP adaptation of at least 2 BWPs.

#### 17.5.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.3.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.3.2.1.

#### 17.5.3.2.1.4 Test description

##### 17.5.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.5.3.2.1.4.1-1.

**Table 17.5.3.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.3.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.5.3.2.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.5.3.2.1.4.1-2.

**Table 17.5.3.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 17.5.3.2.1.4.1-3.

2. Message contents are defined in clause 17.5.3.2.1.4.3.

3. The test scenario comprises of one NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

**Table 17.5.3.2.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | |
| T1 | s | 0.2 | |

### 17.5.3.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1. Cell 1 has constant signal level throughout the test. PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 17.5.3.2.1.4.1-3, Table 17.5.3.2.1.5-1 and Table 17.5.3.2.1.5-2. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 17.5.3.2.1.5-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 17.5.3.2.1.5-1. T1 starts.

6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.

7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i + X + k_1$ then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where:

   - X = 128 for test configuration 17.5.3.2.1-1;

   - X = 256 for test configuration 17.5.3.2.1-2.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.

9. After the RRC connection release, the SS:

   - transmits in NR Cell 1 a Paging message for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PCell by counting the slots from the time when the *RRCReconfiguration* message including updated BWP configuration is sent till a valid ACK/NACK is received.

#### 17.5.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.5.3.2.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |

**Table 17.5.3.2.1.4.3-2: *RRCReconfiguration* (Test procedure, Steps 3 and 5)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table 17.5.3.2.1.4.3-3 | |
| dedicatedNAS-MessageList | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.5.3.2.1.4.3-3: *CellGroupConfig* (Table 17.5.3.2.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | Table 17.5.3.2.1.4.3-4 | |
| } | | | |
| } | | | |

**Table 17.5.3.2.1.4.3-4: *ServingCellConfig* (Table 17.5.3.2.1.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| pdcch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pdsch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| radioLinkMonitoringConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] SEQUENCE { | BWP-Downlink | entry 1 Table 17.5.3.2.1.4.3-5 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | BWP-1 | |
| defaultDownlinkBWP-Id | 1 | BWP-1 | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | | | |
| pucch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| pusch-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| srs-Config CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1 Table 17.5.3.2.1.4.3-6 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | BWP-1 | |
| } | | | |
| } | | | |

**Table 17.5.3.2.1.4.3-5: *BWP-Downlink* (Table 17.5.3.2.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3 | | Step 3 |

| | | | |
|---|---|---|---|
| | RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

**Table 17.5.3.2.1.4.3-6: *BWP-Uplink* (Table 17.5.3.2.1.4.3-4)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3 | | Step 3 |
| | RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1 | | Step 5 |
| } | | | |
| } | | | |

17.5.3.2.1.5 Test requirements

Tables 17.5.3.2.1.4.1-3, 17.5.3.2.1.5-1 and 17.5.3.2.1.5-2 define the primary level settings including test tolerances.

**Table 17.5.3.2.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Cell 1 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | | | TDD |
| TDD configuration | | | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 |
| Initial Condition | Active DL BWP-1 Configuration | | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | | ULBWP.1.1 |
| 'PDSCH Reference measurement channel | | | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| TCI State | | | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8]. |

**Table 17.5.3.2.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Angle of arrival configuration | | Setup 1 defined in clause A.9.1 |
| Assumption for UE beams Note 6 | | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 |
| $N_{oc}$ Note 1 | dBm/SCS | -103 |
| SS-RSRP Note 2 | dBm/SCS Note3 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 |
| $\hat{E}_s/N_{oc}$ Note 5 | dB | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 |

| | |
|---|---|
| Note 1: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 2: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 3: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 4: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone |
| Note 5: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs after the beginning of slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.214 [9].

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

## 17.5.4 Active TCI state switch delay for RedCap

### 17.5.4.0 Minimum conformance requirements

#### 17.5.4.0.1 Known conditions for TCI state

The minimum requirements given in clause 7.5.4.0.0 shall apply.

#### 17.5.4.0.2 Minimum conformance requirements for MAC-CE based active TCI state switch

The minimum requirements given in clause 7.5.4.0.1 shall apply.

#### 17.5.4.0.3 Minimum conformance requirements for RRC based active TCI state switch

The minimum requirements given in clause 7.5.4.0.2 shall apply.

### 17.5.4.1 MAC-CE based active TCI state switch for RedCap

#### 17.5.4.1.1 NR SA FR2 MAC-CE based active TCI state switch for a known TCI state for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

##### 17.5.4.1.1.1 Test purpose

To verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10B.3.

##### 17.5.4.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

##### 17.5.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.4.0.1 and 17.5.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.4.1.1.

##### 17.5.4.1.1.4 Test description

###### 17.5.4.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.8.1.1.4.1 with following exceptions:

- Table 7.5.8.1.1.4.1-1 is replaced by Table 17.5.4.1.1.4.1-1;
- Table 7.5.8.1.1.4.1-2 is replaced by Table 17.5.4.1.1.4.1-2;
- Table 7.5.8.1.1.4.1-3 is replaced by Table 17.5.4.1.1.4.1-3.

**Table 17.5.4.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.4.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.5.4.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.4.1.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | |

### 17.5.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.5.8.1.1.4.2.

### 17.5.4.1.1.4.3 Message contents

Same as the message contents given in clause 7.5.8.1.1.4.3.

### 17.5.4.1.1.5 Test requirement

Same as the test requirements given in clause 7.5.8.1.1.5 with following exceptions:

- Table 7.5.8.1.1.5-1 is replaced by Table 17.5.4.1.1.5-1;
- Table 7.5.8.1.1.5-2 is replaced by Table 17.5.4.1.1.5-2.

**Table 17.5.4.1.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | No external noise (Note 2) |

| | |
|---|---|
| Note 1: | OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0. |

**Table 17.5.4.1.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 4 | | Rough | | | |
| $\hat{E}_s$ | dBm/SCS | -80.9+ | -80.9 | -Infinity | -80.9 |
| SSB_RP Note 1 | dBm/SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note1 | dBm/95.04 MHz Note2 | -55.71 | -55.71 | - Infinity | -55.71 |

Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 3: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

## 17.5.4.2 RRC based active TCI state switch for RedCap

### 17.5.4.2.1 NR SA FR2 RRC-CE based active TCI state switch for a known TCI state for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.5.4.2.1.1 Test purpose

To verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10B.5.

#### 17.5.4.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting SA FR2, more than one TCI state configuration, and more than one simultaneously trackable TRS resource set.

#### 17.5.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.4.0.1 and 17.5.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.4.2.1.

#### 17.5.4.2.1.4 Test description

##### 17.5.4.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.8.2.1.4.1 with following exceptions:

- Table 7.5.8.2.1.4.1-1 is replaced by Table 17.5.4.2.1.4.1-1;
- Table 7.5.8.2.1.4.1-2 is replaced by Table 17.5.4.2.1.4.1-2;
- Table 7.5.8.2.1.4.1-3 is replaced by Table 17.5.4.2.1.4.1-3.

**Table 17.5.4.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.4.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.5.4.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.4.2.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

##### 17.5.4.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.5.8.2.1.4.2.

##### 17.5.4.2.1.4.3 Message contents

Same as the message contents given in clause 7.5.8.2.1.4.3.

#### 17.5.4.2.1.5 Test requirement

Same as the test requirements given in clause 7.5.8.2.1.5 with following exceptions:

- Table 7.5.8.2.1.5-1 is replaced by Table 17.5.4.2.1.5-1;
- Table 7.5.8.2.1.5-2 is replaced by Table 17.5.4.2.1.5-2.

**Table 17.5.4.2.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |

| | | |
|---|---|---|
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | | 24 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.2 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.5 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| TCI State 0 | | TCI.State.0 |
| TCI State 1 | | TCI.State.1 |
| *reportConfigType* | | ssb-Index-RSRP |
| *reportConfigType* | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 640 |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | No external noise (Note 2) |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

**Table 17.5.4.2.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 4 | | Rough | | | |
| $\hat{E}_S$ | dBm/SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| SSB_RP Note 1 | dBm/SCS | -80.9 | -80.9 | -Infinity | -80.9 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note1 | dBm/95.04 MHz Note2 | -55.71 | -55.71 | - Infinity | -55.71 |

Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 3: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

## 17.5.5 Uplink spatial relation switch delay for RedCap

### 17.5.5.1 MAC-CE based Spatial Relation switch for RedCap

#### 17.5.5.1.0 Minimum conformance requirements MAC-CE based uplink spatial relation switch delay

The spatial relation associated to DL RS is known if the following conditions are met:

- During the period from the last transmission of the DL RS resource used for the L1-RSRP measurement reporting for the target spatial relation to the completion of active spatial relation, where the DL RS resource for L1-RSRP measurement is the DL RS in target spatial relation or QCLed to the target spatial relation with QCL type-D.
  - Spatial relation switch command is received within 1280 ms upon the last transmission of the DL RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target spatial relation before the spatial relation switch command
  - The DL RS configured in spatial relation remains detectable during the spatial relation switching period
    - SNR of the DL RS configured in spatial relation ≥ -3 dB
  - The SSB associated with the spatial relation remain detectable during the spatial relation switching period
    - SNR of the SSB associated with the spatial relation ≥ -3 dB

Otherwise, the spatial relation is unknown.

If the target spatial relation associated to DL RS is known and UE is configured with uplink resources for transmission on target spatial relation, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation no later than slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ 1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1 where $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8].

If the target spatial relation associated to DL RS is unknown and UE is configured with uplink resources for transmission on target spatial relation, upon receiving PDSCH carrying MAC-CE activation command in slot n, for UL spatial relation switch for PUCCH or semi-persistent SRS transmission of serving cell with a target UL spatial relation, the UE shall be able to transmit PUCCH or semi-persistent SRS with the target UL spatial relation no later than slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$+ $T_{L1\text{-}RSRP}$+1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- $T_{HARQ}$ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8],
- $T_{L1\text{-}RSRP}$ is the time for Rx beam refinement in FR2, defined as
  - $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ for SSB as specified in clause 9.5B,
    - with the assumption of M = 1
    - with $T_{Report}$ = 0
  - $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ for CSI-RS as specified in clause 9.5.4.2
    - configured with higher layer parameter *repetition* set to ON
    - with the assumption of M = 1 for periodic CSI-RS
    - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
    - with $_{T}$Report = 0

The UE shall be able to transmit with the old UL spatial relation until slot n+ $T_{HARQ}$ + $3N_{slot}^{subframe,\mu}$.

When the UL spatial relation info switch for PUCCH changes both the associated DL RS and *pucch-PathlossReferenceRS* with the same MAC-CE activation, and if both the DL RS and *pucch-PathlossReferenceRS* are known as specified in clauses 8.12A.2 and 8.14.2 respectively, the UE shall be able to transmit PUCCH with the target UL spatial relation after the delay specified in clause 8.14.3. If either the associated DL RS or *pucch-PathlossReferenceRS* are unknown, a longer switching delay is allowed. The UE is not required to transmit PUCCH with the target UL spatial relation until the DL RS and pathloss reference RS switch are completed.

The normative reference for this requirement is TS 38.133 [6] clauses 8.12A.2 and 8.12A.3.

### 17.5.5.1.1 NR SA FR2 MAC-CE based spatial relation switch associated with known DL-RS for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are still TBD.

TT analysis is available for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

#### 17.5.5.1.1.1 Test purpose

To verify fulfillment of the uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12A.3 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 17.5.5.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.5.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.5.1.1.

#### 17.5.5.1.1.4 Test description

##### 17.5.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.9.1.1.4.1 with following exceptions:

- Table 7.5.9.1.1.4.1-1 is replaced by Table 17.5.5.1.1.4.1-1;
- Table 7.5.9.1.1.4.1-2 is replaced by Table 17.5.5.1.1.4.1-2;
- Table 7.5.9.1.1.4.1-3 is replaced by Table 17.5.5.1.1.4.1-3.

**Table 17.5.5.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.5.1.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.5.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.5.1.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | [0.2] | |
| T2 | s | [2] | |

### 17.5.5.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.5.9.1.1.4.2.

### 17.5.5.1.1.4.3 Message contents

Same as the message contents given in clause 7.5.9.1.1.4.3.

### 17.5.5.1.1.5 Test requirements

Same as the test requirements given in clause 7.5.9.1.1.5 with following exceptions:

- Table 7.5.9.1.1.5-1 is replaced by Table 17.5.5.1.1.5-1;
- Table 7.5.9.1.1.5-2 is replaced by Table 17.5.5.1.1.5-2.

- **Table 17.5.5.1.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |

| | | |
|---|---|---|
| SMTC Configuration | | SMTC.1 |
| TCI State-0 Configuration | | TCI.State.0 |
| *reportConfigType* | | ssb-Index-RSRP |
| *reportConfigType* | | periodic |
| timeRestrictionForChannelMeasurements | | configured |
| TRS Configuration | | TRS.2.1 TDD |
| Spatial Relation Info-0 Configuration | | PUCCH.SRI.0 |
| Spatial Relation Info-1 Configuration | | PUCCH.SRI.1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 17.5.5.1.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 | | | |
|---|---|---|---|---|---|
| | | SSB0 | | SSB1 | |
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | | -infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | | -infinity | -82.1 |
| Io Note2 | dBm/95.04 MHz Note4 | -50.6 | | -54.1 | -50.6 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |
| Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | | |
| Note 5: As observed with 0 dBi gain antenna at the center of the quiet zone. | | | | | |
| Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | |

## 17.5.5.2 RRC based spatial relation switch for RedCap

### 17.5.5.2.0 Minimum conformance requirements RRC based uplink spatial relation switch delay

The spatial relation associated to DL RS is known if the following conditions are met:

- During the period from the last transmission of the DL RS resource used for the L1-RSRP measurement reporting for the target spatial relation to the completion of active spatial relation, where the DL RS resource for

L1-RSRP measurement is the DL RS in target spatial relation or QCLed to the target spatial relation with QCL type-D.

- Spatial relation switch command is received within 1280 ms upon the last transmission of the DL RS resource for beam reporting or measurement
- The UE has sent at least 1 L1-RSRP report for the target spatial relation before the spatial relation switch command
- The DL RS configured in spatial relation remains detectable during the spatial relation switching period
  - SNR of the DL RS configured in spatial relation ≥ -3 dB
- The SSB associated with the spatial relation remain detectable during the spatial relation switching period
  - SNR of the SSB associated with the spatial relation ≥ -3 dB

Otherwise, the spatial relation is unknown.

If the target spatial relation associated to DL RS is known and UE is configured with uplink resources for transmission on target spatial relation, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured no later than slot n+ $T_{RRC_processing}$ /*NR slot length* +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command,
- $T_{RRC_processing}$ is the RRC processing delay defined in TS 36.331 [29] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS 38.331 [13].

If the target spatial relation associated to DL RS is unknown and UE is configured with uplink resources for transmission on target spatial relation, UE shall be able to transmit target periodic SRS with spatial relation of the serving cell on which periodic SRS with spatial relation reconfigured no later than slot n+ $T_{RRC_processing}$ /*NR slot length* + $T_{L1\text{-}RSRP}$ +1 when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command,
- $T_{RRC_processing}$ is the RRC processing delay defined in TS 36.331 [29] is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in TS 38.331 [13].
- $T_{L1\text{-}RSRP}$ is defined in clause 8.12A.3

For RedCap UE in HD-FDD mode, if a downlink reception overlaps with target periodic SRS with spatial relation of the serving cell with periodic SRS with spatial relation reconfigured then the UE is allowed to postpone the uplink transmission.

The normative reference for this requirement is TS 38.133 [6] clauses 8.12A.2 and 8.12A.5.

#### 17.5.5.2.1 NR SA FR2 RRC-based spatial relation switch associated with a known DL-RS for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are still TBD.

TT analysis is available for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- -- The test is incomplete for test frequencies > 40.8 GHz

#### 17.5.5.2.1.1 Test purpose

To verify fulfillment of the uplink spatial relation switch delay requirement defined in TS 38.133 [6] clause 8.12A.5 by a UE capable of beam correspondence without the need for UL beam sweeping.

#### 17.5.5.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.5.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.5.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.5.2.1.

#### 17.5.5.2.1.4 Test description

Same as the test description given in clause 7.5.9.2.1.4.

##### 17.5.5.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.9.2.1.4.1 with following exceptions:

- Table 7.5.9.2.1.4.1-1 is replaced by Table 17.5.5.2.1.4.1-1;
- Table 7.5.9.2.1.4.1-2 is replaced by Table 17.5.5.2.1.4.1-2;
- Table 7.5.9.2.1.4.1-3 is replaced by Table 17.5.5.2.1.4.1-3.

**Table 17.5.5.2.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.5.2.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table 17.5.5.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.5.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.5.5.2.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active PCell | | Cell 1 | PCell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| Cell-individual offset for cells on RF channel 1 | dB | 0 | Individual offset for cells on PCC. |
| *timeRestrictionForChannelMeasurements* | | configured | Time domain measurement restriction for the channel (signal) measurements (see TS 38.214 [9], clause 5.2.1.1) |

| | | | |
|---|---|---|---|
| T1 | s | 0.5 | |
| T2 | s | 1.5 | |

#### 17.5.5.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.5.9.2.1.4.2.

#### 17.5.5.2.1.4.3 Message contents

Same as the message contents given in clause 7.5.9.2.1.4.3.

### 17.5.5.2.1.5 Test requirements

Same as the test requirements given in clause 7.5.9.2.1.5 with following exceptions:

- Table 7.5.9.2.1.5-1 is replaced by Table 17.5.5.2.1.5-1;
- Table 7.5.9.2.1.5-2 is replaced by Table 17.5.5.2.1.5-2.

**Table 17.5.5.2.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Initial DL BWP Configuration | | DLBWP.0.2 |
| Dedicated DL BWP Configuration | | DLBWP.1.1 |
| Initial UL BWP Configuration | | ULBWP.0.2 |
| Dedicated UL BWP Configuration | | ULBWP.1.1 |
| PDSCH Reference measurement channel | | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 |
| SSB Configuration | | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 |
| *SRS-SpatialRelation0* | | SRS.SRI0 |
| *SRS-SpatialRelation1* | | SRS.SRI1 |
| *reportConfigType* | | ssb-Index-RSRP |
| *reportConfigType* | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 160 |
| TRS Configuration | | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation Condition | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 17.5.5.2.1.5-2: OTA related test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|

| | | SSB0 | | SSB1 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | Setup 3 according to clause A.9.3 | | | |
| | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -infinity | 1 |
| SS-RSRP Note 2 | dBm/SCS Note3 | -82.1 | -82.1 | -infinity | -82.1 |
| Io Note2 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 5: As observed with 0 dBi gain antenna at the center of the quiet zone.
Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

## 17.5.6 UE specific CBW change for RedCap

### 17.5.6.0 Minimum conformance requirements

#### 17.5.6.0.1 Minimum conformance requirements for UE specific CBW change

The minimum conformance requirements given in clause 16.5.4.0.1 applies.

### 17.5.6.1 NR SA FR2 UE specific CBW change on PCell for 2 Rx UE

#### 17.5.6.1.1 Test purpose

To verify the UE specific CBW change delay requirement defined in TS 38.133 [6] clause 8.13A.

#### 17.5.6.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

#### 17.5.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.6.1.

#### 17.5.6.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

During T1 the TE sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received.

#### 17.5.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.5.6.1.4.1-1.

**Table 17.5.6.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 17.5.6.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.5.6.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.5.6.1.4.1-2.

**Table 17.5.6.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.5.6.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 17.5.6.1.4.1-3.
2. Message contents are defined in clause 17.5.6.1.4.3.
3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

**Table 17.5.6.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1 | One NR radio channel is used for this test |
| Active Cell | | Cell 1 | Cell on RF channel number 1. |
| CP length | | Normal | |
| DRX | | OFF | |
| T1 | s | 0.2 | |

#### 17.5.6.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.
2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.
3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.
4. T1 starts from the beginning of the last slot (denoted as slot #i) carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ , then the number of successful tests is increased by one.
Otherwise, the number of failure tests is increased by one.

6. After the SS receives the ACK/NACK in step 5 or when T1 expires, the SS shall

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

7. Depending on the choice in step 6, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 6. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 6.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 17.5.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.5.6.1.4.3-1:*ServingCellConfigCommon* (steps 1, 3 and 8, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| downlinkConfigCommon SEQUENCE { | | | |
| initialDownlinkBWP SEQUENCE { | | | |
| genericParameters | Set according to DLBWP.0.1 | | |
| } | | | |
| } | | | |
| uplinkConfigCommon SEQUENCE { | | | |
| initialUplinkBWP SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters | Set according to ULBWP.0.1 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.5.6.1.4.3-2: *ServingCellConfig* (steps 1, 3 and 8, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-UL | Entry 1 Table 17.5.6.1.4.3-4 | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier { | 1 entry | | |
| SCS-SpecificCarrier[1] | SCS-SpecificCarrier-DL | Entry 1 Table 17.5.6.1.4.3-3 | |
| } | | | |
| } | | | |

**Table 17.5.6.1.4.3-3: *SCS-SpecificCarrier-DL* (Table 17.5.6.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | The offset between point A and the lowest PRB index to guarantee the CBW including SSB and CORESET#0 | CBW-1 (DLCBW.1.1) | step 1 or step 8 |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1 [14] clause 4.3.1. | CBW-2 (DLCBW.1.2) | step 3 |
| } | | | |

**Table 17.5.6.1.4.3-4: *SCS-SpecificCarrier-UL* (Table 17.5.6.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-160 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SCS-SpecificCarrier ::= SEQUENCE { | | | |
| offsetToCarrier | Any offset within the CBW of test frequency given in TS 38.508-1 [14] clause 4.3.1.and different with offsetToCarrier of ULCBW.1.2 | CBW-1 (ULCBW.1.1) | step 1 or step 8 |
| | The offset between Point A and the lowest usable subcarrier on this carrier, i.e. the offsetToCarrier given in TS 38.508-1 [14] clause 4.3.1. | CBW-2 (ULCBW.1.2) | step 3 |
| } | | | |

### 17.5.6.1.5 Test requirement

Table 17.5.6.1.4.1-3, Table 17.5.6.1.5-1 and Table 17.5.6.1.5-2 define the primary level settings including test tolerances.

**Table 17.5.6.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 |
| Active DL BWP ID | | 1 |
| Initial DL BWP Configuration (BWP-1) | | DLBWP.0.1 |

| | | | |
|---|---|---|---|
| Initial UL BWP Configuration | | | ULBWP.0.1 |
| Initial Condition | Active DL CBW-1 Configuration | | DLCBW.1.1 |
| | Active UL CBW-1 Configuration | | ULCBW.1.1 |
| Final Condition | Active DL CBW-1 Configuration | | DLCBW.1.2 |
| | Active UL CBW-1 Configuration | | ULCBW.1.2 |
| 'PDSCH Reference measurement channel | | | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 |
| SSB Configuration | | | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 |
| TCI State | | | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 |
| Propagation Condition | | | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

**Table A.17.5.6.1.1-4: OTA related test parameters for UE specific CBW change test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 according to table A.3.15 |
| Assumption for UE beams Note 5 | | | Fine |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/15kHz | -112 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS | -103 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| SS-RSRP Note2 | NR_TDD_FR2_A | dBm/SCS Note3 | -85 |
| | NR_TDD_FR2_B | | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |
| $\hat{E}_s/I_{ot}$ | | dB | 18 |
| Io Note2 | NR_TDD_FR2_A | | -56 |

| | | | |
|---|---|---|---|
| | NR_TDD_FR2_B | dBm/95.04 MHz Note4 | |
| | NR_TDD_FR2_F | | |
| | NR_TDD_FR2_G | | |
| | NR_TDD_FR2_T | | |
| | NR_TDD_FR2_Y | | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs after the beginning of slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{CBWchangeDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\text{RRCprocessingDelay}}+T_{\text{CBWchangeDelayRRC}}}{\text{NR Slot length}}$ + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.213 [8].

All of the above test requirements shall be fulfilled in order for the observed PCell UE specific CBW change delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

# 17.6 Measurement procedures for RedCap

## 17.6.1 Intra-frequency measurements for RedCap

### 17.6.1.0 Minimum conformance requirements

#### 17.6.1.0.1 General

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP as specified in 3GPP TS 38.213 [8].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in TS 38.133 [6] clause 9.2B.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5 ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5 ms for frequency range 1.

The requirements in this clause apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- For 2 Rx RedCap:
  - SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding band,
  - SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding band,
  - SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding band,
  - SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding band.

For 2 Rx RedCap: The requirements in TS 38.133 [6] clause 9.2.4.3 shall apply.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x $TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 17.6.1.0.2 or clause 17.6.1.0.3. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index_RedCap}$ as defined in clause 17.6.1.0.2 or clause 17.6.1.0.3. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 17.6.1.0.2 or clause 17.6.1.0.3 becomes undetectable for a period $\leq 5$ seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.1 and 9.2B.4.3.

### 17.6.1.0.2 Minimum conformance requirements for event-triggered measurement without gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2.

$$T_{identify_intra_without_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap})\ ms$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 17.6.1.0.2-1.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 17.6.1.0.2-2.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non-overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

For 2 Rx RedCap:

$M_{pss/sss_sync_w/o_gaps_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 24. For a UE supporting FR2 power class 7, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 24.

$M_{meas_period_w/o_gaps_RedCap}$: For a UE supporting power class 1 or 5, $M_{meas_period_w/o_gaps_RedCap}$ = 40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps_RedCap}$ = 24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps_RedCap}$ = 24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps_RedCap}$ = 24. For a UE supporting power class 7, $M_{meas_period_w/o_gaps_RedCap}$ = 24.

When intra-frequency SMTC is fully non-overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp = 1.

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. For calculation of Kp, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index_RedCap}$.

For FR2,

$K_{layer1_measurement}$ = 1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$ = 1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra_RedCap}$.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

**Table 17.6.1.0.2-1: Time period for PSS/SSS detection, (Frequency range 2) for 2 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, ceil($M_{pss/sss_sync_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | ceil($M_{pss/sss_sync_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 17.6.1.0.2-2: Measurement period for intra-frequency measurements without gaps (FR2) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max(400 ms, ceil($M_{meas_period_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(400 ms, ceil(1.5 x $M_{meas_period_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | ceil($M_{meas_period_w/o_gaps_RedCap}$ x $K_p$ x $K_{layer1_measurement}$ ) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

**Table 17.6.1.0.2-3: Measurement period for intra-frequency measurements without gaps (FR1) for 1 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max(200 ms, ceil( 5 x $K_p$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(200] ms, ceil(1.5x 5 x $K_p$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | ceil( 5 x $K_p$ ) x DRX cycle x $CSSF_{intra_RedCap}$ |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified. | |

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration (The signalling *deriveSSB_IndexFromCell* is always enabled for FR2). If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*; otherwise the SMTC periodicity follows *smtc1*.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration (The signalling *deriveSSB_IndexFromCellc* is always enabled for FR2). If the high layer signalling of *smtc2* is configured in TS 38.331 [13], the SMTC periodicity follows *smtc2*; otherwise the SMTC periodicity follows *smtc1*.

If following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots.

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.5.

### 17.6.1.0.3 Minimum conformance requirements for event-triggered measurement with gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra-frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2.

$$T_{identify_intra_without_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 17.6.1.0.3-1.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 17.6.1.0.3-2.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps.

For 2 Rx RedCap:

$M_{pss/sss_sync_with_gaps_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync\ with_gaps_RedCap} = 40$. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps_RedCap} = 24$. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps_RedCap} = 24$. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps_RedCap} = 24$. For a UE supporting FR2 power class 7, $M_{pss/sss_sync\ with_gaps_RedCap} = 24$.

$M_{meas_period_with_gaps_RedCap}$: For a UE supporting power class 1 or 5, $M_{meas_period_with_gaps_RedCap} = 40$. For a UE supporting power class 2, $M_{meas_period_with_gaps_RedCap} = 24$. For a UE supporting power class 3, $M_{meas_period_with_gaps_RedCap} = 24$. For a UE supporting power class 4, $M_{meas_period\ with_gaps_RedCap} = 24$. For a UE supporting power class 7, $M_{meas_period_with_gaps_RedCap} = 24$.

If the higher layer signalling in TS 38.331 [13] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index_RedCap}$ or $T_{identify_intra_with_index_RedCap.}$

**Table 17.6.1.0.3-1: Time period for PSS/SSS detection (FR2) for 2 Rx RedCap UE**

| DRX cycle | $T_{PSS/SSS_sync_intra_RedCap}$ |
|---|---|
| No DRX | max(600 ms, $M_{pss/sss_sync_with_gaps_RedCap}$ x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |
| DRX cycle ≤ 320 ms | max(600 ms, ceil(1.5x $M_{pss/sss_sync_with_gaps_RedCap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra_RedCap_RedCap}$ |
| DRX cycle > 320 ms | $M_{pss/sss_sync_with_gaps_RedCap}$ x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

**Table 17.6.1.0.3-2: Measurement period for intra-frequency measurements with gaps (FR2) for 2 Rx RedCap UE**

| DRX cycle | $T_{SSB_measurement_period_intra_RedCap}$ |
|---|---|
| No DRX | max(400 ms, $M_{meas_period\ with_gaps_RedCap}$ x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$ |

| | |
|---|---|
| DRX cycle ≤ 320 ms | max(400 ms, ceil(1.5 x $M_{meas_period\ with_gaps_RedCap}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra_RedCap}$ |
| DRX cycle > 320 ms | $M_{meas_period\ with_gaps_RedCap}$ x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$ |

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.6.

## 17.6.1.1 NR SA FR2 event triggered reporting without gap in non-DRX for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

### 17.6.1.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements for RedCap in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 17.6.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from release 17 onwards.

### 17.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.6.1.0.1 and 17.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.1.

### 17.6.1.1.4 Test description

#### 17.6.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.1.1.4.1 with following exceptions:

- Table 7.6.1.1.4.1-1 is replaced by Table 17.6.1.1.4.1-1.
- Table 7.6.1.1.4.1-2 is replaced by Table 17.6.1.1.4.1-2.

**Table 17.6.1.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.1.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.1.1-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test requirement and the DUT according to the parameters in Table 17.6.1.1.4.1-2.

**Table 17.6.1.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.1.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2 |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.6.1.1.4.1-3: General test parameters**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | PCell (Cell 1) | |
| Neighbour cell | | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1, 2 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| SMTC configuration | | 1, 2 | SMTC.1 | |
| *A3-Offset* | dB | 1, 2 | -11 | |
| CP length | | 1, 2 | Normal | |
| *Hysteresis* | dB | 1, 2 | 0 | |
| *TimeToTrigger* | s | 1, 2 | 0 | |
| Filter coefficient | | 1, 2 | 0 | L3 filtering is not used |
| DRX | | 1, 2 | OFF | |
| Time offset between Cell 1 and Cell 2 | | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 5 | |

### 17.6.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.6.1.1.4.2 with following exceptions:

- Step 6 in test procedure in clause 7.6.1.1.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 2402 ms for UE supporting power class 1 or 5,

   - 1442 ms for UE supporting power class 2, 3, 4 or 7.

### 17.6.1.1.4.3 Message contents

Same as the message contents given in clause 7.6.1.1.4.3.

### 17.6.1.1.5 Test requirement

Same as the test requirements given in clause 7.6.1.1.5 with following exceptions:

- Table 7.6.1.1.5-1 is replaced by Table 17.6.1.1.5-1.
- Table 7.6.1.1.5-2 is replaced by Table 17.6.1.1.5-2.
- X is
  - 2.4 s for a UE supporting power class 1 or 5,
  - 1.44 s for a UE supporting power class 2, 3, 4 or 7.

**Table 17.6.1.1.5-1: NR Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | Cell 2 |
|---|---|---|---|---|

| | | | T1 | T2 | T1 | T2 |
|---|---|---|---|---|---|---|
| TDD configuration | | 1, 2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1 | 24 | | 24 | |
| | | 2 | 48 | | 48 | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration | | 1 | SR.3.2 TDD | | N/A | |
| | | 2 | SR.3.3 TDD | | | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | | N/A | |
| | | 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | | N/A | |
| | | 2 | CCR.3.7 TDD | | N/A | |
| TRS configuration | | 1, 2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI states | | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns | | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | dB | 1, 2 | N/A | | 16 | |
| SSB | | 1 | SSB.1 FR2 | | SSB.7 FR2 | |
| | | 2 | SSB.2 FR2 | | SSB.8 FR2 | |
| Propagation Condition | | 1, 2 | No external noise (Note 1) | | No external noise (Note 1) | |

Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

**Table 17.6.1.1.5-2: NR OTA Cell specific test parameters**

| Parameter | Unit | Config | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1, 2 | Setup 3 defined in A.3.9.3 | | | |
| | | | AoA1 | | AoA2 | |
| Beam assumption[Note 4] | | 1,2 | Rough | | Rough | |
| $E_S$ | dBm/ SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | dBm/ SCS | 1 | -89 | -89 | -Infinity | -89 |
| | | 2 | -86 | -86 | -Infinity | -86 |
| *Io* | dBm/ 95.04 MHz | 1 | -64.41 | -64.41 | -Infinity | -64.41 |
| | | 2 | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure 7.6.1.1.5-1 | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Void
Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

## 17.6.1.2 NR SA FR2 event triggered reporting without gap in DRX for 2 Rx UE

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

### 17.6.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

### 17.6.1.2.2 Test applicability

This test applies to all types of NR RedCap UEs from release 17 supporting 5GS NR SA FR2 and long DRX cycle.

### 17.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.6.1.0.1 and 17.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.2.

### 17.6.1.2.4 Test description

#### 17.6.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.1.2.4.1 with following exceptions:

- Table 7.6.1.2.4.1-1 is replaced by Table 17.6.1.2.4.1-1.
- Table 7.6.1.2.4.1-2 is replaced by Table 17.6.1.2.4.1-2.

**Table 17.6.1.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.6.1.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.1.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.1.2.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

#### 17.6.1.2.4.2 Test procedure

Same as the test procedure given in clause 7.6.1.2.4.2 with following exceptions:

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for sub-test 1 or less than Y ms for sub-test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one. Where X is

   - 7202 for UE supporting power class 1 or 5,
   - 4322 for UE supporting power class 2, 3, 4 or 7.

   and Y is

   - 51202 for UE supporting power class 1 or 5,
   - 30722 for UE supporting power class 2, 3, 4 or 7.

#### 17.6.1.2.4.3 Message contents

Same as the message contents given in clause 7.6.1.2.4.3.

#### 17.6.1.2.5 Test requirement

Same as the test requirements given in clause 7.6.1.2.5 with following exceptions:

- For sub-test 1, X is
  - X = 7202 for UE supporting power class 1 or 5;
  - X = 4322 for UE supporting power class 2, 3, 4 or 7.
- For sub-test 2, X is
  - X = 51202 for UE supporting power class 1 or 5;
  - X = 30722 for UE supporting power class 2, 3, 4 or 7.

### 17.6.1.3 NR SA FR2 event triggered reporting with gap in non-DRX for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

This test case is incomplete for test frequencies f > 40.8 GHz.

#### 17.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

#### 17.6.1.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

#### 17.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.6.1.0.1 and 17.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.3.

#### 17.6.1.3.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 17.6.1.3.4.1-3, Table 17.6.1.3.5-1 and Table 17.6.1.3.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell and indicates to the UE that event-triggered reporting with Event A3 is used.

##### 17.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.1.3.4.1-1.

**Table 17.6.1.3.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.6.1.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.1.3-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.6.1.3.4.1-2.

**Table 17.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 17.6.1.3.4.1-3.
2. Message contents are defined in clause 17.6.1.3.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 17.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Active cell | | PCell (Cell 1) | |
| Neighbour cell | | Cell 2 | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Gap type | | Per-UE gaps | |
| Measurement gap repetition periodicity | ms | 40 | |
| Measurement gap length | ms | 6 | |
| Measurement gap offset | ms | 4 | |
| SMTC configuration for CD-SSB | | SMTC.1 RedCap | |

| | | | |
|---|---|---|---|
| SMTC configuration for NCD-SSB | | SMTC.2 RedCap | |
| CSI-RS parameters | | CSI-RS.3.2 TDD | |
| *A3-Offset* | dB | -11 | |
| CP length | | Normal | |
| *Hysteresis* | dB | 0 | |
| Time-To-Trigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | |
| Time offset between Cell 1 and Cell 2 | µs | 3 | Synchronous cells |
| T1 | s | 5 | |
| T2 | s | 5 | |

#### 17.6.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 17.6.1.3.5-1.

3. Set NR Cell 2 physical cell identity = (current NR Cell 2 physical cell identity + 3) mod 1008 for current iteration of the test procedure loop.

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 17.6.1.3.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 17.6.1.3.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

17.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 17.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition GAP NEEDED<br>Table H.3.1-4 with *A3-offset* = -11 dB<br>Table H.3.1-6 with Condition gapUE, Pattern #0 and *gapOffset* is set to 4<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.1-8 with Condition CSI-RS RLM |

**Table 17.6.1.3.4.3-2: *MeasObjectNR* (Step 4, test procedure)**

| Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of NCD-SSB | | |
| smtc1 | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap | | |
| cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod { | 1 entry | | |
| CellsToAddMod[1] SEQUENCE { | | entry 1 | |
| physCellId | PhysCellId of Cell 2 | | |
| cellIndividualOffset SEQUENCE { | | | |
| rsrpOffsetSSB | dB16 | | |
| rsrqOffsetSSB | Not present | | |
| sinrOffsetSSB | Not present | | |
| rsrpOffsetCSI-RS | Not present | | |
| rsrqOffsetCSI-RS | Not present | | |
| sinrOffsetCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.6.1.3.4.3-3: *ServingCellConfig* (step 4, test procedure)**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink { | 1 entry | | |
| BWP-Downlink[1] | BWP-Downlink | entry 1<br>Table 17.6.1.3.4.3-4 | |
| } | | | |
| firstActiveDownlinkBWP-Id | 1 | Activate the RedCap-specific dedicated DL BWP | |
| uplinkConfig SEQUENCE { | | | |
| initialUplinkBWP | Not present | | |

| | | | |
|---|---|---|---|
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | entry 1<br>Table 17.6.1.3.4.3-5 | |
| } | | | |
| firstActiveUplinkBWP-Id | 1 | Activate the RedCap-specific dedicated UL BWP | |
| pusch-ServingCellConfig | Not present | | |
| } | | | |
| servingCellMO | Not present | | |
| } | | | |

**Table 17.6.1.3.4.3-4: *BWP-Downlink* (Table 17.6.1.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Downlink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to DLBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| bwp-Dedicated SEQUENCE { | | | |
| nonCellDefiningSSB-r17 SEQUENCE { | | | |
| absoluteFrequencySSB-r17 | ARFCN-ValueNR of NCD-SSB | | |
| ssb-Periodicity-r17 | ms40 | | |
| ssb-TimeOffset-r17 | Not present | | |
| } | | | |
| servingCellMO-r17 | MeasId | | |
| } | | | |
| } | | | |

**Table 17.6.1.3.4.3-5: *BWP-Uplink* (Table 17.6.1.3.4.3-3)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-Uplink ::= SEQUENCE { | | | |
| bwp-Id | 1 | | |
| bwp-Common SEQUENCE { | BWP-UplinkCommon | | |
| genericParameters SEQUENCE { | | | |
| locationAndBandwidth | The RIV corresponds to ULBWP.1.3 RedCap | | |
| } | | | |
| } | | | |
| } | | | |

17.6.1.3.5 Test requirement

Table 17.6.1.3.4.1-3 and Table 17.6.1.3.5-1 define the primary level settings including test tolerances.

**Table 17.6.1.3.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1 | | 24 | | 24 | |

| | | | | |
|---|---|---|---|---|
| | Config 2 | | 48 | 48 |
| Initial BWP configuration | | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated DL BWP configuration | | | DLBWP.1.3 RedCap Note 1 | DLBWP.1.3 RedCap Note 1 |
| Dedicated UL BWP configuration | | | ULBWP.1.3 RedCap Note 2 | ULBWP.1.3 RedCap Note 2 |
| RLM-RS | | | CSI-RS | SSB |
| PDSCH RMC configuration | Config 1 | | SR.3.2 TDD | N/A |
| | Config 2 | | SR.3.3 TDD | |
| RMSI CORESET RMC configuration | Config 1 | | CR.3.1 TDD | CR.3.1 TDD |
| | Config 2 | | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.3.1 TDD | CCR.3.1 TDD |
| | Config 2 | | CCR.3.7 TDD | CCR.3.7 TDD |
| TRS configuration | | | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI states | | | TCI.State.2 | N/A |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 |
| OCNG Patterns | | | OP.1 | OP.1 |
| cellIndividualOffset | | dB | N/A | 16 |
| CD-SSB | Config 1 | | SSB.2 RedCap FR2 | SSB.2 RedCap FR2 |
| | Config 2 | | SSB.4 RedCap FR2 | SSB.4 RedCap FR2 |
| NCD-SSB | Config 1 | | SSB.3 RedCap FR2 | SSB.3 RedCap FR2 |
| | Config 2 | | SSB.5 RedCap FR2 | SSB.5 RedCap FR2 |
| Propagation Condition | | | No external noise (Note 3) | |

Note 1: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index.

Note 2: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.

Note 3: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

**Table 17.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Setup 3 defined in A.9 | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption Note 4 | | | Rough | | Rough | |
| $E_s$ | Config 1 | dBm/SCS | -89 | -89 | -Infinity | -89 |
| | Config 2 | | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot}$ BB Note 5 | | dB | -0.12 | -0.12 | -Infinity | -0.12 |
| SSB_RP | Config 1 | dBm/SCS | -89 | -89 | -Infinity | -89 |
| | Config 2 | | -86 | -86 | -Infinity | 86 |
| $Io$ | Config 1 | dBm/95.04 MHz | -64.41 | -64.41 | -Infinity | -64.41 |
| | Config 2 | | -61.41 | -61.41 | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | | Defined in Figure 17.6.1.3.5-1 | | | |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.

Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to 2 x $TTI_{DCCH}$ higher than the measurement reporting delay specified in TS 38.133 [6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_without_index}$ + 2 x $TTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 3200 ms for UE supporting power class 1 or 5 and 1920 ms for UE supporting power class 2, 3, 4 or 7, is the time for intra-frequency cell identification specified in TS 38.133 [6] clause 9.2B.5.1,
- $TTI_{DCCH}$ = 1 ms.

Which gives a total of 3202 ms for UE supporting power class 1 or 5 and 1922 ms for UE supporting power class 2, 3, 4 or 7.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

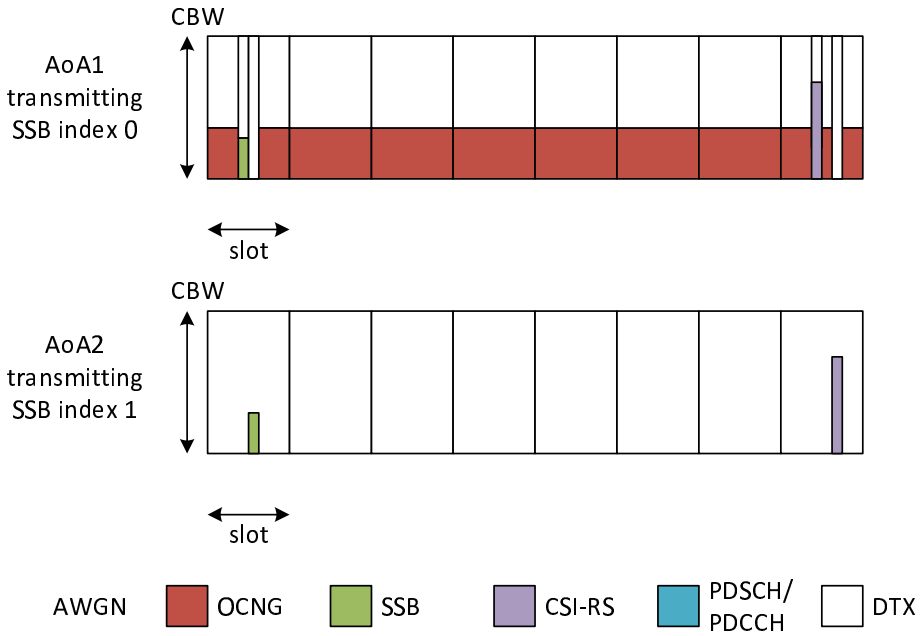



**Figure 17.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)**

## 17.6.1.4 NR SA FR2 event triggered reporting with gap in DRX for 2 Rx UE

Editor's Note:

This test case is complete for the following configurations:

- UE PC3
- Test frequencies f ≤ 40.8 GHz;

This test case is incomplete for UE power classes other than PC3;

- This test case is incomplete for test frequencies f > 40.8 GHz.

#### 17.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

#### 17.6.1.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS based RLM, BWP operation without bandwidth restriction and long DRX cycle.

#### 17.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.6.1.0.1 and 17.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.4.

#### 17.6.1.4.4 Test description

##### 17.6.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.1.4.4.1 with following exceptions:

- Table 7.6.1.4.4.1-1 is replaced by Table 17.6.1.4.4.1-1.
- Table 7.6.1.4.4.1-2 is replaced by Table 17.6.1.4.4.1-2.
- Table 7.6.1.4.4.1-3 is replaced by Table 17.6.1.4.4.1-3.

**Table 17.6.1.4.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.6.1.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.1.4-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.6.1.4.4.1-3: General test parameters**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Test 1 | Test 2 | |
| Active cell | | PCell (Cell 1) | | |
| Neighbour cell | | Cell 2 | | Cell to be identified. |
| RF Channel Number | | 1: Cell 1 and Cell 2 | | One TDD carrier frequency is used for the NR cells. |
| Gap type | | Per-UE gaps | | |
| Measurement gap repetition periodicity | ms | 40 | | |
| Measurement gap length | ms | 6 | | |

| | | | | |
|---|---|---|---|---|
| Measurement gap offset | ms | 39 | | |
| SMTC configuration | | SMTC.1 | | |
| CSI-RS parameters | | CSI-RS.3.2 TDD | | |
| *A3-Offset* | dB | -7 | | |
| CP length | | Normal | | |
| *Hysteresis* | dB | 0 | | |
| Time To Trigger | s | 0 | | |
| Filter coefficient | | 0 | | L3 filtering is not used |
| DRX | | DRX.1 | DRX.7 | |
| Time offset between Cell 1 and Cell 2 | | 3 μs | | Synchronous cells |
| T1 | s | 5 | | |
| T2 | s | 10 | 52 | |

#### 17.6.1.4.4.2 Test procedure

Same as the test procedure given in clause 7.6.1.4.4.2 with following exceptions:

- Step 6 in clause 7.6.1.4.4.2 is replaced by:

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

   - X = 7202, Y = 51202 for UE supporting power class 1 or 5,

   - X = 4322, Y = 30722 for UE supporting power class 2, 3, 4 or 7.

#### 17.6.1.4.4.3 Message contents

Same as the message contents given in clause 7.6.1.4.4.3.

### 17.6.1.4.5 Test requirement

Same as the test requirements given in clause 7.6.1.4.5 with following exceptions:

- Table 7.6.1.4.5-1 is replaced by Table 17.6.1.4.5-1.
- Table 7.6.1.4.5-2 is replaced by Table 17.6.1.4.5-2.
- In Test 1 the overall delay measured shall be less than a total of X ms, where
  - X = 7202 for UE supporting power class 1 or 5,
  - X = 4322 for UE supporting power class 2, 3, 4 or 7.
- In Test 2 the overall delay measured shall be less than a total of X ms, where
  - X = 51202 for UE supporting power class 1 or 5,
  - X = 30722 for UE supporting power class 2, 3, 4 or 7.

**Table 17.6.1.4.5-1: NR Cell specific test parameters**

| Parameter | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|
| | | T1 | T2 | T1 | T2 |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | | 66 | |
| Initial BWP configuration | | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Active DL BWP configuration | | DLBWP.1.2 | | DLBWP.1.1 | |

| | | | | |
|---|---|---|---|---|
| Active UL BWP configuration | | | ULBWP.1.2 | ULBWP.1.1 |
| RLM-RS | | | CSI-RS | SSB |
| PDSCH RMC configuration | Config 1 | | SR.3.2 TDD | N/A |
| | Config 2 | | SR.3.3 TDD | |
| RMSI CORESET RMC configuration | Config 1 | | CR.3.1 TDD | N/A |
| | Config 2 | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | Config 1 | | CCR.3.1 TDD | N/A |
| | Config 2 | | CCR.3.7 TDD | |
| TRS configuration | | | TRS.2.1 TDD | N/A |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | N/A |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 |
| OCNG Patterns | | | OP.1 | OP.1 |
| SSB | Config 1 | | SSB.3 FR2 | SSB.3 FR2 |
| | Config 2 | | SSB.4 FR2 | SSB.4 FR2 |
| Propagation Condition | | | AWGN | |

**Table 17.6.1.4.5-2: NR OTA Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Setup 1 defined in A.9.1 | | | |
| Beam Assumption Note 4 | | | Rough | | | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | | dB | 3.51 | -1.60 | -Infinity | -1.60 |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -101.5 | | | |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -92.5 | | | |
| | Config 2 | | -89.5 | | | |
| SSB_RPSS-RSRP | Config 1 | dBm/SCS | -88.50 | -88.50 | -Infinity | -88.50 |
| | Config 2 | | -85.50 | -88.50 | -Infinity | -88.50 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 4 |
| $Io$ | | dBm/95.04 MHz | -58.03 | -55.68 | -58.03 | -55.68 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 5: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4.

## 17.6.2 Inter-frequency measurements for RedCap

### 17.6.2.0 Minimum conformance requirements

The requirements in clause 17.6.2.0 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- For 2 Rx RedCap UE:
  - SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding band,

- SS-RSRQ related side conditions given in TS 38.133 [6] clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding band,
- SS-SINR related side conditions given in TS 38.133 [6] clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding band.

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index_RedCap}$. The UE shall be able to identify a new detectable inter-frequency SS block of an already detected cell within $T_{identify_inter_without_index_RedCap}$.

$$T_{identify_inter_without_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap}) \text{ ms}$$

$$T_{identify_inter_with_index_RedCap} = (T_{PSS/SSS_sync_inter_RedCap} + T_{SSB_measurement_period_inter_RedCap} + T_{SSB_time_index_inter_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_inter_RedCap}$: it is the time period used in PSS/SSS detection given in table 17.6.2.0-1.

$T_{SSB_time_index_inter_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in table 17.6.2.0-2.

$T_{SSB_measurement_period_inter_RedCap}$: equal to a measurement period of SSB based measurement given in table , table 17.6.2.0-3, table.

For 2 Rx RedCap UE:

$M_{pss/sss_sync_inter_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_inter_RedCap}$ = 64 samples. For a UE supporting FR2 power class 2, 3, 4 or 7, $M_{pss/sss_sync_inter_RedCap}$ = 40 samples.

$M_{SSB_index_inter_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{SSB_index_inter_RedCap}$ = 40 samples. For a UE supporting FR2 power class 2, 3, 4 or 7, $M_{SSB_index_inter_RedCap}$ = 24 samples.

$M_{meas_period_inter_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{meas_period_inter_RedCap}$ = 64 samples. For a UE supporting FR2 power class 2, 3, 4 or 7, $M_{meas_period_inter_RedCap}$ = 40 samples.

$CSSF_{inter_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in TS 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps.

**Table 17.6.2.0-1: Time period for PSS/SSS detection, (Frequency range 2) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{PSS/SSS_sync_inter_RedCap}$ |
|---|---|
| No DRX | $\text{Max}(600 \text{ ms}, M_{pss/sss_sync_inter_RedCap} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | $\text{Max}(600 \text{ ms}, (1.5 \times M_{pss/sss_sync_inter_RedCap}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | $M_{pss/sss_sync_inter_RedCap} \times \text{DRX cycle} \times CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non-DRX requirements apply according to the conditions described in clause 3.6.1. | |

**Table 17.6.2.0-2: Time period for time index detection (Frequency range 2) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_time_index_inter_RedCap}$ |
|---|---|
| No DRX | $\text{Max}(200 \text{ ms}, M_{SSB_index_inter_RedCap} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | $\text{Max}(200 \text{ ms}, (1.5 \times M_{SSB_index_inter_RedCap}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | $M_{SSB_index_inter_RedCap} \times \text{DRX cycle} \times CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non-DRX requirements apply according to the conditions described in clause 3.6.1. | |

When measurement gaps are provided for inter-frequency measurements, the RedCap UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as

specified in TS 38.133 [6] clauses 10.1A.4, 10.1A.5, 10.1A.8, 10.1A.9, 10.1A.12 and 10.1A.13, respectively, as shown in table 17.6.2.0-3.

**Table 17.6.2.0-3: Measurement period for inter-frequency measurements with gaps (Frequency FR2) for 2 Rx RedCap UE**

| Condition NOTE1 | $T_{SSB_measurement_period_inter_RedCap}$ |
|---|---|
| No DRX | $\max(400\text{ ms}, M_{meas_period_inter_RedCap} \times \max(\text{MGRP}, \text{SMTC period})) \times CSSF_{inter_RedCap}$ |
| DRX cycle ≤ 320 ms | $\max(400\text{ ms}, (1.5 \times M_{meas_period_inter_RedCap}) \times \max(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times CSSF_{inter_RedCap}$ |
| DRX cycle > 320 ms | $M_{meas_period_inter_RedCap} \times \text{DRX cycle} \times CSSF_{inter_RedCap}$ |
| NOTE 1: DRX or non-DRX requirements apply according to the conditions described in clause 3.6.1. | |

For 2 Rx RedCap UE: Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise, UE shall be able to identify a new detectable inter-frequency cell within $T_{identify_inter_with_index_RedCap}$. Both $T_{identify_inter_without_index_RedCap}$ and $T_{identify_inter_with_index_RedCap}$ are defined in TS 38.133 [6] clause 9.3B.4. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_inter_without_index_RedCap}$ or $T_{identify_inter_with_index_RedCap}$ as defined in TS 38.133 [6] clauses 9.3B.4 or 9.3B.7.1. If a cell which has been detectable at least for the time period $T_{identify\ inter\ without\ index_RedCap}$ or $T_{identify\ inter\ with\ index_RedCap}$ defined in TS 38.133 [6] clauses 9.3B.4 or 9.3B.7.1 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ $T_c$ while the measurement gap has not been available and L3 filtering has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [7]. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.3B.2, 9.3B.4, 9.3B.5 and 9.3B.6.3.

## 17.6.2.1 NR SA FR2-FR2 event triggered reporting in non-DRX for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

### 17.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for RedCap in TS 38.133 [6] clause 9.3B.4.

#### 17.6.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from release 17 onwards.

#### 17.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.2.1.

#### 17.6.2.1.4 Test description

##### 17.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.2.1.4.1-1.

**Table 17.6.2.1.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.2.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 17.6.2.1.4.1-2.

**Table 17.6.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 17.6.2.1.4.1-3 below.
2. Message contents are defined in clause 17.6.2.1.4.3.
3. There are two cells on 2 different carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 17.6.2.1.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause TS 38.133 [6] 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | |

| | | | | |
|---|---|---|---|---|
| SMTC-CD-SSB parameters | | Config 1 | SSB.2 RedCap FR2 | |
| NCD-SSB parameters | | Config 1 | SSB.3 RedCap FR2 | |
| *offsetMO* | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| *A3-Offset* | dB | Config 1 | -11 | |
| *Hysteresis* | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3 μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 5.2 for PC1; 3.5 for other PC | |

#### 17.6.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.6.2.1.4.2.

#### 17.6.2.1.4.3 Message contents

Same as the message contents given in clause 7.6.2.1.4.3.

### 17.6.2.1.5 Test requirement

Same as the test requirements given in clause 7.6.2.1.5 with following exceptions:

- Table 7.6.2.1.5-1 is replaced by Table 17.6.2.1.5-1.

**Table 17.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.3.15 | | | |
| | | | | AoA1 | | AoA2 | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| | Dedicated DL BWP configuration | | | DLBWP.1.3 RedCap Note 9 | | N/A | |
| | Dedicated UL BWP configuration | | | ULBWP.1.3 RedCap Note 10 | | N/A | |

| | | | | | | |
|---|---|---|---|---|---|---|
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 for CD-SSB | | Config 1 | SMTC.1 | | SMTC.1 | |
| SMTC configuration for NCD-SSB | | Config 1 | SMTC.2 RedCap | | SMTC.2 RedCap | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $\hat{E}_S$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | | Config 1 | No external noise (Note 11) | | No external noise (Note 11) | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 9: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dediacted DL BWP2 corresponding to NCD-SSB PRB index.
Note 10: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.
Note 11: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

## 17.6.2.2 NR SA FR2-FR2 event triggered reporting in DRX for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

### 17.6.2.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for RedCap in TS 38.133 [6] clause 9.3B.4.

### 17.6.2.2.2 Test applicability

This test applies to all types of NR RedCap UE supporting long DRX cycle from release 17 onwards.

### 17.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.2.2.

### 17.6.2.2.4 Test description

#### 17.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.2.2.4.1-1.

**Table 17.6.2.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.2.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 17.6.2.2.4.1-2.

**Table 17.6.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 17.6.2.2.4.1-3 below.

2. Message contents are defined in clause 17.6.2.2.4.3.

3. There are two cells on 2 different carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 17.6.2.2.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | | As specified in TS 38.133 [6] clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | | |
| *A3-Offset* | dB | Config 1 | -12 | | Value modified by TT |
| *Hysteresis* | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.7 | As specified in TS 38.133 [6] clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 8 for PC1; 5 for other PC | 82 for PC1; 52 for other PC | |

### 17.6.2.2.4.2 Test procedure

Same as the test procedure given in clause 7.6.2.2.4.2.

### 17.6.2.2.4.3 Message contents

Same as the message contents given in clause 7.6.2.2.4.3.

### 17.6.2.2.5 Test requirement

Same as the test requirements given in clause 7.6.2.2.5 with following exceptions:

- Table 7.6.2.2.5-1 is replaced by Table 17.6.2.2.5-1.

**Table 17.6.2.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam Assumption[Note 7] | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | Config 1 | 1 | | 2 | |
| TDD configuration | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | | Config 1 | TDD | | TDD | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | | Config 1 | AWGN | | AWGN | |
| Antenna Configuration | | | Config 1 | 1x2 | | 1x2 | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | Void |
| Note 5: | Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. |
| Note 6: | As observed with 0 dBi gain antenna at the centre of the quiet zone. |
| Note 7: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |

## 17.6.2.3 NR SA FR2-FR2 event triggered reporting with SSB time index detection in non-DRX for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

### 17.6.2.3.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for RedCap in TS 38.133 [6] clause 9.3B.4.

### 17.6.2.3.2 Test applicability

This test applies to all types of NR RedCap UE from release 17 onwards.

### 17.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.2.3.

### 17.6.2.3.4 Test description

#### 17.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.2.3.4.1-1.

**Table 17.6.2.3.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.2.3-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 17.6.2.3.4.1-2.

**Table 17.6.2.3.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.2.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 17.6.2.3.4.1-3 below.

2. Message contents are defined in clause 17.6.2.3.4.3.

3. There are two cells on 2 different carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 17.6.2.3.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | Config 1 | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1 | 16 | Applied to NR Cell 2 measurement object |
| *A3-Offset* | dB | Config 1 | -11 | |
| *Hysteresis* | dB | Config 1 | 0 | |
| CP length | | Config 1 | Normal | |
| TimeToTrigger | s | Config 1 | 0 | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| DRX | | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | Config 1 | 3 μs | Synchronous cells. |
| T1 | s | Config 1 | 5 | |
| T2 | s | Config 1 | 7 for PC1; 4.5 for other PC | |

### 17.6.2.3.4.2 Test procedure

Same as the test procedure given in clause 7.6.2.3.4.2.

### 17.6.2.3.4.3 Message contents

Same as the message contents given in clause 7.6.2.3.4.3.

### 17.6.2.3.5 Test requirement

Same as the test requirements given in clause 7.6.2.3.5 with following exceptions:

- Table 7.6.2.3.5-1 is replaced by Table 17.6.2.3.5-1.

**Table 17.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 3 as specified in clause A.3.15 | | | |
| | | | | AoA1 | | AoA2 | |
| Beam Assumption Note 7 | | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $\hat{E}_s$ | | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | | dBm/SCS Note5 | Config 1 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s / I_{ot}$ BB Note 8 | | dB | Config 1 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note5 | Config 1 | -58.01 | -58.01 | -Infinity | -58.01 |

| | | | | |
|---|---|---|---|---|
| Propagation Condition | | Config 1 | No external noise (Note 9) | No external noise (Note 9) |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.
Note 8: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 9: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 [18] Annex B.0.

## 17.6.2.4 NR SA FR2-FR2 event triggered reporting with SSB time index detection in DRX for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

### 17.6.2.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for RedCap in TS 38.133 [6] clause 9.3B.4.

### 17.6.2.4.2 Test applicability

This test applies to all types of NR RedCap UE from release 17 onwards.

### 17.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.2.4.

### 17.6.2.4.4 Test description

#### 17.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.2.4.4.1-1.

**Table 17.6.2.4.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.2.4-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Configure the test requirement and the DUT according to the parameters in Table 17.6.2.4.4.1-2.

**Table 17.6.2.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.2.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters for PCell and neighbour cell are given in Table 17.6.2.4.4.1-3 below.

2. Message contents are defined in clause 17.6.2.4.4.3.

3. There are two cells on 2 different carriers specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

**Table 17.6.2.4.4.1-3: General test parameters**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| NR RF Channel Number | | Config 1 | 1, 2 | | Two FR2 NR carrier frequencies is used. |
| Active cell | | Config 1 | NR Cell 1 (PCell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | Config 1 | NR Cell 2 | | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | Config 1 | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1 | 39 | | |
| SMTC-SSB parameters | | Config 1 | SSB.3 FR2 | | |
| *A3-Offset* | dB | Config 1 | -12 | | Value modified by TT |
| *Hysteresis* | dB | Config 1 | 0 | | |
| CP length | | Config 1 | Normal | | |
| TimeToTrigger | s | Config 1 | 0 | | |
| Filter coefficient | | Config 1 | 0 | | L3 filtering is not used |
| DRX | | Config 1 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | | Config 1 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1 | 5 | | |
| T2 | s | Config 1 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | |

### 17.6.2.4.4.2 Test procedure

Same as the test procedure given in clause 7.6.2.4.4.2.

### 17.6.2.4.4.3 Message contents

Same as the message contents given in clause 7.6.2.4.4.3.

17.6.2.4.5 Test requirement

Same as the test requirements given in clause 7.6.2.4.5 with following exceptions:

- Table 7.6.2.4.5-1 is replaced by Table 17.6.2.4.5-1.

**Table 17.6.2.4.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection**

| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam Assumption[Note 7] | | | Config 1 | Rough | | Rough | |
| NR RF Channel Number | | | Config 1 | 1 | | 2 | |
| Duplex mode | | | Config 1 | TDD | | TDD | |
| TDD configuration | | | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | Config 1 | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | | ULBWP.0.1 | | N/A | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | N/A | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | | | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | | | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | | Config 1 | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | | | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | | | Config 1 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | | | Config 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition | | Config 1 | AWGN | | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

## 17.6.3 L1-RSRP measurement for beam reporting for RedCap

### 17.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

#### 17.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The minimum requirements given in clause 5.6.3.0.1 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.1, 9.5B.2, 9.5B.3.1, 9.5B.4.1 and 9.5B.5.1.

#### 17.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The minimum requirements given in clause 5.6.3.0.2 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.1, 9.5B.2, 9.5B.3.3, 9.5B.4.2 and 9.5B.5.1.

### 17.6.3.1 NR SA FR2 SSB based L1-RSRP measurement in non-DRX for 2 Rx UE

Editor's Notes:

This test case has been completed for the following configurations:

- Test frequencies f ≤ 40.8 GHz
- UE PC3
- This test case is incomplete for UE power classes other than PC3

- This test case is incomplete for Test frequencies f > 40.8 GHz

#### 17.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

#### 17.6.3.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

#### 17.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.1.

#### 17.6.3.1.4 Test description

##### 17.6.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.3.1.4.1 with following exceptions:

- Table 7.6.3.1.4.1-1 is replaced by Table 17.6.3.1.4.1-1.
- Table 7.6.3.1.4.1-3 is replaced by Table 17.6.3.1.4.1-2.

**Table 17.6.3.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.6.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.3.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.3.1.4.1-2: Test environment**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

##### 17.6.3.1.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.1.4.2.

##### 17.6.3.1.4.3 Message contents

Same as the test procedure given in clause 7.6.3.1.4.3.

#### 17.6.3.1.5 Test requirement

Same as the test requirements given in clause 7.6.3.1.5.

## 17.6.3.2 NR SA FR2 SSB based L1-RSRP measurement in DRX for 2 Rx UE

Editor's Notes:

This test case has been completed for the following configurations:

- Test frequencies f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for Test frequencies f > 40.8 GHz

### 17.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

### 17.6.3.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting long DRX cycle.

### 17.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.2.

### 17.6.3.2.4 Test description

#### 17.6.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.3.2.4.1 with following exceptions:

- Table 7.6.3.2.4.1-1 is replaced by Table 17.6.3.2.4.1-1.
- Table 7.6.3.2.4.1-3 is replaced by Table 17.6.3.2.4.1-2.
- Table 7.6.3.2.4.1-2 is replaced by Table 17.6.3.2.4.1-3.

**Table 17.6.3.2.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.6.3.2-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.6.3.2.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | TDD |
| TDD Configuration | 1, 2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1, 2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1, 2 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD |
| | 2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| OCNG Patterns | 1, 2 | | OP.1 |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1, 2 | | SMTC.1 |
| TRS Configuration | 1, 2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1, 2 | | TCI.State.2 |
| DRX configuration | 1, 2 | | DRX.3 |
| *reportConfigType* | 1, 2 | | periodic |
| *reportQuantity* | 1, 2 | | ssb-Index-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| L1-RSRP reporting period | 1, 2 | slot | 320 |
| T1 | 1, 2 | s | 5 |
| T2 | 1, 2 | s | 3 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation condition | 1, 2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 17.6.3.2.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.2.4.2.

### 17.6.3.2.4.3 Message contents

Same as the message content given in clause 7.6.3.2.4.3.

### 17.6.3.2.5 Test requirement

Same as the test requirements given in clause 7.6.3.2.5 with following exceptions:

- Table 7.6.3.2.5-1 is replaced by Table 17.6.3.2.5-1.

**Table 17.6.3.2.5-1: Cell specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.9 | | | |
| Assumption for UE beams Note 4 | 1, 2 | | Rough | | | |
| $N_{oc}$ Note2 | 1, 2 | dBm/15 kHz | -105 | | | |
| $N_{oc}$ Note2 | 1 | dBm/SSB SCS | -96 | | | |
| | 2 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 1, 2 | dB | 0 | 0 | -Infinity | 9 |
| SSB_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 2 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04 MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| | 2 | | -63.97 | -63.97 | -66.98 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 1, 2 | dB | 0 | 0 | -Infinity | 9 |

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

## 17.6.3.3 NR SA FR2 CSI-RS based L1-RSRP measurement in non-DRX for 2 Rx UE

Editor's Notes:

This test case has been completed for the following configurations:

- Test frequencies f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for Test frequencies f > 40.8 GHz

### 17.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 17.6.3.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

### 17.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.3.

### 17.6.3.3.4 Test description

#### 17.6.3.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.3.3.4.1 with following exceptions:

- Table 7.6.3.3.4.1-1 is replaced by Table 17.6.3.3.4.1-1.
- Table 7.6.3.3.4.1-3 is replaced by Table 17.6.3.3.4.1-2.
- Table 7.6.3.3.4.1-2 is replaced by Table 17.6.3.3.4.1-3.

**Table 17.6.3.3.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.3.3-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.3.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.3.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.6.3.3.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS configuration | 1 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | Off |
| *reportConfigType* | 1 | | aperiodic |
| *reportQuantity* | 1 | | cri-RSRP |
| Number of reported RS | 1 | | 2 |
| *qcl-Info* | 1 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | 1 | | 8 |

| | | | |
|---|---|---|---|
| Propagation condition | 1 | | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

#### 17.6.3.3.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.3.4.2.

#### 17.6.3.3.4.3 Message contents

Same as the message content given in clause 7.6.3.3.4.3.

### 17.6.3.3.5 Test requirement

Same as the test requirements given in clause 7.6.3.3.5 with following exceptions:

- Table 7.6.3.3.5-1 is replaced by Table 17.6.3.3.5-1.

**Table 17.6.3.3.5-1: Cell specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1 | | Setup 1 according to A.9 | |
| Beam Assumption Note 3 | 1 | | Rough | Rough |
| $N_{oc}$ Note1 | 1 | dBm/15 kHz | -105 | |
| $N_{oc}$ Note1 | 1 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s/I_{ot}$ | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note 2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note 2 | 1 | dBm/95.04 MHz | -63.97 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 1 | dB | 0 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 3: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | |

## 17.6.3.4 NR SA FR2 CSI-RS based L1-RSRP measurement in DRX for 2 Rx UE

Editor's Notes:

This test case has been completed for the following configurations:

- Test frequencies f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for Test frequencies f > 40.8 GHz

### 17.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

### 17.6.3.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting long DRX cycle.

### 17.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.4.

### 17.6.3.4.4 Test description

#### 17.6.3.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.3.4.4.1 with following exceptions:

- Table 7.6.3.4.4.1-1 is replaced by Table 17.6.3.4.4.1-1.
- Table 7.6.3.4.4.1-3 is replaced by Table 17.6.3.4.4.1-2.
- Table 7.6.3.4.4.1-2 is replaced by Table 17.6.3.4.4.1-3.

**Table 17.6.3.4.4.1-1: Supported test configurations**

| Test Config | Description |
|---|---|
| 17.6.3.4-1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.6.3.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.3.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 17.6.3.4.4.1-3: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |

| | | | |
|---|---|---|---|
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| CSI-RS configuration | 1 | | CSI-RS.3.3 TDD |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1 | | SMTC.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| DRX configuration | 1 | | DRX.3 |
| *reportConfigType* | 1 | | aperiodic |
| *reportQuantity* | 1 | | cri-RSRP |
| Number of reported RS | 1 | | 2 |
| *qcl-Info* | 1 | | SSB#0 for resource#0 |
| | | | SSB#1 for resource#1 |
| *reportSlotOffsetList* | 1 | | 8 |
| Propagation condition | 1 | | AWGN |
| T1 | 1 | s | 5 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

### 17.6.3.4.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.4.4.2.

### 17.6.3.4.4.3 Message contents

Same as the message content given in clause 7.6.3.4.4.3.

### 17.6.3.4.5 Test requirement

Same as the test requirements given in clause 7.6.3.4.5 with following exceptions:

- Table 7.6.3.4.5-1 is replaced by Table 17.6.3.4.5-1.

**Table 17.6.3.4.5-1: Cell specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| Angle of arrival configuration | 1 | | Setup 1 according to A.9 | |
| Beam Assumption Note 3 | 1 | | Rough | Rough |
| $N_{oc}$ Note1 | 1 | dBm/15 kHz | -105 | |
| $N_{oc}$ Note1 | 1 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s / I_{ot}$ | 1 | dB | 0 | 9 |
| CSI-RS RSRP Note 2 | 1 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note 2 | 1 | dBm/95.04 MHz | -63.97 | -57.47 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | 1 | dB | 0 | 9 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | |
| Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 3: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | |

## 17.6.4 NR Measurements with autonomous gaps for RedCap

### 17.6.4.0 Minimum conformance requirements

#### 17.6.4.0.1 Minimum conformance requirements for CGI identification of an NR cell with autonomous gaps

The UE shall identify and report the CGI of a known NR target cell when requested by the network for the purpose of *reportCGI*. Only one cell is provided to the UE with *cellForWhichToReportCGI* for identifying the CGI.The UE may make autonomous gaps in both downlink reception and uplink transmission for receiving *MIB* and *SIB1* message according to clause 5.5.3 of TS 38.331 [13]. Note that a UE is not required to use autonomous gap if *useAutonomousGaps* is set to false. If autonomous gaps are used for measurement with the purpose of *reportCGI*, regardless of whether DRX is used or not, the UE shall be able to identify a new CGI of NR cell within:

$$T_{identify_CGI_redcap} = (T_{MIB_redcap} + T_{SIB1_redcap})\ ms$$

Where:

$T_{MIB_redcap}$ is the time period used to acquire *MIB* message. $T_{MIB_redcap} = 25 * T_{SMTC}$ ms for target cell carrier frequency on FR2.

$T_{SIB1_redcap}$ is the time period used to acquire *SIB1* message. $T_{SIB1_redcap} = 6 * T_{RMSI\text{-}scheduling}$ ms.

Where $T_{SMTC}$ is the SMTC periodicity configured for the target cell measurement, and $T_{RMSI\text{-}scheduling}$ is

- the periodicity with which the *SIB1* is actually transmitted by the NR target cell when SSB and RMSI CORESET multiplexing pattern is 1.

- the maximum between the periodicity with which the *SIB1* is actually transmitted by the NR target cell and $T_{SMTC}$ when SSB and RMSI CORESET multiplexing pattern is 2 or 3. The requirement for identifying the CGI of an NR cell within $T_{identify_CGI_redcap}$ is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [13] is used.

In the requirement a cell is known if,

- During the last 5 seconds for FR1 or 3 seconds for FR2 before the reception of the report CGI command:
  - The UE has sent a valid L3-RSRP measurement report with SSB index for the target cell and.
- During *MIB* decoding at least reported SSBs remains detectable according to the cell identification conditions specified in clauses 9.2B or 9.3B of TS 38.133 [6], and
- During *SIB1* decoding the SSB used for *MIB* decoding remains detectable according to the cell identification conditions specified in clauses 9.2B or 9.3B of TS 38.133 [6], and
- During *MIB* decoding, the SSB for *MIB* decoding remains detectable with SNR $\geqslant$-3 dB
- During *SIB1* decoding, the PDSCH for *SIB1* decoding remains detectable with SNR $\geqslant$-3 dB

The CGI reporting delay is defined as the time between a command that will trigger a CGI report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay

uncertainty of 2 x $TTI_{DCCH}$ resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The CGI reporting delay shall be less than $T_{identify_CGI_redcap}$ plus RRC procedure delay defined in clause 12 in TS 38.331 [13], and additional 20 ms margin if target cell is on FR2.

When a RedCap UE is identifying CGI of an NR cell with autonomous gaps, the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on PCell for the following slots:

- with up to K1 interruptions with interrupted slots up to X1 specified in Table 17.6.4.0.1-1 for each interruption during *MIB* decoding time period $T_{MIB_redcap}$ (ms).
- with up to L1 interruptions with interrupted slots up to Y1 specified in Table 17.6.4.0.1-1 during *SIB1* decoding time period $T_{SIB1_redcap}$ (ms) for SSB and CORESET for RMSI scheduling multiplexing patterns 1.
- with up to L2 interruptions with interrupted slots up to interruption length Y2 specified in Table 17.6.4.0.1-1 during *SIB1* decoding time period $T_{SIB1_redcap}$ (ms) for SSB and CORESET for RMSI scheduling multiplexing patterns 2 and 3.

Where:

- K1 = 25 for the target cell carrier frequency on FR2, and
- L1 = $T_{SIB1_redcap}$ /20 and
- L2 = $T_{SIB1_redcap}$ /$T_{SMTC}$, where $T_{SMTC}$ is the periodicity of the SMTC occasion configured for the target cell carrier.

**Table 17.6.4.0.1-1: Interruption length X1, Y1 and Y2 during measurements with autonomous gaps**

| $\mu$ | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) | Interruption length Y2 (slots) |
|---|---|---|---|---|
| 3 | 0.125 | 48 | 49 | 37 |

The normative reference for this requirement is TS 38.133 [6] clauses 9.11A.2, 9.11A.3 and 9.11A.4.

## 17.6.4.1 NR SA FR2-FR2 CGI identification of NR neighbour cell for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is still missing.

### 17.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of an CGI. This test will partly verify the SA inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.11A.

### 17.6.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting FR2 and acquisition of CGI from neighbour NR cell using autonomous gap.

### 17.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.4.1.

#### 17.6.4.1.4 Test description

The test scenario comprises of two NR carriers and two NR cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2.

The test consists of three successive time periods, with time durations of T1 and T2 respectively:

- Measurement gap patterns are configured. During T1 the UE shall report event A3 for Cell 2. Within 3 seconds of the event report, the test equipment shall add a measurement reporting configuration using *ReportConfigNR* which contains a *ReportCGI* IE with *cellForWhichToReportCGI* set to the physical Cell ID of Cell 2 and including the optional IE *useAutonomousGaps-r16*.

- Time period T2 begins 10 ms after the test equipment has transmitted the *RRCreconfiguration* message containing the *ReportCGI* IE.

##### 17.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.4.1.4.1-1.

**Table 17.6.4.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.6.4.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 17.6.4.1.4.1-2

**Table 17.6.4.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.6.4.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 17.6.4.1.4.3.

2. The power levels and settings for NR PCell (Cell 1) and NR neighbour cell (Cell 2) are set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 17.6.4.1.4.1-3 below.

**Table 17.6.4.1.4.1-3: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| NR RF Channel Number | | 1, 2 | Two FR2 NR carrier frequencies is used. |
| Active cell | | NR Cell 1 (PCell) | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell | | NR Cell 2 | NR Cell 2 is on NR RF channel number 2. |
| Gap Pattern Id | | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | 39 | |
| SMTC-SSB parameters | | SSB.3 FR2 | As specified in clause A.3.10.2 |
| SI-RNTI scheduling rate | ms | 20 | S-RNTI scheduled on 8 occasions per 160 ms transmission period |
| *A3-Offset* | dB | -15 | |

| | | | |
|---|---|---|---|
| *Hysteresis* | dB | 0 | |
| CP length | | Normal | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | DRX is not used |
| Time offset between serving and neighbour cells | | 3μs | Synchronous cells. |
| T1 | s | < 10 | UE expected to report event A3 for Cell 2 within 5,2 s (PC1) or 3.5 s (other PC) of the start of T1. Test equipment shall configure CGI reporting within 3 s after receiving the event A3 report. T2 begins 10 ms after test equipment has transmitted the *RRCreconfiguration* to configure CGI reporting. |
| T2 | s | 1 | |

#### 17.6.4.1.4.2 Test procedure

Throughout the test, the UE shall be scheduled to perform DL reception on every slot suitable for DL.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 17.6.4.1.5-1 and Table 17.6.4.1.5-2. T1 starts.
3. The SS transmits an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on NR Cell 2.
4. The UE transmits an *RRCReconfigurationComplete* message.
5. UE transmits a *MeasurementReport* message triggered by Event A3.
6. Within 3 seconds after receiving *MeasurementReport* message in step 5, the SS transmits an *RRCReconfiguration* message to configure an autonomous gap based CGI measurement reporting on NR Cell 2.
7. The start of T2 is the instant 10 ms after the last TTI containing the *RRCReconfiguration* message in step 6 is sent to the UE, at that instant the SS shall switch the power setting from T1 to T2 as specified in Tables 17.6.4.1.5-1 and 17.6.4.1.5-2.
8. If the UE

   a) transmits a *MeasurementReport* message containing CGI of NR Cell 2 less than 645 ms from the beginning of time period T2, and

   b) has missed no more than 1240 ACK/NACKs from the start of T2 until 645 ms,

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
9. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 17.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 17.6.4.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-7 with condition INTER-FREQ for test procedure step 6 |

**Table 17.6.4.1.4.3-2: *MeasConfig* (Steps 3 & 6, test procedure)**

| Derivation path: Table H.3.1-2 with condition INTER-FREQ | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT(-15) specified in Table H.3.1-4 | A3-Offset is set to -30<br>Acutal threshold = -30*0.5 = -15 dB | Step 3 |
| | ReportConfigNR-CGI | Table 17.6.4.1.4.3-3 | Step 6 |
| } | | | |
| } | | | |
| measGapConfig | MeasGapConfig-DEFAULT specified in Table H.3.1-6 with condition gapUE and Pattern #13 | | Step 3 |
| measGapConfig SEQUENCE { | | | Step 6 |
| gapUE CHOICE { | | | |
| release | null | MG needs to be released to avoid interfering with the missed ACK/NACK count | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.6.4.1.4.3-3: *ReportConfigNR-CGI* (Table 17.6.4.1.4.3-2)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition CGI | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| reportCGI SEQUENCE { | | | |
| cellForWhichToReportCGI | PhysCellId of NR Cell 2 | | |
| useAutonomousGaps-r16 | setup | | |
| } | | | |
| } | | | |
| } | | | |

**Table 17.6.4.1.4.3-4: *MeasResults* (Step 8, test procedure)**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResults ::= SEQUENCE { | | | |
| measResultServingMOList | Not checked | | |
| measResultNeighCells CHOICE { | | | |

| | | | |
|---|---|---|---|
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultNR { | 1 entry | | |
| MeasResultNR [1] SEQUENCE { | | Entry 1 | |
| physCellId | PhysCellId of NR Cell 2 | | |
| measResult | Not checked | | |
| cgi-Info | Checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

17.6.4.1.5 Test requirements

Table 17.6.4.1.4.1-3 and Table 17.6.4.1.5-1 define the primary level settings including test tolerances for the test.

**Table 17.6.4.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | | Setup 3 as specified in clause A.3.15 | | | |
| | | | AoA1 | | AoA2 | |
| Beam Assumption Note 7 | | | Rough | | | |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | | | TDD | | | |
| TDD configuration | | | TDDConf.3.1 | | | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP BW | | MHz | 100: $N_{RB,c}$ = 66 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | N/A | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| OCNG Patterns | | | OP.1 | | Not sent | |
| PDSCH RMC | | | SR.3.1 TDD | | - | |
| CORESET RMC | | | CR.3.1 TDD | | - | |
| SMTC configuration | | | SMTC.1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | | |
| TRS configuration | | | TRS.2.1 TDD | | N/A | |
| TCI configuration | | | CSI-RS.Config.0 | | N/A | |
| EPRE ratio of PSS to SSS | | | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 kHz Note5 | -99.03+TT | | -99.03+TT | |
| $N_{oc}$ Note2 | | dBm/SCS Note4 | -90+TT | | -90+TT | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | -87+TT | | -93+TT | |
| $\hat{E}_s / I_{ot}$ | | dB | 3+TT | | -3+TT | |
| $\hat{E}_s / N_{oc}$ | | dB | 3+TT | | -3+TT | |
| Io Note3 | | dBm/95.04 MHz Note5 | -56.25+TT | | -59.25+TT | |

| Propagation Condition | | AWGN |
|---|---|---|
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | |
| Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. | | |
| Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone. | | |
| Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation. | | |

The UE shall transmit a measurement report containing the cell global identifier of Cell 2 within overall delay from the start of T2, where the overall delay is calculated as follows,

Overall delay = RRC procedure delay + $T_{identify_CGI_RedCap}$ + additional margin for FR2 + TTI insertion uncertainty

- RRC procedure delay = 10 ms, is the RRC procedure delay specified in TS 38.331 [13] clause 12;
- $T_{identify_CGI_RedCap} = T_{MIB_redcap} + T_{SIB1_redcap}$
  - $T_{MIB_redcap}$ = 500 ms, is the time period used to acquire *MIB* message;
  - $T_{SIB1_redcap}$ = 120 ms, is the time period used to acquire *SIB1* message;
- TTI insertion uncertainty = 2 x $TTI_{DCCH}$ = 2 ms, is the delay uncertainty when inserting the measurement report to the TTI of the uplink DCCH;
- additional margin for FR2 = 20 ms, is specified in TS 38.133 [6] clause 9.11A.3

Which gives overall delay = 10 + 500 + 120 + 20 + 2 = 652 ms, allow 655 ms.

From the start of T2 until 655 ms. The number of missed ACK/NACK shall be no more than the maximum number of missed ACK/NACK given in Table 17.6.4.1.5-2.

The rate of correct events observed during repeated tests shall be at least 90%.

**Table 17.6.4.1.5-2: Maximum number of missed ACK/NACKs during the overall delay**

| Test config. | Maximum number of missed ACK/NACKs |
|---|---|
| 1 | 1240 Note 1 |
| NOTE 1: The overall missed ACK/NACK number is caused by two parts. Firstly, up to 25 interruptions, each has a length of up to 48 slots, are allowed during $T_{MIB_redcap}$ as specified in TS 38.133 [6] Table 9.11A.4-1. Secondly, up to 6 interruptions, each has a length of up to 49 slots are allowed during $T_{SIB1_redcap}$ as specified in TS 38.133 [6] Table 9.11A.4-1 assuming SSB/CORESET0 multiplxing pattern #0. In worst case, they will cause up to ceil(48/5)*4*25 + ceil(49/5)*4*6 = 1240 missed ACK/NACKs (assuming TDDConf.3.1 is used). | |

# 17.7 Measurement performance requirements for RedCap

## 17.7.1 SS-RSRP for RedCap

### 17.7.1.0 Minimum conformance requirements

#### 17.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.1.

#### 17.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.2.

### 17.7.1.1 NR SA FR2 SS-RSRP measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.1.1.1 Test purpose

To verify that the intra-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

#### 17.7.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.1.1.

#### 17.7.1.1.4 Test description

Same as the test description given in clause 7.7.1.1.4.

##### 17.7.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.1.1.4.1 with following exceptions:

- Table 7.7.1.1.4.1-1 is replaced by Table 17.7.1.1.4.1-1;
- Table 7.7.1.1.4.1-2 is replaced by Table 17.7.1.1.4.1-2.

**Table 17.7.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.1.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

### 17.7.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.7.1.1.4.2.

### 17.7.1.1.4.3 Message contents

Same as the message contents given in clause 7.7.1.1.4.3.

### 17.7.1.1.5 Test requirement

Same as the test requirements given in clause 7.7.1.1.5 with followings exceptions:

- Table 7.7.1.1.5-1 is replaced by Table 17.7.1.1.5-1;
- Table 7.7.1.1.5-2 is replaced by Table 17.7.1.1.5-2;
- Table 7.7.1.1.5-3 is replaced by Table 17.7.1.1.5-3;
- Table 7.7.1.1.5-3a is replaced by Table 17.7.1.1.5-4;
- Table 7.7.1.1.5-4 is replaced by Table 17.7.1.1.5-5;
- Table 7.7.1.1.5-5 is replaced by Table 17.7.1.1.5-6.

**Table 17.7.1.1.5-1: Cell-specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Cell ID | | 489 | 0 |
| SSB ARFCN | | freq1 | |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 24 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | - |
| Uplink initial BWP configuration | | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | - |
| DRX cycle configuration | | N/A | - |
| TRS configuration | | TRS.2.1 TDD | - |
| TCI state | | TCI.State.0 | - |
| PDSCH Reference measurement channel | | SR.3. 2TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - |
| Dedicated CORESET Reference channel | | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.3 | |
| SSB configuration | | SSB.3 FR2 | |
| SMTC configuration | | SMTC.1 | |
| Time offset with Cell 1 | μs | - | 3 |

| | | |
|---|---|---|
| PDSCH/PDCCH subcarrier spacing | kHz | 120 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH-DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH-DMRS | | |
| EPRE ratio of PDCCH-DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH-DMRS | | |
| EPRE ratio of PDSCH-DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH-DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation conditions | | AWGN |
| Antenna configuration | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 17.7.1.1.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 | | | |
| Assumption for UE beams Note 5 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15 kHz Note3 | -97.4 | | N/A | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -88.37 | | N/A | |
| $\hat{E}_s / N_{oc}$ | dB | 6.0 | 1.4 | N/A | N/A |
| $E_s$ | dBm/SCS Note3 | | | (Table B.2.2-2 Rx Beam Peak + 9.8 dB) | (Table B.2.2-2 Rx Beam Peak + 9.8 dB) |
| SSB_RP Note2 | dBm/SCS | -82.37 | -86.97 | (Table B.2.2-2 Rx Beam Peak + 9.8 dB) | (Table B.2.2-2 Rx Beam Peak + 9.8 dB) |
| $\hat{E}_s / I_{ot}$ BB Note4 | dB | 2.20 | -5.59 | -1.77 | -1.77 |
| Io Note2 | dBm/95.04 MHz Note3 | -55.74 | | (Table B.2.2-2 Rx Beam Peak + 37.40 dB) | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. | | | | | |
| Note 4 Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101- | | | | | |

| | |
|---|---|
| | 2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [3] Table 6.2.1.3-4. |
| Note 5: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |

**Table 17.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | 50 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 1) | 108 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | 46 | n257, n258, n261 | 31 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | 103 | n257, n258, n261 | 88 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (Cell 1) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.1.1.5-4: evaluation limits for the Δ(Max-Min) reported values for each cell during each time period**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | 16 | 16 |
| Δ(Max-Min) reported value Cell 2 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value Cell 1 | FFS | FFS |
| Δ(Max-Min) reported value Cell 2 | FFS | FFS |

**Table 17.7.1.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |

| | | |
|---|---|---|
| Lowest reported value (Cell 2 – Cell 1) | - 12 | - 6 |
| Highest reported value (Cell 2 – Cell 1) | + 2 | + 6 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2 – Cell 1) | FFS | FFS |
| Highest reported value (Cell 2 – Cell 1) | FFS | FFS |

**Table 17.7.1.1.5-6: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8**

| UE power class 3 | | | |
|---|---|---|---|
| **Test 2** | **Bands** | **Normal Conditions** | **Extreme Conditions** |
| Lowest reported value (Cell 1 T2 – Cell 1 T1) | n257, n258, n261 | - 28 | FFS |
| | n260 | - 26 | FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 1 T2 – Cell 2 T1) | n257, n258, n261 | - 12 | FFS |
| | n260 | - 10 | FFS |
| | n259 | FFS | FFS |
| Lowest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | - 24 | FFS |
| | n260 | - 21 | FFS |
| | n259 | FFS | FFS |
| Highest reported value (Cell 2 T2 – Cell 2 T1) | n257, n258, n261 | - 8 | FFS |
| | n260 | - 5 | FFS |
| | n259 | FFS | FFS |

## 17.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 17.7.1.2.1 Test purpose

To verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

### 17.7.1.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

### 17.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.1.2.

#### 17.7.1.2.4 Test description

Same as the test description given in clause 7.7.1.2.4.

#### 17.7.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.1.2.4.1 with following exceptions:

- Table 7.7.1.2.4.1-1 is replaced by Table 17.7.1.2.4.1-1;
- Table 7.7.1.2.4.1-2 is replaced by Table 17.7.1.2.4.1-2.

**Table 17.7.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.1.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.7.1.2-2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

#### 17.7.1.2.4.2 Test procedure

Same as the test procedure given in clause 7.7.1.1.4.2.

#### 17.7.1.2.4.3 Message contents

Same as the message contents given in clause 7.7.1.2.4.3.

#### 17.7.1.2.5 Test requirement

Same as the test requirements given in clause 7.7.1.2.5 with followings exceptions:

- Table 7.7.1.2.5-1 is replaced by Table 17.7.1.2.5-1;
- Table 7.7.1.2.5-2 is replaced by Table 17.7.1.2.5-2;
- Table 7.7.1.2.5-3 is replaced by Table 17.7.1.2.5-3;
- Table 7.7.1.2.5-3a is replaced by Table 17.7.1.2.5-4;
- Table 7.7.1.2.5-4 is replaced by Table 17.7.1.2.5-5;
- Table 7.7.1.2.5-5 is replaced by Table 17.7.1.2.5-6.

**Table 17.7.1.2.5-1: Cell-specific test parameters**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| SSB ARFCN | | | freq1 | freq2 |
| BWchannel | | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1 | | 24 | |

| | | | | |
|---|---|---|---|---|
| | Config 2 | | 48 | |
| Gap pattern ID | | | 0 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | Config 1 | | SR.3.2 TDD | - |
| | Config 2 | | SR.3.3 TDD | - |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | - |
| | Config 2 | | CR.3.2 TDD | - |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.3.1 TDD | - |
| | Config 2 | | CCR.3.7 TDD | - |
| SSB configuration | Config 1 | | SSB.3 FR2 | |
| | Config 2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| OCNG Patterns | | | OP.3 | |
| Initial BWP Configuration | | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | | | DLBWP.1.3<br>ULBWP.1.3 | |
| TRS Configuration | | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | | | TCI.State.2 | |
| SMTC configuration | | | SMTC.1 | |
| Time offset between Cell 2 and Cell 1 | | µs | 3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | | | AWGN | |
| Antenna configuration | | | 1x2 | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 17.7.1.2.5-2: OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | 1~2 | | Setup 4b according to clause A.3.15.4.2 | | Setup 4b according to clause A.3.15.4.2 | |
| | | | AoA1 Spherical coverage | AoA2 Rx Beam Peak | AoA1 Spherical coverage | AoA2 Rx Beam Peak |
| Assumption for UE beams Note 7 | 1~2 | | Rough | | Rough | |
| $N_{oc}$ Note1 | 1 | dBm/15 kHz Note4 | -96.3 | -96.3 | (Table B.2.3-2 Rx Beam Peak Note 8 -4.63 dB) | (Table B.2.3-2 Rx Beam Peak Note 8 -3.03 dB) |
| | 2 | | -99.3 | -99.3 | | |
| $N_{oc}$ Note1 | 1 | dBm/SCS Note4 | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +4.4 dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +6.0 dB) |
| | 2 | | -87.3 | -87.3 | (Table B.2.3-2 Rx Beam Peak Note 8 +7.4 dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +9.0 dB) |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc}$ | 1~2 | dB | 6.0 | 6.0 | 17.0 | 1.0 |
| SSB_RP[Note2] | 1 | dBm/SCS | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak[Note 8] +21.4 dB) | (Table B.2. 3-2 Rx Beam Peak[Note 8] +24.47.0 dB) |
| | 2 | | -81.3 | -81.3 | (Table B.2.3-2 Rx Beam Peak[Note 8] +24.4 dB) | (Table B.2. 3-2 Rx Beam Peak[Note 8] +10.0 dB) |
| ($SSB_RP_{Cell\ 1}$ – $SSB_RP_{Cell\ 2}$) | 1~2 | dB | 00+TT | | 14.40 | |
| $\hat{E}_s / I_{ot\ BB}$[Note6] | 1 | dB | 5.23 | 5.93 | 5.38 | -1.46 |
| | 2 | | 4.58 | 5.87 | | |
| Io[Note2] | 1 | dBm/95.04 MHz [Note4] | -55.70 | -55.70 | (Table B.2.3-2 Rx Beam Peak[Note 8] +46.08 dB) | (Table B.2.3-2 Rx Beam Peak[Note 8] +35.13 dB) |
| | 2 | | -55.7 | -55.7 | (Table B.2.3-2 Rx Beam Peak[Note 8] +49.09 dB) | (Table B.2.3-2 Rx Beam Peak[Note 8] +38.14 dB) |
| ($Io_{freq\ 1}$ – $Io_{freq\ 2}$) | 1~2 | dB | 0 | | 11.95 | |

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 1}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Void

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.

Note 5: Void

Note 6: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1 dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.

Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

Note 8: The value in Table B.2.3-2 is the Minimum SSB_RP for $SCS_{SSB}$ = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without $\Delta MB_{P,n}$ adjustment.

**Table 17.7.1.2.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1**

| UE power class 3 | | | | | |
|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | | | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 33 | |
| | n260 | 39 | n260 | 34 | |
| | n259 | FFS | n259 | FFS | |
| Highest reported value (Cell 1) | All bands: 109 | n257, n258, n261 | | 101 | |
| | | n260 | | 104 | |

| | | | |
|---|---|---|---|
| | | n259 | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | n257, n258, n261 | 32 |
| | | n260 | 34 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | All bands: 109 | n257, n258, n261 | 87 |
| | | n260 | 90 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (Cell 1) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (Cell 1) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.1.2.5-4: evaluation limits for the ∆(Max-Min) reported values for Cell 2 during each time period**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16 | 16 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| ∆(Max-Min) reported value Cell 2 | 16+TT | 16+TT |

**Table 17.7.1.2.5-5: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2**

| **UE power class 3** | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | | |
| Lowest reported value (Cell 1) | n257, n258, n261 | 41 | n257, n258, n261 | 36 |
| | n260 | 39 | n260 | 37 |
| | n259 | FFS | n259 | FFS |
| Highest reported value (Cell 1) | All bands: 109 | n257, n258, n261 | | 104 |
| | | n260 | | 107 |
| | | n259 | | FFS |
| Lowest reported value (Cell 2) | All bands: 52 | n257, n258, n261 | | 35 |
| | | n260 | | 37 |
| | | n259 | | FFS |
| Highest reported value (Cell 2) | All bands: 109 | n257, n258, n261 | | 90 |
| | | n260 | | 93 |
| | | n259 | | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | | |
| Lowest reported value (Cell 1) | FFS | n257, n258, n261 | | FFS |
| | | n260 | | FFS |
| | | n259 | | FFS |
| Highest reported value (Cell 1) | FFS | n257, n258, n261 | | FFS |
| | | n260 | | FFS |
| | | n259 | | FFS |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | | FFS |
| | | n260 | | FFS |

| | | | |
|---|---|---|---|
| | | n259 | FFS |
| Highest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.1.2.5-6: evaluation limits for the reported values for Test 1 and Test 2 relative accuracy rules R3, R6**

| UE power class 3 | | | | |
|---|---|---|---|---|
| **Normal Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | All bands: -23 | | -37 | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | +26 | n257, n258, n261 | +17 |
| | n260 | +27 | n260 | +19S |
| | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1** | | **Test 2 All bands** | |
| Lowest value (RSRP report Cell 2 – RSRP report Cell 1) | FFS | | FFS | |
| Highest value (RSRP report Cell 2 – RSRP report Cell 1) | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS |
| | n259 | FFS | n259 | FFS |

## 17.7.2 SS-RSRQ for RedCap

### 17.7.2.0 Minimum conformance requirements

#### 17.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.1.0.1.

#### 17.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.1.0.2.

### 17.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.2.1.1 Test purpose

To verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

#### 17.7.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.2.1.

#### 17.7.2.1.4 Test description

Same as the test description given in clause 7.7.2.1.4.

##### 17.7.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.2.1.4.1 with following exceptions:

- Table 7.7.2.1.4.1-1 is replaced by Table 17.7.2.1.4.1-1;
- Table 7.7.2.1.4.1-2 is replaced by Table 17.7.2.1.4.1-2.

**Table 17.7.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.2.1-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

##### 17.7.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.7.2.1.4.2.

##### 17.7.2.1.4.3 Message contents

Same as the message contents given in clause 7.7.2.1.4.3.

#### 17.7.2.1.5 Test requirement

Same as the test requirements given in clause 7.7.2.1.5 with followings exceptions:

- Table 7.7.2.1.5-1 is replaced by Table 17.7.2.1.5-1;
- Table 7.7.2.1.5-2 is replaced by Table 17.7.2.1.5-2;
- Table 7.7.2.1.5-3 is replaced by Table 17.7.2.1.5-3.

**Table 17.7.2.1.5-1: Cell-specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| SSB ARFCN | | Freq1 | |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |

| | | | | |
|---|---|---|---|---|
| Data RBs allocated | | | 66 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| TRS configuration | | | TRS.2.1 TDD | - |
| TCI state | | | TCI.State.0 | - |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - |
| Control channel RMC | | | CCR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | | | SMTC.1 | |
| SSB configuration | | | SSB.1 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| SS-RSSI-Measurement | | | Not Applicable | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | | | AWGN | |
| Antenna configuration | | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table 17.7.2.1.5-2: OTA related test parameters**

| | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | | Setup 1 according to clause A.9.1 | | | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15 kHz Note4 | -100.7 | | -96.7 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91.67 | | -87.67 | |
| $\hat{E}_s / N_{oc}$ | dB | 3 | | -3 | |
| SSB_RP Note2 | dBm/SCS Note4 | -88.67 | -88.67 | -90.67 | -90.67 |
| SS-RSRQ Note2 | dB | -14.81 | -14.81 | -16.84 | -16.84 |
| $\hat{E}_s / I_{ot}$ | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | | -55.67 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |
| Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone. | | | | | |
| Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone. | | | | | |

| Note 6: | Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. |
|---|---|

**Table 17.7.2.1.5-3: SS-RSRQ Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 (All bands) | Test 2 | |
|---|---|---|---|
| **Normal Conditions** | | | |
| Lowest reported value (Cell 2) | SS-RSRQ_41 | n257, n258, n261 | SS-RSRQ_35 |
| | | n260 | SS-RSRQ_34 |
| | | n259 | FFS |
| Highest reported value (Cell 2) | SS-RSRQ_73 | All bands | SS-RSRQ_71 |
| **Extreme Conditions** | | | |
| Lowest reported value (Cell 2) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (Cell 2) | FFS | All bands | FFS |

## 17.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

### 17.7.2.2.1 Test purpose

To verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

### 17.7.2.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

### 17.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.2.2.

### 17.7.2.2.4 Test description

Same as the test description given in clause 7.7.2.2.4.

#### 17.7.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.2.2.4.1 with following exceptions:

- Table 7.7.2.2.4.1-1 is replaced by Table 17.7.2.2.4.1-1;
- Table 7.7.2.2.4.1-2 is replaced by Table 17.7.2.2.4.1-2.

**Table 17.7.2.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.2.2-1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.3.4.1 | |
| Exceptions to connection diagram | N/A | | |

### 17.7.2.2.4.2 Test procedure

Same as the test procedure given in clause 7.7.2.2.4.2.

### 17.7.2.2.4.3 Message contents

Same as the message contents given in clause 7.7.2.2.4.3.

### 17.7.2.2.5 Test requirement

Same as the test requirements given in clause 7.7.2.2.5 with followings exceptions:

- Table 7.7.2.2.5-1 is replaced by Table 17.7.2.2.5-1;
- Table 7.7.2.2.5-2 is replaced by Table 17.7.2.2.5-2;
- Table 7.7.2.2.5-3 is replaced by Table 17.7.2.2.5-3;
- Table 7.7.2.2.5-4 is replaced by Table 17.7.2.2.5-4.

**Table 17.7.2.2.5-1: Cell-specific test parameters**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| SSB ARFCN | | | Freq1 | Freq2 |
| SSB Configuration | | | SSB.1 FR2 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| TRS configuration | | | TRS.2.1 TDD | - |
| TCI state | | | TCI.State.0 | - |
| Data RBs allocated | | | 66 | |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | | CR.3.1 TDD | - |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| EPRE ratio of PSS to SSS | | | | |

| | | |
|---|---|---|
| EPRE ratio of PBCH DMRS to SSS | dB | 0 |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | |
| Propagation conditions | | AWGN |
| Antenna configuration | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table 17.7.2.2.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup | | Setup 1 in clause A.9.1 | | | |
| Assumption for UE beams Note 6 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15 kHz Note4 | -95.93 | -95.93 | -95.44 | -95.44 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -86.9 | -86.9 | -86.41 | -86.41 |
| $\hat{E}_s / N_{oc}$ | dB | -1.75 | | -3 | |
| SSB_RP Note2 | dBm/SCS Note4 | -88.65 | -88.65 | -89.41 | -89.41 |
| SS-RSRQ Note2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
| $\hat{E}_s / I_{ot}$ | dB | -1.75 | -1.75 | -3 | -3 |
| Io Note2 | dBm/95.04 MHz Note4 | -55.7 | -55.7 | -55.7 | -55.7 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | |
| Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |
| Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | |
| Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone | | | | | |
| Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone. | | | | | |
| Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | |

**Table 17.7.2.2.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 1) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 1) | RSRQ_73 | RSRQ_74 |

| | | |
|---|---|---|
| Lowest reported value (Cell 2) | RSRQ_41 | RSRQ_37 |
| Highest reported value (Cell 2) | RSRQ_73 | RSRQ_74 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 1) | FFS | FFS |
| Highest reported value (Cell 1) | FFS | FFS |
| Lowest reported value (Cell 2) | FFS | FFS |
| Highest reported value (Cell 2) | FFS | FFS |

**Table 17.7.2.2.5-4: evaluation limits for the reported values for Test 1 and Test 2 relative accuracy rules R3, R6**

| **UE power class 3** | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | - 7 | - 9 |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | + 7 | + 9 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1) | FFS | FFS |
| Highest value (RSRQ report Cell 2 – RSRQ report Cell 1) | FFS | FFS |

## 17.7.3 L1-RSRP measurement for beam reporting for RedCap

### 17.7.3.0 Minimum conformance requirements

#### 17.7.3.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.1.

#### 17.7.3.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.2.

#### 17.7.3.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.3.

#### 17.7.3.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.4.

### 17.7.3.1 NR SA FR2 SSB based L1-RSRP measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.3.1.1 Test purpose

To verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 17.7.3.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.7.3.0.1 and 17.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.3.1.

#### 17.7.3.1.4 Test description

##### 17.7.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.4.1.4.1 with following aspects:

- Table 7.7.4.1.4.1-1 is replaced by Table 17.7.3.1.4.1-1;
- Table 7.7.4.1.4.1-2 is replaced by Table 17.7.3.1.4.1-2.

**Table 17.7.3.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.7.3.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 17.7.3.1-2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

##### 17.7.3.1.4.2 Test procedure

Same as the test procedure given in clause 7.7.4.1.4.2.

##### 17.7.3.1.4.3 Message contents

Same as the message contents given in clause 7.7.4.1.4.3.

17.7.3.1.5 Test requirement

Same as the test requirements given in clause 7.7.4.1.5 with following aspects:

- Table 7.7.4.1.5-1 is replaced by Table 17.7.3.1.5-1;
- Table 7.7.4.1.5-2 is replaced by Table 17.7.3.1.5-2;
- Table 7.7.4.1.5-3 is replaced by Table 17.7.3.1.5-3;
- Table 7.7.4.1.5-3a is replaced by Table 17.7.3.1.5-4;
- Table 7.7.4.1.5-3b is replaced by Table 17.7.3.1.5-5;
- Table 7.7.4.1.5-4 is replaced by Table 17.7.3.1.5-6;
- Table 7.7.4.1.5-5 is replaced by Table 17.7.3.1.5-7.

- **Table 17.7.3.1.5-1: Cell-specific test parameters**

| Parameter | Config | Unit | Test 1 & Test 2 |
|---|---|---|---|
| SSB GSCN | 1, 2 | | freq1 |
| Duplex mode | 1, 2 | | TDD |
| TDD Configuration | 1, 2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1, 2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1, 2 | | 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.2 TDD |
| | 2 | | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| | 2 | | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| | 2 | | CCR.3.7 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| | 2 | | SSB.2 FR2 |
| OCNG Patterns | 1, 2 | | OP.1 |
| Initial BWP Configuration | 1, 2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1, 2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1, 2 | | TCI.State.2 |
| SMTC configuration | 1, 2 | | SMTC.1 |
| *reportConfigType* | 1, 2 | | periodic |
| *reportQuantity* | 1, 2 | | ssb-Index-RSRP |
| Number of reported RS | 1, 2 | | 2 |
| L1-RSRP reporting period | 1, 2 | | slot320 |
| Propagation condition | 1, 2 | | AWGN |
| Antenna configuration | | | 1x2 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | |

**Table 17.7.3.1.5-2: OTA related test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 2 | |
|---|---|---|---|---|---|---|
| | | | SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration | | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 3 | | | Rough | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -104.1 | | n.a. | |
| $N_{oc}$ | 1 | dBm/SSB SCS | -95.1 | | | |
| | 2 | | -92.1 | | n.a. | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | -1.6 | n.a. | |
| SSB_RP Note1 | 1 | dBm/SCS | -85.1 | -96.9 | As in Table B.2.4-2+5.7 | |
| | 2 | | -78 | -90 | As in Table B.2.4-2+5.7 | |
| Io Note1 | 1~2 | dBm/95.04 MHz | -55.67 | | SSB_RP+34.68 | |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | -1.6 | n.a. | |
| Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: No additional noise is added by the test system in Test 2.<br>Note 3: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation. | | | | | | |

**Table 17.7.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (SSB#0) | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value (SSB#0) | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (SSB#0) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (SSB#0) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.3.1.5-4: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |

| | | |
|---|---|---|
| Δ(Max-Min) reported value SSB#0 | FFS | FFS |

**Table 17.7.3.1.5-5: evaluation limits for the Δ(Max-Min) reported values for SSB#0 or SSB#1 for rules R3**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Δ(Max-Min) reported value SSB#0 or SSB#1 | FFS | FFS |

**Table 17.7.3.1.5-6: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value | 45 | n257, n258, n261 | 30 |
| | | n260 | 33 |
| | | n259 | FFS |
| Highest reported value | 104 | n257, n258, n261 | 86 |
| | | n260 | 89 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.3.1.5-7: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest DIFF RSRP reported value | FFS | FFS |
| Highest DIFF RSRP reported value | FFS | FFS |

## 17.7.3.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.3.2.1 Test purpose

To verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 17.7.3.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

#### 17.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 17.7.3.0.3 and 17.7.3.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.3.2.

#### 17.7.3.2.4 Test description

##### 17.7.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.4.2.4.1 with following aspects:

- Table 7.7.4.2.4.1-1 is replaced by Table 17.7.3.2.4.1-1;
- Table 7.7.4.2.4.1-2 is replaced by Table 17.7.3.2.4.1-2.

**Table 17.7.3.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 17.7.3.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 17.7.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.3.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

##### 17.7.3.2.4.2 Test procedure

Same as the test procedure given in clause 7.7.4.2.4.2.

##### 17.7.3.2.4.3 Message contents

Same as the message contents given in clause 7.7.4.2.4.3.

17.7.3.2.5 Test requirement

Same as the test requirements given in clause 7.7.4.2.5 with following aspects:

- Table 7.7.4.2.5-1 is replaced by Table 17.7.3.2.5-1;
- Table 7.7.4.2.5-2 is replaced by Table 17.7.3.2.5-2;
- Table 7.7.4.2.5-3 is replaced by Table 17.7.3.2.5-3;
- Table 7.7.4.2.5-3a is replaced by Table 17.7.3.2.5-4;
- Table 7.7.4.2.5-3b is replaced by Table 17.7.3.2.5-5;
- Table 7.7.4.2.5-4 is replaced by Table 17.7.3.2.5-6.

- **Table 17.7.3.2.5-1: Cell-specific test parameters**

| Parameter | Config | Unit | Test 1 & Test 2 |
|---|---|---|---|
| SSB GSCN | 1 | | freq1 |
| Duplex mode | 1 | | TDD |
| TDD Configuration | 1 | | TDDConf.3.1 |
| $BW_{channel}$ | 1 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 | | CCR.3.1 TDD |
| SSB configuration | 1 | | SSB.1 FR2 |
| OCNG Patterns | 1 | | OP.1 |
| Initial BWP Configuration | 1 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1 | | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 | | TCI.State.2 |
| SMTC configuration | 1 | | SMTC.1 |
| CSI-RS | 1 | | CSI-RS.3.2 TDD |
| *reportConfigType* | 1 | | periodic |
| *reportQuantity* | 1 | | cri-RSRP |
| Number of reported RS | 1 | | 2 |
| L1-RSRP reporting period | 1 | | slot320 |
| Propagation condition | 1 | | AWGN |
| Antenna configuration | 1 | | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | |

| | | | |
|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

**Table 17.7.3.2.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 NOTE 3 | |
|---|---|---|---|---|---|
| | | CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | Setup 1 according to A.9.1 | | Setup 1 according to A.9.1 | |
| Assumption for UE beams Note 4 | | Rough | | Rough | |
| $N_{oc}$ | dBm/15 kHz | -104.10 | | n.a. | |
| $N_{oc}$ | dBm/SCS | -95.11 | | n.a.<br>n.a. | |
| $\hat{E}_s / I_{ot}$ | dB | 10 | -1.8 | | |
| CSI-RS-RSRP Note1 | dBm/SCS | -85.11 | -96.93 | As in Table B.2.4-2+5.7 | |
| Io Note1 | dBm/95.04 MHz | -55.67 | | CSI-RS_RP+34.68 | |
| $\hat{E}_s / N_{oc}$ | dB | 10 | -1.82 | n.a. | |

Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

**Table 17.7.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (CSI-RS#0) | 42 | n257, n258, n261 | 27 |
| | | n260 | 30 |
| | | n259 | FFS |
| Highest reported value (CSI-RS#0) | 101 | n257, n258, n261 | 83 |
| | | n260 | 86 |
| | | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2** | |
| Lowest reported value (CSI-RS#0) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |
| Highest reported value (CSI-RS#0) | FFS | n257, n258, n261 | FFS |
| | | n260 | FFS |
| | | n259 | FFS |

**Table 17.7.3.2.5-4: evaluation limits for the ∆(Max-Min) reported values for CSI-RS#0 for rules R1**

| UE power class 3 |
|---|

| Normal Conditions | Test 1<br>All bands | Test 2<br>All bands |
|---|---|---|
| Δ(Max-Min) reported value CSI-RS#0 | 18 | 18 |
| **Extreme Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Δ(Max-Min) reported value CSI-RS#0 | FFS | FFS |

**Table 17.7.3.2.5-5: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | 18 | 18 |
| **Extreme Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1 | FFS | FFS |

**Table 17.7.3.2.5-6: evaluation limits for the reported values for Test 1 and Test 2 relative accuracy rules R2, R4**

| UE power class 3 | | |
|---|---|---|
| **Normal Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Lowest DIFF RSRP reported value | 2 | 0 |
| Highest DIFF RSRP reported value | 9 | 4 |
| **Extreme Conditions** | **Test 1<br>All bands** | **Test 2<br>All bands** |
| Lowest DIFF RSRP reported value | FFS | FFS |
| Highest DIFF RSRP reported value | FFS | FFS |

## 17.7.4 SS-SINR for RedCap

### 17.7.4.0 Minimum conformance requirements

#### 17.7.4.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.1.

#### 17.7.4.0.2 Inter-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.2.

### 17.7.4.1 NR SA FR2 SS-SINR measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.4.1.1 Test purpose

To verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

#### 17.7.4.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting SS-SINR measurements.

#### 17.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.4.1.

#### 17.7.4.1.4 Test description

Same as the test description given in clause 7.7.3.1.4.

##### 17.7.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.3.1.4.1 with following exceptions:

- Table 7.7.3.1.4.1-1 is replaced by Table 17.7.4.1.4.1-1;
- Table 7.7.3.1.4.1-2 is replaced by Table 17.7.4.1.4.1-2.

**Table 17.7.4.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.4.1-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.4.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

##### 17.7.4.1.4.2 Test procedure

Same as the test procedure given in clause 7.7.3.1.4.2.

#### 17.7.4.1.4.3 Message contents

Same as the message contents given in clause 7.7.3.1.4.3.

### 17.7.4.1.5 Test requirement

Same as the test requirement given in clause 7.7.3.1.5 with following exceptions:

- Table 7.7.3.1.5-1 is replaced by Table 17.7.4.1.5-1;
- Table 7.7.3.1.5-2 is replaced by Table 17.7.4.1.5-2;
- Table 7.7.3.1.5-3 is replaced by Table 17.7.4.1.5-3.

**Table 17.7.4.1.5-1: Cell-specific test parameters**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| SSB ARFCN | | Freq2 | |
| Duplex mode | | TDD | |
| TDD configuration | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 66 | |
| Downlink initial BWP configuration | | DLBWP.0.1 | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | |
| Uplink initial BWP configuration | | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | |
| DRX cycle configuration | ms | Not applicable | |
| TRS configuration | | TRS.2.1 TDD | |
| TCI state | | TCI.State.0 | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel | | CCR.3.1 TDD | - |
| OCNG Patterns | | OP.1 | |
| SMTC configuration | | SMTC.1 | |
| SSB configuration | | SSB.1 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | |
| SS-RSSI-Measurement | | Not Applicable | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| Propagation conditions | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table 17.7.4.1.5-2: OTA related test parameters**

| Parameter | Unit | Test 1 | Test 3 |
|---|---|---|---|

| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
|---|---|---|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 according to clause A.9.1 | | Setup 1 according to clause A.9.1 | |
| Assumption for UE beams Note 6 | | | Rough | | Rough | |
| $N_{oc}$ Note1 | | dBm/15 kHz Note4 | -105 | | -105 | |
| $N_{oc}$ Note1 | | dBm/SCS Note3 | -96 | | -96 | |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54 | 2.66 | -3 | |
| SSB_RP Note2 | | dBm/SCS Note4 | -91.46 | -93.34 | -98.8 | -98.8 |
| SS-SINR Note2 | n257, 258, n261 | | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | dB | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| $\hat{E}_s / I_{ot}$ | n257, 258, n261 | | -0.18 | -3.32 | -4.95 | -4.95 |
| | n260 | dB | -0.31 | -3.42 | -5.20 | -5.20 |
| | n259 | | -0.39 | -3.48 | -5.48 | -5.48 |
| Io Note2 | | dBm/95.04 MHz Note4 | -59.43 | | -63.87 | |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3 and does not limit UE implementation or test system implementation.

**Table 17.7.4.1.5-3: SS-SINR Intra-frequency absolute accuracy requirements for the reported values**

| UE Power Class 3 | Test 1 | | Test 2 | |
|---|---|---|---|---|
| **Normal Conditions** | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | SS-SINR_22 | All bands | SS-SINR_18 |
| | n260 | SS-SINR_21 | | |
| | n259 | FFS | | |
| Highest reported value (Cell 2) | All bands | SS-SINR_58 | n257, n258, n261 | SS-SINR_55 |
| | | | n260 | SS-SINR_54 |
| | | | n259 | FFS |
| **Extreme Conditions** | | | | |
| Lowest reported value (Cell 2) | n257, n258, n261 | FFS | All bands | FFS |
| | n260 | FFS | | |
| | n259 | FFS | | |
| Highest reported value (Cell 2) | All bands | FFS | n257, n258, n261 | FFS |
| | | | n260 | FFS |
| | | | n259 | FFS |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 17.7.4.2 NR SA FR2-FR2 SS-SINR measurement accuracy for 2 Rx UE

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

#### 17.7.4.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

#### 17.7.4.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting SS-SINR measurements.

#### 17.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.7.4.2.

#### 17.7.4.2.4 Test description

Same as the test description given in clause 7.7.3.2.4.

##### 17.7.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.7.3.2.4.1 with following exceptions:

- Table 7.7.3.2.4.1-1 is replaced by Table 17.7.4.2.4.1-1;
- Table 7.7.3.2.4.1-2 is replaced by Table 17.7.4.2.4.1-2.

**Table 17.7.4.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 17.7.4.2-1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

**Table 17.7.4.2.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1. | |
| Channel bandwidth | As specified by the selected test configuration. | |
| Propagation conditions | AWGN | As specified in Annex C.2.1 |
| Connection Diagram | TE Part: A.3.3.1.1<br>DUT Part: A.3.4.1.1 | As specified in TS 38.508-1 [14] Annex A. |
| Exceptions to connection diagram | N/A | |

##### 17.7.4.2.4.2 Test procedure

Same as the test procedure given in clause 7.7.3.2.4.2.

#### 17.7.4.2.4.3 Message contents

Same as the message contents given in clause 7.7.3.2.4.3.

### 17.7.4.2.5 Test requirement

Same as the test requirement given in clause 7.7.3.2.5 with following exceptions:

- Table 7.7.3.2.5-1 is replaced by Table 17.7.4.2.5-1;
- Table 7.7.3.2.5-2 is replaced by Table 17.7.4.2.5-2;
- Table 7.7.3.2.5-3 is replaced by Table 17.7.4.2.5-3;
- Table 7.7.3.2.5-4 is replaced by Table 17.7.4.2.5-4.

**Table 17.7.4.2.5-1: SS-SINR Inter-frequency general test parameters**

| Parameter | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|
| | | Test 1 | Test 2 | Test 3 | Test 1 | Test 2 | Test 3 |
| SSB ARFCN | | freq1 | | | freq2 | | |
| Duplex mode | | TDD | | | | | |
| TDD configuration | | TDDConf.3.1 | | | | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | | | |
| Data RBs allocated | | 66 | | | | | |
| Downlink initial BWP configuration | | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration | | TRS.2.1 TDD | | | | | |
| TCI state | | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | | - | | |
| RMSI CORESET Reference Channel | | CR.3.1 TDD | | | - | | |
| OCNG Patterns | | OP.1 | | | | | |
| SMTC configuration | | SMTC.1 | | | | | |
| SSB configuration | | SSB.3 FR2 | | | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| Propagation conditions | | AWGN | | | | | |
| Antenna Configuration | | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |

**Table 17.7.4.2.5-2: SS-SINR Inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |

| Angle of arrival configuration | | Setup 1 | | Setup 1 | | Setup 1 | |
|---|---|---|---|---|---|---|---|
| Assumption for UE beams[Note 6] | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15 kHz Note4 | -105 | -105 | -105.1 | -105.1 | -105 | -105 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | -96 | -96.1 | -96.1 | -96 | -96 |
| $\hat{E}_s / N_{oc}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| SS-RSRP[Note2] | dBm/SCS Note4 | -96.5 | -96.5 | -85.1 | -85.1 | -98.1 | -98.1 |
| SS-SINR[Note2] | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| $\hat{E}_s / I_{ot}$ | dB | -0.5 | -0.5 | 11 | 11 | -2.1 | -2.1 |
| Io[Note2] | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.75 | -55.75 | -64.9 | -64.9 |

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in Annex B.2.1.3 of TS 38.133 [6] and does not limit UE implementation or test system implementation.

**Table 17.7.4.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5**

| UE power class 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 1) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | SINR_27 | | SINR_48 | | n257, n258, n261 | SINR_23 |
| | | | | | n260 | SINR_22 |
| | | | | | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | SINR_62 | n257, n258, n261 | SINR_87 | n257, n258, n261 | SINR_60 |
| | n260 | SINR_61 | n260 | SINR_86 | n260 | SINR_59 |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| **Extreme Conditions** | **Test 1 All bands** | | **Test 2 All bands** | | **Test 3 All bands** | |
| Lowest reported value (Cell 1) | FFS | | FFS | | n257, n258, n261 | FFS |
| | | | | | n260 | FFS |
| | | | | | n259 | FFS |
| Highest reported value (Cell 1) | n257, n258, n261 | FFS | n257, n258, n261 | FFS | n257, n258, n261 | FFS |
| | n260 | FFS | n260 | FFS | n260 | FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |
| Lowest reported value (Cell 2) | FFS | | FFS | | n257, n258, n261 | FFS |
| | | | | | n260 | FFS |
| | | | | | n259 | FFS |
| Highest reported value (Cell 2) | n257, n258, n261 | FFS | n257, n258, n261 | FFS | n257, n258, n261 | SINR_60 + FFS |
| | n260 | FFS | n260 | FFS | n260 | SINR_59 + FFS |
| | n259 | FFS | n259 | FFS | n259 | FFS |

**Table 17.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6**

| UE power class 3 | | | |
|---|---|---|---|
| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | - 8 | - 17 | - 9 |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | + 8 | + 17 | + 9 |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest value (SINR report Cell 2 – SINR report Cell 1) | FFS | FFS | FFS |
| Highest value (SINR report Cell 2 – SINR report Cell 1) | FFS | FFS | FFS |

# 18 E-UTRA - NR inter-RAT with E-UTRA serving cell for RedCap

## 18.1 RRC_IDLE state mobility for RedCap

### 18.1.1 Inter-RAT cell re-selection for RedCap

#### 18.1.1.0 Minimum conformance requirements

TBD

#### 18.1.1.1 E-UTRA - NR SA FR1 E-UTRA cell re-selection to higher priority NR target Cell for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- Test applicability is missing
- Cell mapping is missing

##### 18.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRA - NR SA FR1 inter-RAT cell reselection for RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

##### 18.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

##### 18.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 18.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.18.1.1.1.

18.1.1.1.4 Test description

18.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 18.1.1.1.4.1-1.

**Table 18.1.1.1.4.1-1: Supported test configurations for E-UTRA - NR SA FR1 E-UTRA Cell re-selection to higher priority NR target Cell in FR1**

| Configuration | Description |
|---|---|
| 18.1.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.1.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.1.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.1.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.1.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.1.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.1.1.1-7 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.1.1.1-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 18.1.1.1.4.1-2.

**Table 18.1.1.1.4.1-2: Initial conditions for E-UTRA - NR SA FR1 E-UTRA Cell re-selection to higher priority NR target Cell in FR1**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | Without faders. | | |

1. The general test parameter settings are set up according to Table 18.1.1.1.4.1-3.
2. Message contents are defined in clause 18.1.1.1.4.3.
3. The test scenario comprises of 1 E-UTRA cell and 1 NR cell. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

**Table 18.1.1.1.4.1-3: General test parameters for E-UTRA - NR SA FR1 E-UTRA Cell re-selection to higher priority NR target Cell in FR1**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell2 | The UE camps on cell 2 in the initial phase |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell1 | |
| T1 end condition | Active cell | | | Cell1 | During T1 period the UE reselects to cell 1 |
| | Neighbour cell | | | Cell2 | |
| T3 end condition | Active cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell2 | The UE shall perform reselection to cell 2 during T3 |
| | Neighbour cell | | 1, 2, 3, 4, 5, 6, 7, 8 | Cell1 | |
| RF Channel Number | | | 1, 2, 3, 4, 5, 6, 7, 8 | 1, 2 | E-UTRAN radio channel (1) and NR radio channel (2) are used for this test |
| Time offset between cells | | | 1, 4, 7, 8 | 3 ms | Asynchronous cells |

| | | | | |
|---|---|---|---|---|
| | | 2, 5 | 3 μs | Synchronous cells |
| | | 3, 6 | 3 μs | Synchronous cells |
| Access Barring Information | - | 1, 2, 3, 4, 5, 6, 7, 8 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | s | 1, 2, 3, 4, 5, 6, 7, 8 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | | 1, 2, 3, 4, 5, 6, 7, 8 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| T1 | s | 1, 2, 3, 4, 5, 6, 7, 8 | 15 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | s | 1, 2, 3, 4, 5, 6, 7, 8 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | s | 1, 2, 3, 4, 5, 6, 7, 8 | 75 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

#### 18.1.1.1.4.2 Test procedure

TBD

#### 18.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

### 18.1.1.1.5 Test requirement

Table 18.1.1.1.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 2 Rx UE.

**Table 18.1.1.1.5-1: NR cell 2 specific test parameters for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1**

| Parameter | Unit | Test configuration | Cell 2 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| TDD configuration | | 1, 4, 7, 8 | N/A | | |
| | | 2, 5 | TDDConf.1.1 | | |
| | | 3, 6 | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | | 1, 4, 7, 8 | SR.1.1 FDD | | |
| | | 2, 5 | SR.1.1 TDD | | |
| | | 3, 6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | 1, 4, 7, 8 | CR.1.1 FDD | | |
| | | 2, 5 | CR.1.1 TDD | | |
| | | 3, 6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | | 1, 4, 7, 8 | CCR.1.1 FDD | | |
| | | 2, 5 | CCR.1.1 TDD | | |
| | | 3, 6 | CCR.2.1 TDD | | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6, 7, 8 | OP.1 | | |
| SMTC configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | SMTC.1 | | |
| SSB configuration | | 1, 4, 7, 8 | SSB.1 FR1 | | |
| | | 2, 5 | SSB.1 FR1 | | |
| | | 3, 6 | SSB.1 RedCap FR1 | | |
| Initial DL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | DLBWP.0.1 | | |

| | | | | | |
|---|---|---|---|---|---|
| Initial UL BWP configuration | | 1, 2, 3, 4, 5, 6, 7, 8 | ULBWP.0.1 | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6, 7, 8 | SSB | | |
| Qrxlevmin | dBm/SCS | 1, 2, 4, 5, 7, 8 | -140 | | |
| | | 3, 6 | -137 | | |
| Pcompensation | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| $Qhyst_s$ | dB | 1, 2, 3, 4, 5, 6 | 0 | | |
| $Qoffset_{s,n}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | | |
| Cell_selection_and_reselection_quality_measurement | | 1, 2, 3, 4, 5, 6, 7, 8 | SS-RSRP | | |
| $\hat{E}_s / I_{ot}$ | dB | 1, 4, 7, 8 | -3.65 | -infinity | 13.55 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1, 4, 7, 8 | -99.90 | -98 | -98 |
| | | 2, 5 | -99.90 | -98 | -98 |
| | | 3, 6 | -96.90 | -95 | -95 |
| $N_{oc}$ Note2 | dBm/15 kHz | 1, 4, 7, 8 | -99.90 | -98 | -98 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| $\hat{E}_s / N_{oc}$ | dB | 1, 4, 7, 8 | -3.65 | -infinity | 13.55 |
| | | 2, 5 | | | |
| | | 3, 6 | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 4, 7, 8 | -103.55 | -infinity | -84.45 |
| | | 2, 5 | -103.55 | -infinity | -84.45 |
| | | 3, 6 | -100.54 | -infinity | -81.44 |
| Io | dBm/9.36 MHz | 1, 4, 7, 8 | -70.39 | -70.05 | -56.31 |
| | dBm/9.36 MHz | 2, 5 | -70.39 | -70.05 | -56.31 |
| | dBm/18.36 MHz | 3, 6 | -67.46 | -67.12 | -53.38 |
| Treselection | s | 1, 2, 3, 4, 5, 6, 7, 8 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | | |
| $Thresh_{x, highP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 44 | | |
| $Thresh_{x, lowP}$ | dB | 1, 2, 3, 4, 5, 6, 7, 8 | 50 | | |
| Propagation Condition | | 1, 2, 3, 4, 5, 6, 7, 8 | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table 18.1.1.1.5-2: E-UTRA cell 1 specific test parameters for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1**

| Parameter | Unit | Cell 1 | | |
|---|---|---|---|---|
| | | T1 | T2 | T3 |
| E-UTRA RF Channel number | | 1 | | |
| $BW_{channel}$ | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 | | OP.2 FDD for test configuration 1, 2, 3, 7; OP.2 TDD for test configuration 4, 5, 6, 8 | | |
| PBCH_RA | dB | 0 | | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |

| | | | | |
|---|---|---|---|---|
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA Note 1 | dB | | | |
| OCNG_RB Note 1 | dB | | | |
| Qrxlevmin | dBm | -140 | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | -98 | | |
| RSRP Note 3 | dBm/15 KHz | -84 | -84 | -82.45 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | 14 | 15.55 |
| $\hat{E}_s/N_{oc}$ | dB | 14 | 14 | 15.55 |
| $Treselection_{EUTRAN}$ | S | 0 | | |
| SnonintrasearchP | dB | 50 | | |
| $Thresh_{x, highP}$ | dB | 48 | | |
| $Thresh_{serving, lowP}$ | dB | 44 | | |
| $Thresh_{x, lowP}$ | dB | 50 | | |
| Propagation Condition | | AWGN | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR} + T_{SI-NR,}$ and to a lower priority cell can be expressed as: $T_{evaluate, NR} + T_{SI-NR,}$

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

# 18.2 RRC_CONNECTED state mobility for RedCap

## 18.2.1 Handover for RedCap

### 18.2.1.0 Minimum conformance requirements

Then minimum requirements given in clause 16.3.1.0.2 apply.

The normative reference for this requirement is TS 36.133 [23] clause 5.3.4B.

### 18.2.1.1 E-UTRA - NR SA FR1 handover for 2 Rx UE

#### 18.2.1.1.1 Test purpose

To verify the E-UTRAN to NR FR1 handover requirements for 2RX RedCap as specified in TS 36.133 [23] clause 5.3.4B.

#### 18.2.1.1.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx.

#### 18.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 18.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.18.2.1.1.

#### 18.2.1.1.4 Test description

Same as the test description given in clause 8.3.1.1.4.

##### 18.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 8.3.1.1.4.1 with following exceptions:

- Table 8.3.1.1.4.1-1 is replaced by Table 18.2.1.1.4.1-1.
- Table 8.3.1.1.4.1-2 is replaced by Table 18.2.1.1.4.1-2.
- Table 8.3.1.1.4.1-3 is replaced by Table 18.2.1.1.4.1-3.

**Table 18.2.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.2.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.2.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.2.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.2.1.1-4 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.2.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.2.1.1-6 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.2.1.1-7 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.2.1.1-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 18.2.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.2.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.1 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.2.1.1.4.1-3: General test parameters for E-UTRAN inter-RAT NR handover**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| NR RF Channel Number | | | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number | | | 2 | 1 E-UTRAN carrier frequency is used in the test |
| Initial conditions | Active cell | | Cell 1 | E-UTRAN cell |
| | Neighbouring cell | | Cell 2 | NR cell |
| Final condition | Active cell | | Cell 2 | |
| NR measurement quantity | | | SS-RSRP | |
| E-UTRAN measurement quantity | | | RSRP | |

| | | | |
|---|---|---|---|
| b2-Threshold1 | dBm | -83 | Absolute E-UTRAN RSRP threshold for event B2 |
| b2-Threshold2NR | dBm | As specified in Table 18.2.1.1.5-2 | Absolute NR SS-RSRP threshold for event B2 |
| Hysteresis | dB | 0 | |
| TimeToTrigger | s | 0 | |
| Filter coefficient | | 0 | L3 filtering is not used |
| DRX | | OFF | Non-DRX test |
| Access Barring Information | - | Not sent | No additional delays in random access procedure |
| Time offset between cells | | 3 ms | Asynchronous cells |
| Gap pattern configuration Id | | 0 | As specified in Table 8.1.2.1-1 started before T2 starts [23] |
| T1 | s | 5 | |
| T2 | s | ≤5 | |
| T3 | s | 1 | |

### 18.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 8.3.1.1.4.2.

### 18.2.1.1.4.3 Message contents

Same as the message contents given in clause 8.3.1.1.4.3 with following exceptions.

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

### 18.2.1.1.5 Test requirement

Same as the test requirements given in clause 8.3.1.1.5 with following exceptions:

- Table 8.3.1.1.5-1 is replaced by Table 18.2.1.1.5-1.
- Table 8.3.1.1.5-2 is replaced by Table 18.2.1.1.5-2.

**Table 18.2.1.1.5-1: Cell specific test parameters for E-UTRAN inter-RAT NR handover (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| RF channel number | | 1,2,3,4,5,6,7,8 | 2 | | |
| Duplex mode | | 1,2,3,4 | FDD | | |
| | | 5,6,7,8 | TDD | | |
| TDD special subframe configuration[Note1] | | 5,6,7,8 | 6 | | |
| TDD uplink-downlink configuration[Note1] | | 5,6,7,8 | 1 | | |
| $BW_{channel}$ | MHz | 1,2,3,4,5,6,7,8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | | |
| PRACH Configuration[Note2] | | 1,2,3,4 | 4 | | |
| | | 5,6,7,8 | 53 | | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1,2,3,4 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | | |
| | | 5,6,7,8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1,2,3,4 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | | |
| | | 5,6,7,8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | | |
| OCNG Patterns[Note3] | | 1,2,3,4 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | | |
| | | 5,6,7,8 | 5 MHz: OP.9 TDD | | |

| Parameter | Unit | Configuration | Cell 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| | | | 10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | | |
| PBCH_RA | dB | 1,2,3,4,5,6,7,8 | 0 | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| PDSCH_RA | | | | | |
| PDSCH_RB | | | | | |
| OCNG_RA Note4 | | | | | |
| OCNG_RB Note4 | | | | | |
| $N_{oc}$ Note5 | dBm/15 kHz | 1,2,3,4,5,6,7,8 | -98 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3,4,5,6,7,8 | 7 | 5.45 Note 8 | 5.45 Note 8 |
| $\hat{E}_s/I_{ot}$ Note6 | dB | 1,2,3,4,5,6,7,8 | 7 | 5.45 | 5.45 |
| RSRP Note6 | dBm/15 kHz | 1,2,3,4,5,6,7,8 | -91 | -92.55 | -92.55 |
| SCH_RP Note6 | dBm/15 kHz | 1,2,3,4,5,6,7,8 | -91 | -92.55 | -92.55 |
| Io Note6 | dBm/9 MHz | 1,2,3,4,5,6,7,8 | -62.43 | -63.68 | -63.68 |
| Propagation Condition | | 1,2,3,4,5,6,7,8 | AWGN | | |
| Antenna Configuration and Correlation Matrix Note7 | | 1,2,3,4,5,6,7,8 | 1x2 Low | | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
NOTE 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
NOTE 3: DL RMCs and OCNG patterns are specified in clauses A.3.1 and A.3.2 of TS 36.133 [15] respectively.
NOTE 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].
NOTE 8: Including test tolerance given in Annex F.

**Table 18.2.1.1.5-2: Cell specific test parameters E-UTRAN inter-RAT NR handover (Cell 2)**

| Parameter | | Unit | Configuration | Cell 2 | | |
|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 |
| RF channel number | | | 1,2,3,4,5,6,7,8 | 1 | | |
| Duplex mode | | | 1,5 | FDD | | |
| | | | 2,3,6,7 | TDD | | |
| | | | 4.8 | HD-FDD | | |
| TDD Configuration | | | 2 6 | TDDConf.1.1 | | |
| | | | 3,7 | TDDConf.2.1 | | |
| $BW_{channel}$ | | MHz | 1,4,5,8 | 10: $N_{RB,c}$ = 52 (FDD) | | |
| | | | 2,6 | 10: $N_{RB,c}$ = 52 (TDD) | | |
| | | | 3,7 | 20: $N_{RB,c}$ = 51 (TDD) | | |
| PDSCH reference measurement channel | | | 1,4,5,8 | SR.1.1 FDD | | |
| | | | 2,6 | SR.1.1 TDD | | |
| | | | 3,7 | SR.2.1 TDD | | |
| CORSET reference channel | | | 1,4,5,8 | CR.1.1 FDD | | |
| | | | 2,6 | CR.1.1 TDD | | |
| | | | 3,7 | CR.2.1 TDD | | |
| PRACH configuration | | | 1,2,3,4,5,6,7,8 | PRACH.1 FR1 | | |
| OCNG pattern Note1 | | | 1,2,3,4,5,6,7,8 | OP.1 | | |
| BWP | Initial DL BWP | | 1,2,3,4,5,6,7,8 | DLBWP.0.1 | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Initial UL BWP | | | ULBWP.0.1 | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | |
| SMTC configuration | | | 1,2,3,4,5,6,7,8 | SMTC.1 RedCap | | |
| SSB configuration | | | 1,2,4,5,6,8 | SSB.4 RedCap FR1 | | |
| | | | 3,7 | SSB.2 RedCap FR1 | | |
| b2-Threshold2NR | | dBm | 1,2,4,5,6,8 | -106 | | |
| | | | 3,7 | -103 | | |
| EPRE ratio of PSS to SSS | | dB | 1,2,3,4,5,6,7,8 | 0 | | |
| EPRE ratio of PBCH_DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH_DMRS | | | | | | |
| EPRE ratio of PDCCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH_DMRS | | | | | | |
| EPRE ratio of PDSCH_DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH_DMRS | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | | | | | |
| $N_{oc}$ Note2 | | dBm/15 KHz | 1,2,3,4,5,6,7,8 | -98 | | |
| $N_{oc}$ Note2 | | dBm/SCS | 1,2,4,5,6,8 | -98 | | |
| | | | 3,7 | -95 | | |
| $\hat{E}_s/N_{oc}$ | | dB | 1,2,3,4,5,6,7,8 | -infinity | 1.55 Note 4 | 1.55 Note 4 |
| $\hat{E}_s/I_{ot}$ Note3 | | dB | 1,2,3,4,5,6,7,8 | -infinity | 1.55 | 1.55 |
| SS-RSRP Note3 | | dBm/SCS | 1,2,4,5,6,8 | -infinity | -96.45 | -96.45 |
| | | | 3,7 | -infinity | -93.44 | -93.44 |
| Io Note3 | | dBm/9.36 MHz | 1,2,4,5,6,8 | -70.05 | -66.19 | -66.19 |
| | | dBm/18.36 MHz | 3,7 | -67.13 | -63.27 | -63.27 |
| Propagation condition | | | 1,2,3,4,5,6,7,8 | AWGN | | |
| Antenna Configuration and Correlation Matrix | | | 1,2,3,4,5,6,7,8 | 1x2 Low | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Including test tolerance given in Annex F.

## 18.2.2 RRC connection release with redirection for RedCap

### 18.2.2.0 Minimum conformance requirements

#### 18.2.2.0.1 Redirection from E-UTRA to FR1 RedCap UE

The RedCap UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR_RedCap}$.

The time delay ($T_{connection_release_redirect_NR_RedCap}$) is the time between the end of the last TTI containing the RRC command, "*RRCConnectionRelease*" (TS 36.331 [2]) on the E-UTRAN PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR_RedCap}$) shall be less than:

$$T_{connection_release_redirect_NR_RedCap} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_Redcap} + T_{SI\text{-}NR_RedCap} + T_{RACH_RedCap}$$

The target NR cell shall be considered detectable for 1 Rx RedCap when for each relevant SSB:

- SSB_RP and SSB $\hat{E}s/Iot$ according to Annex B.2.X of TS 38.133 [6] for a corresponding NR Band.

The target NR cell shall be considered detectable for 2 Rx RedCap when for each relevant SSB:

- SSB_RP and SSB $\hat{E}s/Iot$ according to Annex B.2.X of TS 38.133 [6] for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCConnectionRelease*" as defined in clause 6.2.2 of TS 36.331 [2]. It shall be less than 110 ms.

$T_{identify-NR_RedCap}$: It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in Table 18.2.2.0-1 for 1 Rx RedCap for FR1 and in Table 18.2.2.0-2 for 2 Rx RedCap. $T_{identify-NR_RedCap} = T_{PSS/SSS-sync_RedCap} + T_{meas_RedCap}$, where $T_{PSS/SSS-sync_RedCap}$ is the cell search time and $T_{meas_RedCap}$ is the measurement time due to cell selection criteria evaluation. The RedCap UE operating in NR HD-FDD shall meet the requirements in this section provided that the SSB is available at the UE at least once every SMTC period during $T_{identify-NR_RedCap}$.

$T_{SI-NR_RedCap}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

$T_{RACH_RedCap}$: It is the delay caused due to the random access procedure when sending random access to the target NR cell. $T_{RACH_RedCap}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [39]. The RedCap UE operating in NR HD-FDD mode shall perform the PRACH transmission on the PRACH resource of the target NR cell provided that the UE has received at least one SSB associated with the PRACH resource during the last [TBD] period in the target NR cell.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with $T_{rs}$ = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,
- there is no requirement if the SSB transmission periodicity is larger than 20 ms.

**Table 18.2.2.0-1: Time to identify target NR cell for RRC connection release with redirection to NR for 1 Rx RedCap**

| Frequency range (FR) of target NR cell | $T_{identify-NR_RedCap}$ |
|---|---|
| FR1 | MAX (680 ms, 12 x Trs) |

**Table 18.2.2.0-2: Time to identify target NR cell for RRC connection release with redirection to NR for 2 Rx RedCap**

| Frequency range (FR) of target NR cell | $T_{identify-NR_RedCap}$ |
|---|---|
| FR1 | MAX (680 ms, 11 x Trs) |
| FR2 | MAX (880 ms, 88 x Trs) |

The normative reference for this requirement is TS 36.133 [23] clause 6.3.2.6.

## 18.2.2.1 E-UTRA - NR SA FR1 RRC connection release with redirection for 2 Rx UE

### 18.2.2.1.1 Test purpose

To verify RRC connection release with redirection from E-UTRA to NR requirements for 2Rx RedCap specified in TS 36.133 [23] clause 6.3.2.6.

### 18.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

### 18.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 18.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.18.2.2.1.

18.2.2.1.4 Test description

18.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 18.2.2.1.4.1-1

**Table 18.2.2.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.2.2.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 18.2.2.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 18.2.2.1-3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 18.2.2.1-4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 18.2.2.1-5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 18.2.2.1-6 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 18.2.2.1-7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 18.2.2.1-8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 18.2.2.1.4.1-2.

**Table 18.2.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 6.3.2.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.6.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.2 | |
| Exceptions to connection diagram | | | |

1. The general test parameters settings are given in Table 18.2.2.1.4.1-3 below.

2. Message contents are defined in clause 18.2.2.1.4.3.

3. There are two cells specified in the test. Cell 1 is the E-UTRA PCell and Cell 2 is the NR neighbour cell. Cell 1 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1, Cell 2 is configured according to Annex C.1.1 and C.1.2,

**Table 18.2.2.1.4.1-3: General test parameters for Redirection from E-UTRAN to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | E-UTRA Cell |
| | Neighbouring cell | | Cell 2 | NR Cell |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | |

18.2.2.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCConnectionRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last

TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to T1 in Table 18.2.2.1.5-1 for Cell 1 and Table 18.2.2.1.5-2 for Cell 2. T1 starts.
3. SS shall transmit an *RRCConnectionRelease* with *redirectedCarrierInfo* during period T1.
4. The SS shall start T2 timer when the last TTI containing the *RRCConnectionRelease* message is sent to UE.
5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 18.2.2.1.5-1 for Cell 1 and in Table 18.2.2.1.5-2 for Cell 2.
6. The UE shall transmit an *RRCSetupRequest* message.
7. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T2 expires, the UE shall be switched off. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. Cell 1 is the active cell and Cell 2 shall be powered OFF.
9. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

### 18.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 18.2.2.1.4.3-1: RRCConnectionRelease (Test procedure, Step 3)**

| Derivation Path: 36.508 [25] Table 4.6.1-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionRelease-r8 SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr-r15 SEQUENCE { | | | |
| carrierFreq-r15 | ARFCN-ValueNR-r15 of Cell 2 | | |
| subcarrierSpacingSSB-r15 | khz15 | | Config 1,2,4,5,7,8 |
| | Khz30 | | Config 3,6 |
| smtc-r15 SEQUENCE { | | | |
| periodicityAndOffset-r15 CHOICE { | | | |
| sf40-r15 | 0 | | |
| } | | | |
| ssb-Duration-r15 | sf1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 18.2.2.1.5 Test requirement

Table 18.2.2.1.4.3-1 and Table 18.2.2.1.4.3-2 define the primary level settings for redirection from E-UTRA to NR RedCap test case.

**Table 18.2.2.1.5-1: E-UTRA Cell specific test parameters (Cell 1)**

| Parameter | Unit | Configuration | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | 1,2,3,4,5,6,7,8 | 2 | |
| Duplex mode | | 1,2,3,7 | FDD | |
| | | 4,5,6,8 | TDD | |
| TDD special subframe configuration[Note1] | | 4,5,6,8 | 6 | |
| TDD uplink-downlink configuration[Note1] | | 4,5,6,8 | 1 | |
| $BW_{channel}$ | MHz | 1,2,3,4,5,6,7,8 | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PRACH Configuration[Note2] | | 1,2,3,7 | 4 | |
| | | 4,5,6,8 | 53 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note3] | | 1,2,3,7 | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | | 4,5,6,8 | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note3] | | 1,2,3,7 | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | | 4,5,6,8 | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note3] | | 1,2,3,7 | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | | 4,5,6,8 | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| PBCH_RA | dB | 1,2,3,4,5,6,7,8 | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note4] | | | | |
| OCNG_RB[Note4] | | | | |
| $N_{oc}$[Note5] | dBm/15kHz | 1,2,3,4,5,6,7,8 | -98 | |
| $\hat{E}_s/N_{oc}$ | dB | 1,2,3,4,5,6,7,8 | 4 | 4 |
| $\hat{E}_s/I_{ot}$[Note6] | dB | 1,2,3,4,5,6,7,8 | 4 | 4 |
| RSRP[Note6] | dBm/15kHz | 1,2,3,4,5,6,7,8 | -94 | -94 |
| SCH_RP[Note6] | dBm/15kHz | 1,2,3,4,5,6,7,8 | -94 | -94 |
| Io[Note6] | dBm/9MHz | 1,2,3,4,5,6,7,8 | -64.76 | -64.76 |
| Propagation Condition | | 1,2,3,4,5,6,7,8 | AWGN | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
Note 3: DL RMCs and OCNG patterns are specified in clauses A.3.1 and A.3.2 of TS 36.133 [15] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

**Table 18.2.2.1.5-2: NR Cell specific test parameters (Cell 2)**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| | Config 7,8 | | HD-FDD | |
| SSB Configuration | Config 1,2,4,5,7,8 | | SSB.1 FR1 | |
| | Config 3,6 | | SSB.1 RedCap FR1 | |
| TDD configuration | Config 1,4,7,8 | | Not Applicable | |
| | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| BWP BW | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4,7,8 | | SR.1.1 FDD | |
| | Config 2,5 | | SR.1.1 TDD | |
| | Config 3,6 | | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1,4,7,8 | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | |
| | Config 3,6 | | CR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1,2,4,5,7,8 | | SMTC.1 RedCap FR1 | |
| | Config 3,6 | | SMTC.1 RedCap FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| | Config 3,6 | | 30 kHz | |
| PRACH configuration | | | PRACH.1 FR1 | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | |
| | Dedicated DL BWP | | DLBWP.1.1 | |
| | Initial UL BWP | | ULBWP.0.1 | |
| | Dedicated UL BWP | | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| $\hat{E}_s / I_{ot}$ | | dB | -infinity | 4 |
| $\hat{E}_s / N_{oc}$ | | dB | -infinity | 4 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/ 9.36MHz | -70.05 | -64.59 |
| | Config 3,6 | dBm/ 18.36MHz | -67.12 | -61.67 |
| Propagation condition | | - | AWGN | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

| Note 3: | Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
|---|---|

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.
The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR_RedCap} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_Redcap} + T_{SI\text{-}NR_RedCap} + T_{RACH_RedCap}$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify\text{-}NR}$ = 680 ms in the test.

$T_{SI\text{-}NR_RedCap}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331[13] for the target NR cell.

$T_{RACH_RedCap}$ = 170 ms in the test.

This gives a total of 2240 ms.

# 18.3 Measurement procedure for RedCap

## 18.3.1 E-UTRA - NR Measurements for RedCap

### 18.3.1.0 Minimum conformance requirements

#### 18.3.1.0.1 Minimum conformance requirements for E-UTRA - NR event-triggered measurement

The UE shall be able to identify new inter-RAT NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

Requirements in this clause are applicable to both E-UTRA FDD and E-UTRA TDD serving cell.

When measurement gaps are scheduled, the RedCap UE shall be able to identify a new detectable cell within $T_{identify_irat_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT cell within $T_{identify_irat_with_index_RedCap}$. The UE shall be able to identify a new detectable inter-RAT SS block of an already detected cell within $T_{identify_irat_without_index_RedCap.}$

$$T_{identify_irat_without_index_RedCap} = (T_{PSS/SSS_sync_irat_RedCap} + T_{SSB_measurement_period_irat_RedCap}) \text{ ms}$$

$$T_{identify_irat_with_index_RedCap} = (T_{PSS/SSS_sync_irat_RedCap} + T_{SSB_measurement_period_irat_RedCap} + T_{SSB_time_index_irat_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_irat_RedCap}$: it is the time period used in PSS/SSS detection given in Table 18.3.1.0.1-1 and Table 18.3.1.0.1-3 for 2 Rx RedCap, Table 18.3.1.0.1-2 for 1 Rx RedCap.

$T_{SSB_time_index_irat_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 18.3.1.0.1-4 and Table 18.3.1.0.1-6 for 2 Rx RedCap, Table 18.3.1.0.1-5 for 1 Rx RedCap.

$T_{SSB_measurement_period_irat_RedCap}$: equal to a measurement period of SSB based measurement given in Table 18.3.1.0.1-7 and Table 18.3.1.0.1-9 for 2 Rx RedCap, Table 18.3.1.0.1-8 for 1 Rx RedCap.

$M_{pss/sss_sync_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{pss/sss_sync_irat_RedCap}$ = 40 samples.

$M_{SSB_index_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{SSB_index_irat_RedCap}$ = 40 samples.

$M_{meas_period_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{meas_period_irat}$ = 40 samples.

$N_{freq_RedCap}$ is defined in TS 38.133 [6] clause 8.1.2.1.1d.

**Table 18.3.1.0.1-1: Time period for PSS/SSS detection for 2 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{PSS/SSS_sync_irat_RedCap}$ |
|---|---|
| No DRX | Max(600ms, 8 × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8×1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | 8 × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 18.3.1.0.1-2: Time period for PSS/SSS detection for 1 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{PSS/SSS_sync_irat_RedCap}$ |
|---|---|
| No DRX | Max(600ms, 7 × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(7 *1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | 7 × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 18.3.1.0.1-3: Time period for PSS/SSS detection for 2 Rx RedCap (Frequency range 2)**

| Condition NOTE1 | $T_{PSS/SSS_sync_irat_RedCap}$ |
|---|---|
| No DRX | Max(600ms, $M_{pss/sss_sync_irat_RedCap}$ × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(600ms, (1.5 × $M_{pss/sss_sync_irat_RedCap}$) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | $M_{pss/sss_sync_irat_RedCap}$ × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 18.3.1.0.1-4: Time period for time index detection for 2 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_time_index_irat_RedCap}$ |
|---|---|
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | 3 × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 18.3.1.0.1-5: Time period for time index detection for 1 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_time_index_irat_RedCap}$ |
|---|---|
| No DRX | Max(160ms, 6 × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(160ms, Ceil(6 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | 6 × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 18.3.1.0.1-6: Time period for time index detection for 2 Rx RedCap (Frequency range 2)**

| Condition NOTE1 | $T_{SSB_time_index_irat_RedCap}$ |
|---|---|
| No DRX | Max(200ms, $M_{SSB_index_irat_RedCap}$ × Max(MGRP, SMTC period)) × $N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | Max(200ms, (1.5 × $M_{SSB_index_irat_RedCap}$) × Max(MGRP, SMTC period, DRX cycle)) × $N_{freq_RedCap}$ |
| DRX cycle > 320ms | $M_{SSB_index_irat_RedCap}$ × DRX cycle × $N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

In the requirements, an NR cell is considered detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in Section 9.11.x are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],
- NR SS-RSRQ related conditions in the accuracy requirements in Section 9.11.y are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],
- NR SS-SINR related conditions in the accuracy requirements in Section 9.11.z are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50].

The RedCap UE operating in NR HD-FDD shall meet the current PSS/SSS detection requirements provided that at least 5 SMTC windows are available at the UE during the PSS/SSS detection time.

The RedCap UE operating in NR HD-FDD shall meet the current time index detection requirements provided that at least 3 SMTC windows are available at the UE during the time index detection time.

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clause 9.11, with measurement period as shown in table 8.20.2.1-5 and 8.20.2.1-6 for 2Rx UE, table 8.20.2.1-5a for 1Rx UE:

**Table 8.20.2.1-5: Measurement period for inter-RAT measurements for 2 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_measurement_period_irat_RedCap}$ |
|---|---|
| No DRX | $Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | $Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$ |
| DRX cycle > 320ms | $8 \times DRX\ cycle \times N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 8.20.2.1-5a: Measurement period for inter-RAT measurements for 1 Rx RedCap (Frequency range 1)**

| Condition NOTE1 | $T_{SSB_measurement_period_irat_RedCap}$ |
|---|---|
| No DRX | $Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | $Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$ |
| DRX cycle > 320ms | $8 \times DRX\ cycle \times N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

**Table 8.20.2.1-6: Measurement period for inter-RAT measurements for 2 Rx RedCap (Frequency range 2)**

| Condition NOTE1 | $T_{SSB_measurement_period_irat_RedCap}$ |
|---|---|
| No DRX | $Max(400ms, M_{meas_period_irat_RedCap} \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$ |
| DRX cycle ≤ 320ms | $Max(400ms, (1.5 \times M_{meas_period_irat_RedCap}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$ |
| DRX cycle > 320ms | $M_{meas_period_irat_RedCap} \times DRX\ cycle \times N_{freq_RedCap}$ |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50]. | |

The RedCap UE operating in NR HD-FDD shall meet the current measurement requirements provided that at least 5 SMTC windows are available at the UE during the measurement period.

Reported measurements in event triggered measurement reports shall meet the requirements in clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_without_index_RedCap}$ or $T_{identify_irat_with_index_RedCap}$ for the minimum requirements.

If an NR cell which has been detectable at least for the time period $T_{identify_irat_without_index_RedCap}$. or $T_{identify_irat_with_index_RedCap}$ defined in clause 8.20.2.1 for the minimum requirements and then triggers the measurement report as per TS 36.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_irat_RedCap}$ defined in clause 8.20.2.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used.

## 18.3.1.1 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in non-DRX

### 18.3.1.1.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

### 18.3.1.1.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx.

### 18.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.1.

### 18.3.1.1.4 Test description

Same as the test description given in clause 8.4.2.1.4.

#### 18.3.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.1.4.1 with following exceptions:

- Table 8.4.2.1.4.1-1 is replaced by Table 18.3.1.1.4.1-1.
- Table 8.4.2.1.4.1-2 is replaced by Table 18.3.1.1.4.1-2.
- Table 8.4.2.1.4.1-3 is replaced by Table 18.3.1.1.4.1-3.

**Table 18.3.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.1-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.1-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.1-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.1-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.1-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.1-6 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.1-7 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.3.1.1-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.1.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| E-UTRA RF Channel Numbers | | | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | | 1 | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA cell 1 | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR cell 2 | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 39 | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | |
| CP length | | | Normal | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | DRX is not used |
| Time offset between serving and neighbour cells | Config 1,4,7,8 | | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2,3,5,6 | | 3μs | Synchronous cells. |
| T1 | | s | 5 | |
| T2 | | s | 1 | |

### 18.3.1.1.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.1.4.2.

### 18.3.1.1.4.3 Message contents

Same as the message contents given in clause 8.4.2.1.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.1-1 and 8.4.2.1-4 also apply to test configuration 18.3.1.1-7 and 18.3.1.1-8.
- Condition SSB.2 FR1 is replaced by SSB.1 RedCap FR1
- Table 8.4.2.1.4.3-2 is replaced by Table 18.3.1.1.4.3-1.

**Table 18.3.1.1.4.3-1: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 18.3.1.1-1/2/3/7 |
| | 22 | | Config 18.3.1.1-4/5/6/8 |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |

18.3.1.1.5 Test requirement

Same as the test requirements given in clause 8.4.2.1.5 with following exceptions:

- Table 8.4.2.1.5-1 is replaced by Table 18.3.1.1.5-1.
- Table 8.4.2.1.5-2 is replaced by Table 18.3.1.1.5-2.

**Table 18.3.1.1.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | | 1 | |
| Duplex mode | Config 1,2,3,7 | | FDD | |
| | Config 4,5,6,8 | | TDD | |
| TDD special subframe configuration[Note1] | Config 4,5,6,8 | | 6 | |
| TDD uplink-downlink configuration[Note1] | Config 4,5,6,8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | Config 1,2,3,7 | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | Config 4,5,6,8 | | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | | dBm | -77 | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -104 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | 17 | 17 |
| RSRP[Note5] | | dBm/15 kHz | -87 | -87 |
| SCH_RP[Note5] | | dBm/15 kHz | -87 | -87 |
| Io[Note5] | | dBm/ 9 MHz | -56.12 | -56.12 |
| Propagation Condition [Note6] | | | AWGN | |

| | | |
|---|---|---|
| Antenna Configuration and Correlation Matrix Note6 | | 1x2 |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 18.3.1.1.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| | Config 7,8 | | HD-FDD | |
| TDD configuration | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1,4,7,8 | | SMTC.2 | |
| | Config 2,3,5,6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| b2-Threshold2NR | Config 1,2,4,5,7,8 | dBm/SCS | -101 | |
| | Config 3,6 | | -98 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| SS-RSRP Note 3 | Config 1,2,4,5,7,8 | dBm/SCS | -Infinity | -91 |
| | Config 3,6 | | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 7 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/9.36MHz | -70.05 | -62.26 |
| | Config 3,6 | dBm/18.36MHz | -67.12 | -59.33 |
| Propagation Condition | | | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## 18.3.1.2 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in DRX

### 18.3.1.2.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

### 18.3.1.2.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards supporting NR RedCap with 2Rx and long DRX cycle.

### 18.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.2.

### 18.3.1.2.4 Test description

Same as the test description given in clause 8.4.2.2.4.

#### 18.3.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.2.4.1 with following exceptions:

- Table 8.4.2.2.4.1-1 is replaced by Table 18.3.1.2.4.1-1.
- Table 8.4.2.2.4.1-2 is replaced by Table 18.3.1.2.4.1-2.
- Table 8.4.2.2.4.1-3 is replaced by Table 18.3.1.2.4.1-3.

**Table 18.3.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.2-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.2-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.2-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.2-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.2-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.2-6 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.2-7 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.3.1.2-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.2.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Numbers | | | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA Cell 1 | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR Cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | | As specified in TS 36.133 [23] Table 8.1.2.1-1. |
| Measurement gap offset | | | 39 | | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | | |
| CP length | | | Normal | | |
| TimeToTrigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | Config 1,4,7,8 | | 3ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2,3,5,6 | | 3μs | | Synchronous cells. |
| T1 | | s | 5 | | |
| T2 | | s | 2 | 11 | |

### 18.3.1.2.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.2.4.2.

### 18.3.1.2.4.3 Message contents

Same as the message contents given in clause 8.4.2.2.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.2-1 and 8.4.2.2-4 also apply to test configuration18.3.1.2-7 and 18.3.1.2-8.
- Condition SSB.2 FR1 is replaced by SSB.1 RedCap FR1
- Table 8.4.2.2.4.3-2 is replaced by Table 18.3.1.2.4.3-1.

**Table 18.3.1.2.4.3-1: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 18.3.1.2-1/2/3/7 |
| | 22 | | Config 18.3.1.2-4/5/6/8 |
| } | | | |
| } | | | |

### 18.3.1.2.5 Test requirement

Same as the test requirements given in clause 8.4.2.2.5 with following exceptions:

- Table 8.4.2.2.5-1 is replaced by Table 18.3.1.2.5-1.
- Table 8.4.2.2.5-2 is replaced by Table 18.3.1.2.5-2.

**Table 18.3.1.2.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in DRX with NR neigbour cell in FR1 without SSB time index detection**

| Parameter | | Unit | Cell 1 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| RF channel number | | | 1 | |
| Duplex mode | Config 1,2,3,7 | | FDD | |
| | Config 4,5,6,8 | | TDD | |
| TDD special subframe configuration[Note1] | Config 4,5,6,8 | | 6 | |
| TDD uplink-downlink configuration[Note1] | Config 4,5,6,8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters: DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | Config 1,2,3,7 | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | Config 4,5,6,8 | | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | | dBm | -77 | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -104 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | 17 | 17 |
| RSRP[Note5] | | dBm/15 kHz | -87 | -87 |
| SCH_RP[Note5] | | dBm/15 kHz | -87 | -87 |
| Io[Note5] | | dBm/ 9 MHz | -56.12 | -56.12 |
| Propagation Condition [Note6] | | | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 18.3.1.2.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| | Config 7,8 | | HD-FDD | |
| TDD configuration | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1,4,7,8 | | SMTC.2 | |
| | Config 2,3,5,6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| b2-Threshold2NR | Config 1,2,4,5,7,8 | dBm/SCS | -101 | |
| | Config 3,6 | | -98 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| SS-RSRP Note 3 | Config 1,2,4,5,7,8 | dBm/SCS | -Infinity | -91 |
| | Config 3,6 | | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 7 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/9.36MHz | -70.05 | -62.26 |
| | Config 3,6 | dBm/18.36MHz | -67.12 | -59.33 |
| Propagation Condition | | | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | |

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## 18.3.1.3 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in non-DRX

### 18.3.1.3.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

#### 18.3.1.3.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx.

#### 18.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.3.

#### 18.3.1.3.4 Test description

Same as the test description given in clause 8.4.2.3.4.

##### 18.3.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.3.4.1 with following exceptions:

- Table 8.4.2.3.4.1-1 is replaced by Table 18.3.1.3.4.1-1.
- Table 8.4.2.3.4.1-2 is replaced by Table 18.3.1.3.4.1-2.
- Table 8.4.2.3.4.1-3 is replaced by Table 18.3.1.3.4.1-3.

**Table 18.3.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.3-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.3-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.3-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.3-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.3-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.3-6 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.3-7 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.3.1.3-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.3.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| | | Test 1 | |
| E-UTRA RF Channel Numbers | | 1 | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1 | One FR1 NR carrier frequency is used. |
| Active cell | | E-UTRA cell 1 | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | NR cell 2 | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 0 | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 39 | As specified in TS 36.331 [29]. |

| | | | | |
|---|---|---|---|---|
| Hysteresis | | dB | 0 | |
| CP length | | | Normal | |
| TimeToTrigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| DRX | | | OFF | DRX is not used |
| Time offset between serving and neighbour cells | Config 1,4,7,8 | | 3ms | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2,3,5,6 | | 3μs | Synchronous cells. |
| T1 | | s | 5 | |
| T2 | | s | 2 | |

### 18.3.1.3.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.3.4.2.

### 18.3.1.3.4.3 Message contents

Same as the message contents given in clause 8.4.2.3.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.3-1 and 8.4.2.3-4 also apply to test configuration 18.3.1.3-7 and 18.3.1.3-8.
- Condition SSB.2 FR1 is replaced by SSB.1 RedCap FR1
- Table 8.4.2.3.4.3-2 is replaced by Table 18.3.1.3.4.3-1.

**Table 18.3.1.3.4.3-1: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 18.3.1.3-1/2/3/7 |
| | 22 | | Config 18.3.1.3-4/5/6/8 |
| } | | | |
| } | | | |

### 18.3.1.3.5 Test requirement

Same as the test requirements given in clause 8.4.2.3.5 with following exceptions:

- Table 8.4.2.3.5-1 is replaced by Table 18.3.1.3.5-1.
- Table 8.4.2.3.5-2 is replaced by Table 18.3.1.3.5-2.

**Table 18.3.1.3.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 with SSB time index detection**

| **Parameter** | | **Unit** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| RF channel number | | | 1 | |
| Duplex mode | Config 1,2,3,7 | | FDD | |
| | Config 4,5,6,8 | | TDD | |
| TDD special subframe configuration[Note1] | Config 4,5,6,8 | | 6 | |
| TDD uplink-downlink configuration[Note1] | Config 4,5,6,8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters: | Config 1,2,3,7 | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD | |

| | | | | |
|---|---|---|---|---|
| DL Reference Measurement Channel[Note2] | | | 20 MHz: R.6 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | Config 1,2,3,7 | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | Config 4,5,6,8 | | 5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | | dBm | -77 | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA[Note3] | | | | |
| OCNG_RB[Note3] | | | | |
| $N_{oc}$[Note4] | | dBm/15 kHz | -104 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| $\hat{E}_s/I_{ot}$[Note5] | | dB | 17 | 17 |
| RSRP[Note5] | | dBm/15 kHz | -87 | -87 |
| SCH_RP[Note5] | | dBm/15 kHz | -87 | -87 |
| Io[Note5] | | dBm/ 9 MHz | -56.12 | -56.12 |
| Propagation Condition [Note6] | | | AWGN | |
| Antenna Configuration and Correlation Matrix [Note6] | | | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A.3.1 and A.3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 18.3.1.3.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| | Config 7,8 | | HD-FDD | |
| TDD configuration | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1,4,7,8 | | SMTC.2 | |
| | Config 2,3,5,6 | | SMTC.1 | |

| | | | | |
|---|---|---|---|---|
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| b2-Threshold2NR | Config 1,2,4,5,7,8 | dBm/SCS | -101 | |
| | Config 3,6 | | -98 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| SS-RSRP Note 3 | Config 1,2,4,5,7,8 | dBm/SCS | -Infinity | -91 |
| | Config 3,6 | | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 7 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/9.36MHz | -70.05 | -62.26 |
| | Config 3,6 | dBm/18.36MHz | -67.12 | -59.33 |
| Propagation Condition | | | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## 18.3.1.4 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in DRX

### 18.3.1.4.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

### 18.3.1.4.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards supporting NR RedCap with 2Rx and long DRX cycle.

### 18.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.4.

### 18.3.1.4.4 Test description

Same as the test description given in clause 8.4.2.4.4.

#### 18.3.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.4.4.1 with following exceptions:

- Table 8.4.2.4.4.1-1 is replaced by Table 18.3.1.4.4.1-1.
- Table 8.4.2.4.4.1-2 is replaced by Table 18.3.1.4.4.1-2.
- Table 8.4.2.4.4.1-3 is replaced by Table 18.3.1.4.4.1-3.

**Table 18.3.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.4-1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.4-2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.4-3 | LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.4-4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 18.3.1.4-5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 18.3.1.4-6 | LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 18.3.1.4-7 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| 18.3.1.4-8 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.4.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Numbers | | | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Channel Number | | | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA Cell 1 | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR Cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | | As specified in TS 36.133 [23] Table 8.1.2.1-1. |
| Measurement gap offset | | | 39 | | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | | |
| CP length | | | Normal | | |
| TimeToTrigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | DRX.9 | DRX.12 | As specified in clause A.5 |
| Time offset between serving and neighbour cells | Config 1,4,7,8 | | 3ms | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2,3,5,6 | | 3µs | | Synchronous cells. |
| T1 | | s | 5 | | |
| T2 | | s | 2 | 13 | |

#### 18.3.1.4.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.4.4.2.

#### 18.3.1.4.4.3 Message contents

Same as the message contents given in clause 8.4.2.4.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.4-1 and 8.4.2.4-4 also apply to test configuration 18.3.1.4-7 and 18.3.1.4-8.
- Condition SSB.2 FR1 is replaced by SSB.1 RedCap FR1
- Table 8.4.2.4.4.3-2 is replaced by Table 18.3.1.4.4.3-1.

**Table 18.3.1.4.4.3-1: SchedulingRequest-Config-DEFAULT**

| Derivation Path: TS 36.508 [25] Table 4.6.3-20 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 25 | | Config 18.3.1.4-1/2/3/7 |
| | 22 | | Config 18.3.1.4-4/5/6/8 |
| } | | | |
| } | | | |

#### 18.3.1.4.5 Test requirement

Same as the test requirements given in clause 8.4.2.4.5 with following exceptions:

- Table 8.4.2.4.5-1 is replaced by Table 18.3.1.4.5-1.
- Table 8.4.2.4.5-2 is replaced by Table 18.3.1.4.5-2.

**Table 18.3.1.4.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in DRX with NR neigbour cell in FR1 with SSB time index detection**

| **Parameter** | | **Unit** | **Cell 1** | |
|---|---|---|---|---|
| | | | **T1** | **T2** |
| RF channel number | | | 1 | |
| Duplex mode | Config 1,2,3,7 | | FDD | |
| | Config 4,5,6,8 | | TDD | |
| TDD special subframe configuration[Note1] | Config 4,5,6,8 | | 6 | |
| TDD uplink-downlink configuration[Note1] | Config 4,5,6,8 | | 1 | |
| $BW_{channel}$ | | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 | |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD | |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | Config 1,2,3,7 | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD | |
| | Config 4,5,6,8 | | 5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD | |
| OCNG Patterns[Note2] | Config 1,2,3,7 | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD | |
| | Config 4,5,6,8 | | 5 MHz: OP.9 TDD | |

| | | | | |
|---|---|---|---|---|
| | | | 10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD | |
| b2-Threshold1 | | dBm | -77 | |
| PBCH_RA | | dB | 0 | |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| PDSCH_RA | | | | |
| PDSCH_RB | | | | |
| OCNG_RA Note3 | | | | |
| OCNG_RB Note3 | | | | |
| $N_{oc}$ Note4 | | dBm/15 kHz | -104 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| $\hat{E}_s/I_{ot}$ Note5 | | dB | 17 | 17 |
| RSRP Note5 | | dBm/15 kHz | -87 | -87 |
| SCH_RP Note5 | | dBm/15 kHz | -87 | -87 |
| Io Note5 | | dBm/ 9 MHz | -56.12 | -56.12 |
| Propagation Condition Note6 | | | AWGN | |
| Antenna Configuration and Correlation Matrix Note6 | | | 1x2 | |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A.3.1 and A.3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

**Table 18.3.1.4.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| NR RF Channel Number | | | 1 | |
| Duplex mode | Config 1,4 | | FDD | |
| | Config 2,3,5,6 | | TDD | |
| | Config 7,8 | | HD-FDD | |
| TDD configuration | Config 2,5 | | TDDConf.1.1 | |
| | Config 3,6 | | TDDConf.2.1 | |
| $BW_{channel}$ | Config 1,2,4,5,7,8 | MHz | 10: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 20: $N_{RB,c}$ = 51 | |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | Config 1,4,7,8 | | SMTC.2 | |
| | Config 2,3,5,6 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 | |
| | Config 3,6 | | 30 | |
| b2-Threshold2NR | Config 1,2,4,5,7,8 | dBm/SCS | -101 | |
| | Config 3,6 | | -98 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |

| | | | | |
|---|---|---|---|---|
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | |
| $N_{oc}$ Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | |
| | Config 3,6 | | -95 | |
| SS-RSRP Note 3 | Config 1,2,4,5,7,8 | dBm/SCS | -Infinity | -91 |
| | Config 3,6 | | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | | dB | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 7 |
| Io Note3 | Config 1,2,4,5,7,8 | dBm/9.36MHz | -70.05 | -62.26 |
| | Config 3,6 | dBm/18.36MHz | -67.12 | -59.33 |
| Propagation Condition | | | AWGN | |
| Antenna Configuration and Correlation Matrix | | | 1x2 | |
| NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.<br>NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

## 18.3.1.5 E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in non-DRX

Editor's Notes: This test case is incomplete:

- E-UTRA – NR FR2 testability issue is not cleared.
- The TT analysis is complete for test frequencies f ≤ 40.8 GHz
- The TT analysis is complete for UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for Test frequencies f > 40.8 GHz

### 18.3.1.5.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

### 18.3.1.5.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap.

### 18.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.5.

### 18.3.1.5.4 Test description

#### 18.3.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.5.4.1 with following exceptions:

- Table 8.4.2.5.4.1-1 is replaced by Table 18.3.1.5.4.1-1.

- Table 8.4.2.5.4.1-2 is replaced by Table 18.3.1.5.4.1-2.
- Table 8.4.2.5.4.1-3 is replaced by Table 18.3.1.5.4.1-3.

**Table 18.3.1.5.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.5-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 18.3.1.5-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.5.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.5.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.5.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Numbers | | | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA Cell 1 | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR Cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | N/A | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 39 | N/A | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | | |
| CP length | | | Normal | | |
| TimeToTrigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | Config 1 | | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2 | | 3µs | | Synchronous cells. |
| T1 | | s | 10 | | |
| T2 | | s | 6 | 3 | |

### 18.3.1.5.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.5.4.2.

### 18.3.1.5.4.3 Message contents

Same as the message contents given in clause 8.4.2.5.4.3.

### 18.3.1.5.5 Test requirement

Same as the test requirements given in clause 8.4.2.5.5 with following exceptions:

- Table 8.4.2.5.5-1 is replaced by Table 18.3.1.5.5-1.

**Table 18.3.1.5.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | | Setup 2a | |
| Assumption for UE beams Note 3 | | | Rough | |
| NR RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG patterns | | | OP.3 | |
| SMTC configuration | Config 1 | | SMTC.2 | |
| | Config 2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | -118 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $\hat{E}_s$ | | dBm/SCS | -Infinity | -80.6 |
| SSB_RP Note 2 | | dBm/SCS | -Infinity | -80.6 |
| $\hat{E}_s/Iot_{BB}$ Note 4 | | dB | -Infinity | 8.3 |
| Io Note3 | | dBm/95.04MHz | -Infinity | -56.0 |
| Propagation Condition | | | No external noise (Note 5) | |

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 5: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [18].

## 18.3.1.6 E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in DRX

Editor's Notes: This test case is incomplete:

- E-UTRA – NR FR2 testability issue is not cleared.
- The TT analysis is complete for test frequencies f ≤ 40.8 GHz
- The TT analysis is complete for UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for Test frequencies f > 40.8 GHz

### 18.3.1.6.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

#### 18.3.1.6.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap.

#### 18.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.6.

#### 18.3.1.6.4 Test description

##### 18.3.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.6.4.1 with following exceptions:

- Table 8.4.2.6.4.1-1 is replaced by Table 18.3.1.6.4.1-1.
- Table 8.4.2.6.4.1-2 is replaced by Table 18.3.1.6.4.1-2.
- Table 8.4.2.6.4.1-3 is replaced by Table 18.3.1.6.4.1-3.

**Table 18.3.1.6.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.6-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 18.3.1.6-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.6.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.6.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.6.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|
| | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Numbers | | 1 | | | | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | 1 | | | | One FR1 NR carrier frequency is used. |
| Active cell | | E-UTRA Cell 1 | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | NR Cell 2 | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | 0 | | N/A | | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | 39 | | N/A | | As specified in TS 36.331 [29]. |
| Hysteresis | dB | 0 | | | | |
| CP length | | Normal | | | | |
| TimeToTrigger | s | 0 | | | | |
| Filter coefficient | | 0 | | | | L3 filtering is not used |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRX | | | DRX.9 | DRX.12 | DRX.9 | DRX.12 | |
| Time offset between serving and neighbour cells | Config 1 | | 3ms | | | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2 | | 3μs | | | | Synchronous cells. |
| T1 | | s | 10 | | | | |
| T2 | | s | 6 | 83 | 6 | 83 | |

### 18.3.1.6.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.6.4.2.

### 18.3.1.6.4.3 Message contents

Same as the message contents given in clause 8.4.2.6.4.3.

### 18.3.1.6.5 Test requirement

Same as the test requirements given in clause 8.4.2.6.5 with following exceptions:

- Table 8.4.2.6.5-1 is replaced by Table 18.3.1.6.5-1.

**Table 18.3.1.6.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | | Setup 1 | |
| Assumption for UE beams Note 3 | | | Rough | |
| NR RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns | | | OP.1 | |
| SMTC configuration | Config 1 | | SMTC.2 | |
| | Config 2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | -106 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ Note 4 | | dB | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 8 |
| Io Note3 | | dBm/95.04MHz | -66.7 | -58.0 |
| Propagation Condition | | | AWGN | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |
| Note 5: | Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation |

## 18.3.1.7 E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in non-DRX

Editor's Notes: This test case is incomplete:

- E-UTRA – NR FR2 testability issue is not cleared.
- The TT analysis is complete for test frequencies f ≤ 40.8 GHz
- The TT analysis is complete for UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for Test frequencies f > 40.8 GHz

### 18.3.1.7.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

### 18.3.1.7.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap.

### 18.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.7.

### 18.3.1.7.4 Test description

#### 18.3.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.7.4.1 with following exceptions:

- Table 8.4.2.7.4.1-1 is replaced by Table 18.3.1.7.4.1-1.
- Table 8.4.2.7.4.1-2 is replaced by Table 18.3.1.7.4.1-2.
- Table 8.4.2.7.4.1-3 is replaced by Table 18.3.1.7.4.1-3.

**Table 18.3.1.7.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.7-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 18.3.1.7-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.7.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.7.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.7.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter | | Unit | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | |
| E-UTRA RF Channel Numbers | | | 1 | | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | | 1 | | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA Cell 1 | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR Cell 2 | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | N/A | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 39 | N/A | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | | |
| CP length | | | Normal | | |
| TimeToTrigger | | s | 0 | | |
| Filter coefficient | | | 0 | | L3 filtering is not used |
| DRX | | | OFF | | DRX is not used |
| Time offset between serving and neighbour cells | Config 1 | | 3ms | | Asynchronous cells.<br>The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2 | | 3μs | | Synchronous cells. |
| T1 | | s | 5 | | |
| T2 | | s | 5 | 3 | |

### 18.3.1.7.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.7.4.2.

### 18.3.1.7.4.3 Message contents

Same as the message contents given in clause 8.4.2.7.4.3.

### 18.3.1.7.5 Test requirement

Same as the test requirements given in clause 8.4.2.7.5 with following exceptions:

- Table 8.4.2.7.5-1 is replaced by Table 18.3.1.7.5-1.

**Table 18.3.1.7.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX**

| Parameter | Unit | Cell 2 | |
|---|---|---|---|
| | | T1 | T2 |
| AoA setup | | Setup 1 | |
| Assumption for UE beams[Note 3] | | Rough | |
| NR RF Channel Number | | 1 | |
| Duplex mode | | TDD | |

| | | | | |
|---|---|---|---|---|
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns | | | OP.1 | |
| SMTC configuration | Config 1 | | SMTC.2 | |
| | Config 2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | -106 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | | -104.7 | |
| $N_{oc}$ Note2 | | | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ | | | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 8 |
| Io Note3 | | dBm/95.04MHz | -66.7 | -58.0 |
| Propagation Condition | | | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation

### 18.3.1.8 E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in DRX

Editor's Notes: This test case is incomplete:

- E-UTRA – NR FR2 testability issue is not cleared.
- The TT analysis is complete for test frequencies f ≤ 40.8 GHz
- The TT analysis is complete for UE PC3
- This test case is incomplete for UE power classes other than PC3
- This test case is incomplete for Test frequencies f > 40.8 GHz

#### 18.3.1.8.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

#### 18.3.1.8.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap.

#### 18.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.8.

#### 18.3.1.8.4 Test description

##### 18.3.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.8.4.1 with following exceptions:

- Table 8.4.2.8.4.1-1 is replaced by Table 18.3.1.8.4.1-1.
- Table 8.4.2.8.4.1-2 is replaced by Table 18.3.1.8.4.1-2.
- Table 8.4.2.8.4.1-3 is replaced by Table 18.3.1.8.4.1-3.

**Table 18.3.1.8.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 18.3.1.8-1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 18.3.1.8-2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | |

**Table 18.3.1.8.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 36.508 [25] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 18.3.1.8.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in clause C.2.2 |
| Connection Diagram | TE Part | A.3.3.3.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.4.1.1 | |
| Exceptions to connection diagram | N/A | | |

**Table 18.3.1.8.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX**

| Parameter | | Unit | Value | | | | Comment |
|---|---|---|---|---|---|---|---|
| | | | Test 1 | Test 2 | Test 3 | Test 4 | |
| E-UTRA RF Channel Numbers | | | 1 | | | | One E-UTRA carrier frequency is used. |
| NR RF Chanel Number | | | 1 | | | | One FR1 NR carrier frequency is used. |
| Active cell | | | E-UTRA Cell 1 | | | | E-UTRA cell 1 is on E-UTRA RF channel number 1. |
| Neighbour cell | | | NR Cell 2 | | | | NR cell 2 is on NR RF channel number 1. |
| Gap Pattern Id | | | 0 | | N/A | | As specified in Table 8.1.2.1-1 of TS 36.133 [23]. |
| Measurement gap offset | | | 39 | | N/A | | As specified in TS 36.331 [29]. |
| Hysteresis | | dB | 0 | | | | |
| CP length | | | Normal | | | | |
| TimeToTrigger | | s | 0 | | | | |
| Filter coefficient | | | 0 | | | | L3 filtering is not used |
| DRX | | | DRX.9 | DRX.12 | DRX.9 | DRX.12 | |
| Time offset between serving and neighbour cells | Config 1 | | 3ms | | | | Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1. |
| | Config 2 | | 3µs | | | | Synchronous cells. |

| | | | | | | |
|---|---|---|---|---|---|---|
| T1 | s | 5 | | | | |
| T2 | s | 7 | 70 | 7 | 70 | |

### 18.3.1.8.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.8.4.2.

### 18.3.1.8.4.3 Message contents

Same as the message contents given in clause 8.4.2.8.4.3.

### 18.3.1.8.5 Test requirement

Same as the test requirements given in clause 8.4.2.8.5 with following exceptions:

- Table 8.4.2.8.5-1 is replaced by Table 18.3.1.8.5-1.

**Table 18.3.1.8.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection**

| Parameter | | Unit | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | | Setup 1 | |
| Assumption for UE beams Note 3 | | | Rough | |
| NR RF Channel Number | | | 1 | |
| Duplex mode | | | TDD | |
| TDD configuration | | | TDDConf.3.1 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | |
| OCNG patterns | | | OP.1 | |
| SMTC configuration | Config 1 | | SMTC.2 | |
| | Config 2 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | |
| b1-ThresholdNR | UE power class 3 | dBm/SCS | -106 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104.7 | |
| $N_{oc}$ Note2 | | dBm/SCS | -95.7 | |
| SS-RSRP Note 3 | | dBm/SCS | -Infinity | -87.7 |
| $\hat{E}_s/I_{ot}$ Note 4 | | dB | -Infinity | 8 |
| $\hat{E}_s/N_{oc}$ | | dB | -Infinity | 8 |
| Io Note3 | | dBm/95.04MHz | -66.7 | -58.0 |
| Propagation Condition | | | AWGN | |

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in clause B.2.1.3, and does not limit UE implementation or test system implementation

# 19 NR standalone tests for ATG

## 19.2 RRC_CONNECTED state mobility

### 19.2.1 Handover for ATG

#### 19.2.1.0 Minimum conformance requirements

##### 19.2.1.0.1 Minimum conformance requirements for NR FR1 – NR FR1 handover

When the UE receives a RRC message implying handover to NR cell, the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ msec from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay, which is 10ms

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover to NR cell is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{search}$ is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then $T_{search}$ = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search} = N*T_{rs}$ ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then $T_{search} = 3* N*T_{rs}$ ms. Regardless of whether DRX is in use by the UE, $T_{search}$ shall still be based on non-DRX target cell search times.

For UE with one or multiple omni-directional antenna(s), N = 1;

For UE with the antenna array,

- When network assistance on ATG cells reference location of the target cell is provided to UE, N = 2;
- Otherwise, N = 4.

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$ for both known and unknown target cell.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise $T_{rs}$ is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2D.5 for intra-frequency handover and Clause 9.3D.4 for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1E.1.2.

## 19.2.1.1 Intra-frequency handover from FR1 to FR1; known target cell

Editor's Note: This test case is incomplete for the following configurations:

- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procedures for providing network assistance on ATG cells reference locations are FFS.

### 19.2.1.1.1 Test purpose

To verify the NR ATG UE's ability to perform NR FR1-NR FR1 intra frequency handover for ATG in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to known target cell.

### 19.2.1.1.2 Test applicability

This test applies to all types of NR ATG UE release 18 and forward.

### 19.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.1.1.

### 19.2.1.1.4 Test description

#### 19.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

This test shall be tested using any of the test configurations in Table 19.2.1.1.4.1-1.

**Table 19.2.1.1.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.1.1.4.1-2

**Table 19.2.1.1.4.1-2: Initial conditions for NR ATG SA FR1 handover with known target cell**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [TBD] and TS 38.508-1 [14] clause 4.3.1. | |

| | | | |
|---|---|---|---|
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 19.2.1.1.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Tables 19.2.1.1.4.1-3 and 19.2.1.1.5-1 below.

**Table 19.2.1.1.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| A3-Offset | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | | μs | 3 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |
| T3 | | s | 1 | |

### 19.2.1.1.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells as given in tables 19.2.1.1.4.1-3 and 19.2.1.1.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send measurement report A3. An RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 19.2.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message, configuring measurement object.

4. UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 19.2.1.1.5-1.

6. UE shall transmit a MeasurementReport message triggered by Event A3.

7. SS shall transmit the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 19.2.1.1.5-1. T3 starts.

8. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

9. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.

10. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 3) mod1008) for next iteration of the test procedure loop.

12. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 19.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 19.2.1.1.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.1-1<br>Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2<br>Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3<br>Table H.3.1-4 with A3-offset = -1dB<br>Table H.3.1-5<br>Table H.3.1-7 with Condition INTRA-FREQ<br>Table H.3.2-2 with Condition RBConfig_KeyChange |

#### 19.2.1.1.5 Test requirements

Table 19.2.1.1.5-1 defines the primary level settings for all tests.

**Table 19.2.1.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**

| Parameter | | Unit | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | | 1 | | | 1 | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | Not Applicable | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | | | |
| | Config 2 | | SR.1.1 TDD | | | | | |
| | Config 3 | | SR2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | | | |
| | Config 2 | | CR.1.1 TDD | | | | | |
| | Config 3 | | CR2.1 TDD | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | | | |
| | Config 2 | | TRS.1.1 TDD | | | | | |
| | Config 3 | | TRS.1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC Configuration | | | SMTC.1 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | | | |
| | Config 3 | | -95 | | | | | |
| $\hat{E}_s / I_{ot}$ | | dB | 8 | -2.41 | -2.41 | -Infinity | 1.36 | 1.36 |
| $\hat{E}_s / N_{oc}$ | | dB | 8 | 8 | 8 | -Infinity | 10 | 10 |
| SSB_RP | Config 1,2 | dBm/SCS | -90 | -90 | -90 | -Infinity | -88 | -88 |
| | Config 3 | dBm/SCS | -87 | -87 | -87 | -Infinity | -84.99 | -84.99 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -61.41 | -57.67 | -57.67 | -61.41 | -57.67 | -57.67 |
| | Config 3 | dBm/ 38.16MHz | -55.31 | -51.56 | -51.56 | -55.31 | -51.56 | -51.56 |
| Propagation condition | Config 1, 2 | - | AWGN+220Hz | | | AWGN+220Hz | | |
| | Config 3 | | AWGN+500Hz | | | AWGN+500Hz | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 62 ms in the test. $T_{interrupt}$ is defined in clause 19.2.1.0.1.

This gives a total of 72 ms.

### 19.2.1.2 Inter-frequency handover from FR1 to FR1; unknown target cell

Editor's Note: This test case is incomplete for the following configurations:

- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procedures for providing network assistance on ATG cells reference locations are FFS.

#### 19.2.1.2.1 Test purpose

To verify the NR ATG UE's ability to perform NR FR1-NR FR1 inter frequency handover for ATG in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to unknown target cell.

#### 19.2.1.2.2 Test applicability

This test applies to all types of NR ATG UE release 18 and forward.

#### 19.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.1.2.

#### 19.2.1.2.4 Test description

##### 19.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

This test shall be tested using any of the test configurations in Table 19.2.1.2.4.1-1.

**Table 19.2.1.2.4.1-1: Inter-frequency handover from FR1 to FR1 test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.1.2.4.1-2

**Table 19.2.1.2.4.1-2: Initial conditions for NR ATG SA FR1 handover with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [TBD] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. Message contents are defined in clause 19.2.1.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 19.2.1.2.4.1-3 and 19.2.1.2.5-1 below.

**Table 19.2.1.2.4.1-3: General test parameters Inter-frequency handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| **Initial conditions** | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | | μs | 3 | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤5 | |

### 19.2.1.2.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 19.2.1.2.4.1-3 and 19.2.1.2.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 19.2.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.
4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 19.2.1.2.5-1. T2 starts.
5. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. The UE shall transmit *RRCReconfigurationComplete* message on Cell 2.
7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 19.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 19.2.1.2.4.3-1: Common Exception messages**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | Table H.3.2-2 with Condition RBConfig_KeyChange |

19.2.1.2.5 Test requirements

Table 19.2.1.2.5-1 defines the primary level settings for all tests.

**Table 19.2.1.2.5-1: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC Configuration | | | SMTC.1 | | | |
| SSB Configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | -98 | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| | Config 3 | | -95 | | -95 | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -Infinity | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -Infinity | 5 |
| SSB_RP | Config 1,2 | dBm/SCS | -94 | -94 | -Infinity | -93 |
| | Config 3 | dBm/SCS | -91 | -91 | -Infinity | -90 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -63.85 |
| | Config 3 | dBm/ 38.16MHz | -58.49 | -58.49 | -63.94 | -57.75 |
| Propagation condition | Config 1, 2 | - | AWGN + 220Hz | | AWGN + 220Hz | |
| | Config 3 | - | AWGN + 500Hz | | AWGN + 500Hz | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in clause 6.1E.1.2.2.

This gives a total of 132 ms.

## 19.2.2 Conditional Handover for ATG

### 19.2.2.0 Minimum conformance requirements

#### 19.2.2.0.1 Minimum conformance requirements for NR FR1 – NR FR1 conditional handover

[TS 38.133, clause 6.1E.2.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [2]. UE shall start RRM measurement before the distance condition is met if the *condEventD1* is configured to UE, the distance condition is defined in clause 5.5.4 in TS 38.331[2]. When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{CHO}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

$T_{RRC}$ is the RRC procedure delay defined in clause 12 in TS 38.331 [2].

$T_{Event_DU}$ is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1E.2.2.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1E.2.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1E.2.2.4.

The conditional handover delay requirements are applied if both condition D1-1 and condition D1-2 are fulfilled before the end of $T_{measure}$ for location-based CHO, otherwise no CHO requirement is applied.

[TS 38.133, clause 6.1E.2.2.2]

The measurement time delay is defined from the end of $T_{Event_DU}$ until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in TS 38.133 [6] clause 9.2D.5.1 or clause 9.2D.6.2.

For location-based conditional intra-frequency handover:

- If both condition D1-1 and condition D1-2 are fulfilled earlier than $T_{Event_DU} + T_{identify_intra_with_index}$ or $T_{Event_DU} + T_{identify_intra_without_index}$, then the measurement time delay equal to $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ assuming UE only performs measurements within SMTC window of the target cell.
- If both condition D1-1 and condition D1-2 are fulfilled is later than $T_{Event_DU}$ plus $T_{identify_intra_with_index}$ or $T_{identify_intra_without_index}$ for intra-frequency handover, then the measurement time delay equal to the time from the end of $T_{event_DU}$ until time when both condition D1-1 and condition D1-2 are fulfilled.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$ defined in TS 38.133 [6] clause 9.3D.4.

For location-based conditional inter-frequency handover,

- If both condition D1-1 and condition D1-2 are fulfilled earlier than the time at the end of $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equal to $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$, assuming that the UE uses only the SMTC window of the target inter-frequency carrier for performing the measurements.
- If both condition D1-1 and condition D1-2 are fulfilled later than the time at the end of $T_{Event_DU} + T_{identify_inter_with_index}$ or $T_{Event_DU} + T_{identify_inter_without_index}$, then the measurement time delay equal to the time from the end of $T_{event_DU}$ until time of both condition D1-1 and condition D1-2 are fulfilled.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu}$ Tc while the measurement gap has not been available and the L3 filter has not been used, where $\mu$ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1E.2.2.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1E.2.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the interruption time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}\ \text{ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

$T_{IU}$ is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. $T_{IU}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3]

$T_{\Delta}$ is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

$T_{margin}$ is time for SSB post-processing. $T_{margin}$ can be up to 2ms.

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with $T_{rs}$=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the handover command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of $T_{IU}$ shall depend upon the PRACH configuration used in the target cell.

The normative reference for this requirement is TS 38.133 [6] clause 6.1E.2.2.

## 19.2.2.1 Intra-frequency distance-based conditional Handover from FR1 to FR1

Editor's Note: This test case is incomplete for the following configurations:

- TT analysis is missing.

### 19.2.2.1.1 Test purpose

To verify the requirememt for the NR FR1-NR FR1 intra-frequency distance-based conditional handover for ATG requirements specified in 38.133 [6] 6.1E.2.2.

### 19.2.2.1.2 Test applicability

This test applies to all types of NR ATG UE release 18 onwards and supporting conditional handover.

### 19.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.2.1.

### 19.2.2.1.4 Test description

#### 19.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 19.2.2.1.4.1-1.

**Table 19.2.2.1.4.1-1: NR ATG SA FR1 distance-based conditional handover test configurations**

| Config | Description |
|---|---|
| 19.2.2.1-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.2.2.1-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.2.2.1-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.2.1.4.1-2

**Table 19.2.2.1.4.1-2: Initial conditions for NR ATG SA FR1 distance-based conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [TBD] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 19.2.2.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 19.2.2.1.4.1-3 and 19.2.2.1.5-1 below.

**Table 19.2.2.1.4.1-3: General test parameters NR ATG SA FR1 Intra-frequency distance-based conditional handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | | 1 | |
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| UE position (N,S, H) at T1 start | | | (0, 0, 3000) | Set by AT command |
| UE moving speed | | km/h | (1200, 0, 0) | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | (-4600, 0, 0) | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | (14479, 0, 0) | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | 200 | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | 200 | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 | |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 | |
| A3-Offset in condition | | dB | 0 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 15 | |
| T2 | | s | ≤ 6 | |

### 19.2.2.1.4.2 Test procedure

The test scenario comprises of 2 NR carrier and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 19.2.2.1.4.1-3 and 19.2.2.1.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands. The UE is configured to measure intra-frequency neighbour cell. The RRC message implying distance-based handover to Cell 2 with Event D1 shall be sent to UE, at a time earlier than $T_{RRC}$ (10ms) before the beginning of T2. where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and offset better than Cell 1 and location condition event condEventD1-r17 is is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure}$ + $T_{CHO_execution}$ + $T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 19.2.2.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. UE position and moving speed are configured on the UE via AT commands. Immediately after that, T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure distanced-based CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 19.2.2.1.5-1. T2 starts.

7. If

   a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure}$ + $T_{CHO_execution}$ + $T_{interrupt}$ ms from the beginning of time period T2,

   and

   b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 19.2.2.1-1
   - $X = T_{interrupt}$ for test configuration 19.2.2.1-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 19.2.2.1-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

### 19.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 19.2.2.1.4.3-1: *RRCReconfiguration* for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| measConfig | MeasConfig | Table 19.2.2.1.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 19.2.2.1.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.1.4.3-2: *MeasConfig* (Table 14.2.2.1.4.3-1) for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 1 entry | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 19.2.2.1.4.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-D1 | Table 19.2.2.1.4.3-4 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[2] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 19.2.2.1.4.3-5 | |
| } | | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 1 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 1 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| } | | | |

**Table 19.2.2.1.4.3-3: *MeasObjectNR* (Table 19.2.2.1.4.3-2) for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for PCell | | |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 19.2.2.1.4.3-4: *ReportConfigNR-T1* (Table 19.2.2.1.4.3-2) for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventD1-r17 SEQUENCE { | | | |
| distanceThreshFromReference1-r17 | 4 | Actual value =4*50 = 200m | |
| distanceThreshFromReference2-r17 | 4 | Actual value =4*50 = 200m | |
| referenceLocation1-r17 | OCTET STRING CONTAINING the *Ellipsoid-Point* defined in TS37.355 [38] for (-4600, 0, 0) | | |
| referenceLocation2-r17 | OCTET STRING CONTAINING the *Ellipsoid-Point* defined in TS37.355 [38] for (14479, 0, 0) | | |
| hysteresisLocation-r17 | 0 | | |
| timeToTrigger | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.1.4.3-5: *ReportConfigNR-A3* (Table 19.2.2.1.4.3-2) for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 0 | actuall value = 0dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |

| | | | |
|---|---|---|---|
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.1.4.3-6: *ConditionalReconfiguration* (Table 19.2.2.1.4.3-1) for NR SA FR1 distance-based Conditional Handover for ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>MeasId configured in Table 19.2.2.1.4.3-2 Event D1 | |
| MeasId[2] | 2 | entry 2<br>MeasId configured in Table 19.2.2.1.4.3-2 Event A3 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |
| } | | | |
| } | | | |
| } | | | |

19.2.2.1.5 Test requirements

Table 19.2.2.1.5-1 defines the primary level settings for all tests.

**Table 19.2.2.1.5-1: Cell specific test parameters for NR ATG SA FR1 Intra-frequency distance-based conditional handover from FR1 to FR1**

| Parameter | Test configuration | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2, 3 | | TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | Config 1, 2, 3 | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | | | |
| | | Config 2 | | CR.1.1 TDD | | | |
| | | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | | Config 1 | | TRS.1.1 FDD | | | |
| | | Config 2 | | TRS.1.1 TDD | | | |
| | | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | Config 1, 2, 3 | | OP.1 | | | |
| SMTC Configuration | | Config 1, 2, 3 | | SMTC.1 | | | |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 | | | |
| | | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 15 kHz | | | |
| | | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1, 3 | kHz | 15 kHz | | | |
| | | Config 3 | | 30 kHz | | | |
| PRACH configuration | | Config 1, 2, 3 | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2, 3 | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |
| $N_{oc}$ Note2 | | Config 1, 2, 3 | dBm/ 15kHz | -98 | | | |
| $N_{oc}$ Note2 | | Config 1, 2 | dBm/ SCS | -98 | | | |
| | | Config 3 | | -95 | | | |
| $\hat{E}_s / I_{ot}$ | | Config 1, 2, 3 | dB | 8+TT | -3.3+TT | -Infinity | 2.36+TT |
| $\hat{E}_s / N_{oc}$ | | Config 1, 2, 3 | dB | 8+TT | 8+TT | -Infinity | 11+TT |
| SSB_RP | | Config 1, 2 | dBm/ SCS | -90+TT | -90+TT | -Infinity | -87+TT |
| | | Config 3 | | -87+TT | -87+TT | -Infinity | -84+TT |
| Io Note3 | | Config 1, 2 | dBm/ 9.36MHz | -61.41+TT | -57.06+TT | -61.41+TT | -57.06+TT |
| | | Config 3 | dBm/ 38.16MHz | -55.31+TT | -50.96+TT | -55.31+TT | -50.96+TT |
| Propagation condition | | Config 1, 2 | - | AWGN + 2412Hz Note4 | | | |
| | | Config 3 | | AWGN + 5556Hz Note5 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: 2412Hz is the maximum value of doppler with carrier frequency of 2170MHz. The specific doppler shift trajectory is up to test system's design considering of BS location and UE GNSS emulation.

| Note 5: | 5556Hz is the maximum value of doppler with carrier frequency of 5GHz. The specific doppler shift trajectory is up to test system's design considering of BS location and UE GNSS emulation. |
|---|---|

The UE shall start to transmit the PRACH to Cell 2 less than 872 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay is defined in TS 38.133 [6] clause 6.1E.2, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{Event_DU}$ = start of T2

At start of T2,

distance to source cell reference location is $\sqrt{(3000)^2 + (1200 * 1000/3600 * 15 - (-4600))^2}$ = 10057.8m, and D1-1 = 10000m

distance to target cell reference location is $\sqrt{(3000)^2 + (1200 * 1000/3600 * 15 - (14479))^2}$ = 9942.4m, and D1-2 = 10000m

i.e. D1-1 and D1-2 conditions are fulfilled at start of T2 with >=50m location margin.

$T_{measure}$ = max(600 + 200 ms, 0) = 800 ms;

$T_{interrupt}$ = 62ms; $T_{CHO_execution}$ = 10ms.

This gives a total of 800ms + 62ms + 10ms = 872 ms.

## 19.2.2.2 Inter-frequency distance-based conditional Handover from FR1 to FR1

Editor's Note: This test case is incomplete for the following configurations:

- TT analysis is missing.

### 19.2.2.2.1 Test purpose

To verify the requirememt for the NR FR1-NR FR1 inter-frequency distance-based conditional handover for ATG requirements specified in 38.133 [6] 6.1E.2.2.

### 19.2.2.2.2 Test applicability

This test applies to all types of NR ATG UE release 18 onwards and supporting distance-based conditional handover.

### 19.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.2.2.

### 19.2.2.2.4 Test description

#### 19.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 19.2.2.2.4.1-1.

**Table 19.2.2.2.4.1-1: NR ATG SA FR1 distance-based conditional handover test configurations**

| Config | Description |
|---|---|
| 19.2.2.2-1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.2.2.2-2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.2.2.2-3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.2.2.4.1-2

**Table 19.2.2.2.4.1-2: Initial conditions for NR ATG SA FR1 distance-based conditional handover**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [TBD] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. Message contents are defined in clause 19.2.2.2.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 19.2.2.2.4.1-3 and 19.2.2.2.5-1 below.

**Table 19.2.2.2.4.1-3: General test parameters NR ATG SA FR1 Inter-frequency distance-based conditional handover from FR1 to FR1**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| UE position (N,S, H) at T1 start | | | (0, 0, 3000) | Set by AT command |
| UE moving speed | | km/h | (1200, 0, 0) | Set by AT command |
| referenceLocation1-r17.condEventD1-r17 | | m | (-4600, 0, 0) | Reference location for serving cell |
| referenceLocation2-r17.condEventD1-r17 | | m | (14479, 0, 0) | Reference location for target cell |
| distanceThreshFromReference1-r17.condEventD1-r17 | | 50m | 200 | D1-1 Location condition is fulfilled at T2 |
| distanceThreshFromReference2-r17.condEventD1-r17 | | 50m | 200 | D1-2 Location condition is fulfilled at T2 |
| hysteresis-r17.condEventD1-r17 | | 10m | 0 | |
| timeToTrigger-r17.condEventD1-r17 | | s | 0 | |
| A3-Offset in condition | | dB | -4 | |
| Hysteresis | | dB | 0 | |
| Time To Trigger | | s | 0 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | ≤ 16 | |

#### 19.2.2.2.4.2 Test procedure

The test scenario comprises of 2 NR carrier and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 19.2.2.2.4.1-3 and 19.2.2.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

Time interval T1 needs to start immediately after the UE position and moving speed are configured via AT commands. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying distance-based handover to Cell 2 with Event D1 shall be sent to UE, at a time earlier than $T_{RRC}$ (10ms) before the beginning of T2. where

- $T_{RRC}$ = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and offset better than Cell 1 and after 9976ms of T2, location condition event condEventD1-r17 is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 19.2.2.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. UE position and moving speed are configured on the UE via AT commands. Immediately after that, T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure distanced-based CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 19.2.2.2.5-1. T2 starts.

7. If

   c) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   d) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 19.2.2.2-1
   - $X = T_{interrupt}$ for test configuration 19.2.2.2-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 19.2.2.2-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 19.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

**Table 19.2.2.2.4.3-1: *RRCReconfiguration* for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| measConfig | MeasConfig | Table 19.2.2.2.4.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| conditionalReconfiguration-r16 | ConditionalReconfiguration | Table 19.2.2.2.4.3-6 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.2.4.3-2: *MeasConfig* (Table 19.2.2.2.4.3-1) for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: Table H.3.1-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod { | 2 entries | | |
| MeasObjectToAddMod[1] SEQUENCE { | | entry 1 | |
| measObjectId | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 19.2.2.2.4.3-3 | Cell 1 |
| } | | | |
| } | | | |
| MeasObjectToAddMod[2] SEQUENCE { | | entry 2 | |
| measObjectId | 2 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 19.2.2.2.4.3-3 | Cell 2 |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod { | 2 entries | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 1 | |
| reportConfigId | 1 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-D1 | Table 19.2.2.2.4.3-4 | |
| } | | | |
| } | | | |
| ReportConfigToAddMod[1] SEQUENCE { | | entry 2 | |
| reportConfigId | 2 | | |
| reportConfig CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 19.2.2.2.4.3-5 | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod { | 2 entries | | |
| MeasIdToAddMod[1] SEQUENCE { | | entry 1 | |
| measId | 1 | | |
| measObjectId | 2 | | |
| reportConfigId | 1 | | |
| } | | | |
| MeasIdToAddMod[2] SEQUENCE { | | entry 2 | |
| measId | 2 | | |
| measObjectId | 2 | | |
| reportConfigId | 2 | | |
| } | | | |
| } | | | |
| quantityConfig | QuantityConfig specified in Table H.3.1-5 | | |
| measGapConfig | MeasGapConfig specified in Table H.3.1-6 with conditions gapUE, Pattern #0 and gap offset = 9 | | |
| } | | | |

**Table 19.2.2.2.4.3-3: *MeasObjectNR* (Table 19.2.2.2.4.3-2) for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for Cell 1 | | Cell 1 |
| | ARFCN-ValueNR for Cell 2 | | Cell 2 |
| smtc1 | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.2 | | Cell 1 |
| | SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.5 | | Cell 2 |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

**Table 19.2.2.2.4.3-4: *ReportConfigNR-T1* (Table 19.2.2.2.4.3-2) for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventD1-r17 SEQUENCE { | | | |
| distanceThreshFromReference1-r17 | 4 | Actual value =4*50 = 200m | |
| distanceThreshFromReference2-r17 | 4 | Actual value =4*50 = 200m | |
| referenceLocation1-r17 | OCTET STRING CONTAINING the *Ellipsoid-Point* defined in TS37.355 [38] for (-4600, 0, 0) | | |

| | | | |
|---|---|---|---|
| referenceLocation2-r17 | OCTET STRING CONTAINING the *Ellipsoid-Point* defined in TS37.355 [38] for (14479, 0, 0) | | |
| hysteresisLocation-r17 | 0 | | |
| timeToTrigger | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.2.4.3-5: *ReportConfigNR-A3* (Table 19.2.2.2.4.3-2) for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| condTriggerConfig-r16 SEQUENCE { | | | |
| condEventId CHOICE { | | | |
| condEventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 0 | actuall value = 0*0.5 = 0dB | |
| } | | | |
| hysteresis | 0 | actuall value = 0*0.5 = 0dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 19.2.2.2.4.3-6: *ConditionalReconfiguration* (Table 19.2.2.2.4.3-1) for NR SA FR1-FR1 distance-based Conditional Handover for NR ATG**

| Derivation Path: TS 38.508-1[14], Table 4.6.3-25D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ConditionalReconfiguration-r16::= SEQUENCE { | | | |
| condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 { | 1 entry | | |
| CondReconfigToAddMod-r16 [1] SEQUENCE { | | entry 1 | |
| condReconfigId-r16 | 1 | | |
| condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId { | 2 entries | | |
| MeasId[1] | 1 | entry 1<br>The MeasId configured in Table 19.2.2.2.4.3-2 Event D1 | |
| MeasId[2] | 2 | entry 2<br>The MeasId configured in Table 19.2.2.2.4.3-2 Event A3 | |
| } | | | |
| condRRCReconfig-r16 | OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange) | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

19.2.2.2.5 Test requirements

Table 19.2.2.2.5-1 defines the primary level settings for all tests.

**Table 19.2.2.2.5-1: Cell specific test parameters for NR ATG SA FR1 Intra-frequency distance-based conditional handover from FR1 to FR1**

| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T1 | T2 |
| Duplex mode | | Config 1 | | FDD | | | |
| | | Config 2, 3 | | TDD | | | |
| TDD configuration | | Config 1 | | Not Applicable | | | |
| | | Config 2 | | TDDConf.1.1 | | | |
| | | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | | Config 1, 2 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRX Cycle | | Config 1, 2, 3 | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | Config 1 | | SR.1.1 FDD | | | |
| | | Config 2 | | SR.1.1 TDD | | | |
| | | Config 3 | | SR.2.1 TDD | | | |
| CORESET Reference Channel | | Config 1 | | CR.1.1 FDD | | | |
| | | Config 2 | | CR.1.1 TDD | | | |
| | | Config 3 | | CR.2.1 TDD | | | |
| TRS configuration | | Config 1 | | TRS.1.1 FDD | | | |
| | | Config 2 | | TRS.1.1 TDD | | | |
| | | Config 3 | | TRS.1.2 TDD | | | |
| OCNG Patterns | | Config 1, 2, 3 | | OP.1 | | | |
| SMTC Configuration | | Config 1, 2, 3 | | SMTC.1 | | | |
| SSB Configuration | | Config 1, 2 | | SSB.1 FR1 | | | |
| | | Config 3 | | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 | kHz | 15 kHz | | | |
| | | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1, 3 | kHz | 15 kHz | | | |
| | | Config 3 | | 30 kHz | | | |
| PRACH configuration | | Config 1, 2, 3 | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1, 2, 3 | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | | DLBWP.1.1 | | | |
| | Initial UL BWP | | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | Config 1, 2, 3 | dBm/ 15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1, 2 | dBm/ SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | Config 1, 2, 3 | dB | 8+TT | -3.3+TT | -Infinity | 2.36+TT |
| $\hat{E}_s/N_{oc}$ | Config 1, 2, 3 | dB | 8+TT | 8+TT | -Infinity | 11+TT |
| SSB_RP | Config 1, 2 | dBm/ SCS | -90+TT | -90+TT | -Infinity | -87+TT |
| | Config 3 | | -87+TT | -87+TT | -Infinity | -84+TT |
| Io Note3 | Config 1, 2 | dBm/ 9.36MHz | -61.41+TT | -57.06+TT | -61.41+TT | -57.06+TT |
| | Config 3 | dBm/ 38.16MHz | -55.31+TT | -50.96+TT | -55.31+TT | -50.96+TT |
| Propagation condition | Config 1, 2 | - | AWGN + 2412Hz Note4 | | | |
| | Config 3 | | AWGN + 5556Hz Note5 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: 2412Hz is the maximum value of doppler with carrier frequency of 2170MHz. The specific doppler shift trajectory is up to test system's design considering of BS location and UE GNSS emulation.
Note 5: 5556Hz is the maximum value of doppler with carrier frequency of 5GHz. The specific doppler shift trajectory is up to test system's design considering of BS location and UE GNSS emulation.

The UE shall start to transmit the PRACH to Cell 2 later than 9976 ms and less than 10048 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90 %.

NOTE: The handover delay is defined in clause 6.1E.2, can be expressed as:

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

where:

RRC procedure delay $T_{RRC}$ = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{Event_DU}$ = start of T2

At 9976 ms after start of T2,

distance to source cell reference location is $\sqrt{(3000)^2 + (1200 * 1000/3600 * 14.976 - (-4600))^2}$ = 10050.2m, and D1-1 = 10000m

distance to target cell reference location is $\sqrt{(3000)^2 + (1200 * 1000/3600 * 14.976 - (14479))^2}$ = 9949.08m, and D1-2 = 10000m

i.e. D1-1 and D1-2 conditions are fulfilled at start of T2 with >=50m location margin.

$T_{measure}$ = max(600 + 200 ms, 9976 ms) = 9976 ms;

$T_{interrupt}$ = 62 ms; $T_{CHO_execution}$ = 10 ms.

This gives a total of 9976 ms + 62 ms + 10 ms = 10048 ms.

# 19.2.3

## 19.2.3.1 RRC re-establishment

### 19.2.3.1.0 Minimum conformance requirements

#### 19.2.3.1.1 Minimum conformance requirements for NR FR1 re-establishment

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re-establish_delay} = T_{UE_re-establish_delay} + T_{UL_grant}$$

$T_{UL_grant}$: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re-establish_delay} = 50\ \text{ms} + T_{identify_intra_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in clause 10.1.2 is fulfilled for a corresponding NR Band for FR1, and
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.X1 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clause 10.1.4 are fulfilled for a corresponding NR Band for FR1, and
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.X2 for a corresponding NR Band are fulfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in Table 6.2D.1.2.1-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in Table 6.2D.1.2.1-2.

$T_{SMTC}$: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*, $T_{smtc}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{SI\text{-}NR}$: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

$T_{PRACH:}$ It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{PRACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

$N_{freq}$: It is the total number of NR frequencies to be monitored for RRC re-establishment; $N_{freq}$ = 1 if the target intra-frequency NR cell is known, else $N_{freq}$ = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

**Table 6.2D.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell**

| SSB Ês/Iot (dB) | cell | Known NR cell | Unknown NR cell |
|---|---|---|---|
| ≥ -8 | FR1 | MAX (200 ms, 5 x $T_{SMTC}$) | MAX (800 ms, 10 x $N1^{Note2}$ x $T_{SMTC}$) |
| < -8 | FR1 | N/A | $800^{Note1}$ |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.<br>Note 2: For UEs with the antenna array, N1 = 3 when network assistance on ATG cells reference locations is provided, otherwise N1 = 4.<br>For UEs with one or multiple omni-directional antenna(s), N1 = 1. | | | |

**Table 6.2D.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell**

| Serving cell SSB Ês/Iot (dB) | FR of target NR cell | $T_{identify_inter_NR,\ i}$ [ms] | |
|---|---|---|---|
| | | Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x $T_{SMTC,\ i}$) | MAX (800 ms, 13 x $N1^{Note2}$ x $T_{SMTC,\ i}$) |
| < -8 | FR1 | N/A | $800^{Note1}$ |
| Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.<br>Note 2: For UEs with the antenna array, N1 = 3 when network assistance on ATG cells reference locations is provided, otherwise N1 = 4.<br>For UEs with one or multiple omni-directional antenna(s), N1 = 1. | | | |

The normative reference for this requirement is TS 38.133 [6] clause 6.2D.1.

## 19.2.3.1.1 Intra-frequency RRC Re-establishment in FR1 for ATG

Editor's Note: This test case is incomplete for the following configurations:

- TT analysis is missing.
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procedures for providing network assistance on ATG cells reference locations are FFS.

### 19.2.3.1.1.1 Test purpose

To verify the NR ATG UE's ability to perform NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limit for ATG.

### 19.2.3.1.1.2 Test applicability

This test applies to all types of NR ATG UE release 18 and forward.

### 19.2.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.3.1.1.

#### 19.2.3.1.1.4 Test description

##### 19.2.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

This test shall be tested using any of the test configurations in Table 19.2.3.1.1.4.1-1.

**Table 19.2.3.1.1.4.1-1: Intra-frequency RRC re-establishment test configurations**

| Config | Description |
|---|---|
| 19.2.3.1.1-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.2.3.1.1-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.2.3.1.1-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.3.1.1.4.1-2

**Table 19.2.3.1.1.4.1-2: Initial conditions for NR ATG SA FR1 RRC re-establishment with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table [TBD] and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.3.1.1.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The test parameters are given in Tables 19.2.3.1.1.4.1-3.
2. Message contents are defined in clause 19.2.3.1.1.4.3.

**Table 19.2.3.1.1.4.1-3: General test parameters NR ATG SA FR1 RRC re-establishment**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3 | 1 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2 | 3 μs | Synchronous cells |
| | | | 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3 | 3000 | RRC re-establishment timer |

| | | | | |
|---|---|---|---|---|
| Access Barring Information | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.1 FR1 | |
| | | 3 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.2 | |
| | | 2 | SMTC.1 | |
| | | 3 | SMTC.1 | |
| DRX cycle length | s | 1, 2, 3 | OFF | |
| PRACH configuration | | 1, 2, 3 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| T1 | s | 1, 2, 3 | 5 | |
| T2 | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) |
| T3 | s | 1, 2, 3 | 2 | |

#### 19.2.3.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 19.2.3.1.1.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 19.2.3.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 19.2.3.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1840 ms (= 220ms + 1.6 s) from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 19.2.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 19.2.3.1.1.4.3-1: Common Exception messages intra-frequency RRC re-establishment**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |

| | |
|---|---|
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-1 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-2 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.1-3 | Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 6.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms3000 | | |
| } | | | |

**Table 6.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

### 19.2.3.1.1.5 Test requirements

Table 19.2.3.1.1.5-1 defines the primary level settings for all tests.

**Table 19.2.3.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1 for ATG**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Active DL BWP confgiuration | | 1, 2, 3 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 1.54 | -infinity | -infinity | -3.79 | 4 | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 7 | -infinity | -infinity | 4 | 4 | 4 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 2 | -91 | -infinity | -infinity | -94 | -94 | -94 |
| | | 3 | -88 | -infinity | -infinity | -91 | -91 | -91 |
| Io | dBm/9.36 MHz | 1 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| | dBm/9.36 MHz | 2 | -60.74 | -64.59 | -64.59 | -60.74 | -64.59 | -64.59 |
| | dBm/38.16 MHz | 3 | -54.65 | -58.50 | -58.50 | -54.65 | -58.50 | -58.50 |
| Propagation Condition | | 1, 2, 3 | AWGN | | | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The RRC re-establishment delay is defined as the time from the moment UE declares RLF, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50 \text{ ms} + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR} = 200$ ms

$T_{SI} = 1280$ ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH} = 15$ ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms for RRC re-establishment delay, allow 1840 ms (240 ms + 1.6 s) from the beginning of T2 in the test case.

### 19.2.3.1.2 Inter-frequency RRC Re-establishment in FR1 with unknown target cell without serving cell timing for ATG

Editor's Note: This test case is incomplete for the following configurations:

- TT analysis is missing.
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procedures for providing network assistance on ATG cells reference locations are FFS.

#### 19.2.3.1.2.1 Test purpose

To verify the NR ATG UE's ability to perform NR inter-frequency RRC re-establishment delay in FR1 with unknown target cell and without serving cell timing are within the specified limits for ATG.

#### 19.2.3.1.2.2 Test applicability

This test applies to all types of NR ATG UE release 18 and forward.

#### 19.2.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.2.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.19.2.3.1.2.

#### 19.2.3.1.2.4 Test description

##### 19.2.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

This test shall be tested using any of the test configurations in Table 19.2.3.1.1.4.1-1.

**Table 19.2.3.1.2.4.1-1: Inter-frequency RRC re-establishment test configurations**

| Config | Description |
|---|---|
| 19.2.3.1.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.2.3.1.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.2.3.1.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table 19.2.3.1.2.4.1-2

**Table 19.2.3.1.1.4.1-2: Initial conditions for NR ATG SA FR1 RRC re-establishment with known target cell**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.2.3.1.2.4.1-1 | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The test parameters are given in Tables 19.2.3.1.2.4.1-3.
2. Message contents are defined in clause 19.2.3.1.2.4.3.

**Table 19.2.3.1.2.4.1-3: General test parameters NR ATG SA FR1 RRC re-establishment**

| Parameter | | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|---|
| Initial condition | Active cell | | 1, 2, 3 | Cell 1 | |
| | Neighbour cells | | 1, 2, 3 | Cell 2 | |
| Final condition | Active cell | | 1, 2, 3 | Cell 2 | |
| RF Channel Number | | | 1, 2, 3 | 1, 2 | |
| Time offset between cells | | | 1 | 3 ms | Asynchronous cells |
| | | | 2, 3 | 3 μs | Synchronous cells |
| N310 | | - | 1, 2, 3 | 1 | Maximum consecutive out-of-sync indications from lower layers |
| N311 | | - | 1, 2, 3 | 1 | Minimum consecutive in-sync indications from lower layers |
| T310 | | ms | 1, 2, 3 | 0 | Radio link failure timer; |
| T311 | | ms | 1, 2, 3 | 5000 | RRC re-establishment timer |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | | | 1 | SSB.1 FR1 | |
| | | | 2 | SSB.1 FR1 | |
| | | | 3 | SSB.2 FR1 | |
| SMTC configuration | | | 1 | SMTC.2 | |
| | | | 2 | SMTC.1 | |
| | | | 3 | SMTC.1 | |
| DRX cycle length | | s | 1, 2, 3 | OFF | |
| PRACH configuration | | | 1, 2, 3 | FR1 PRACH configuration 1 | Table A.3.8.2.1-1 |
| T1 | | s | 1, 2, 3 | 5 | |
| T2 | | ms | 1, 2, 3 | 240 | Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 ) The value applies for UEs that don't support *antennaArrayType-r18* and UEs that support *antennaArrayType-18* |
| T3 | | s | 1, 2, 3 | 5 | The value applies for UEs that don't support *antennaArrayType-r18* and UEs that support *antennaArrayType-18* |

### 19.2.3.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 19.2.3.1.2.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 19.2.3.1.2.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 19.2.3.1.2.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 19.2.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table 19.2.3.1.2.4.3-1: Common Exception messages inter-frequency RRC re-establishment**

| Default Message Contents | |
|---|---|
| Common contents of system information blocks exceptions | |
| Default RRC messages and information elements contents exceptions | |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-1 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-2 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |
| Specific message contents exceptions for Test Configuration 6.3.2.1.2-3 | Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells<br>Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 |

**Table 19.2.3.1.2.4.3-2: *RLF-TimersAndConstants* for inter-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| t311 | ms5000 | | |
| } | | | |

**Table 19.2.3.1.2.4.3-3: *MeasConfig* for inter-frequency RRC re-establishment**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig::= SEQUENCE { | | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |

19.2.3.1.2.5 Test requirements

Table 19.2.3.1.2.5-1 defines the primary level settings for all tests.

**Table 19.2.3.1.2.5-1: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1 for ATG**

| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| RF Channel Number | | 1, 2, 3 | 1 | | | 2 | | |
| TDD configuration | | 1 | N/A | | | N/A | | |
| | | 2 | TDDConf.1.1 | | | TDDConf.1.1 | | |
| | | 3 | TDDConf.2.1 | | | TDDConf.2.1 | | |
| PDSCH RMC configuration | | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | 2 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | | 3 | SR.2.1 TDD | | | SR.2.1 TDD | | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| | | 2 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| | | 3 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| | | 2 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| | | 3 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern | | 1, 2, 3 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| TRS configuration | | 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
| | | 2 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| | | 3 | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| Initial DL BWP configuration | | 1, 2, 3 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration | | 1, 2, 3 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| Active DL BWP confgiuration | | 1, 2, 3 | DLBWP.1.1 | N/A | N/A | N/A | N/A | DLBWP.1.1 |
| Active UL BWP configuration | | 1, 2, 3 | ULBWP.1.1 | N/A | N/A | N/A | N/A | ULBWP.1.1 |
| RLM-RS | | 1, 2, 3 | SSB | | | SSB | | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $N_{oc}$ Note2 | dBm/SCS | 1 | -98 | | | | | |
| | | 2 | -98 | | | | | |
| | | 3 | -95 | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1 | -98 | | | | | |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 4 | -infinity | -infinity | -infinity | -infinity | 7 |
| | | 2 | | | | | | |
| | | 3 | | | | | | |
| SS-RSRP Note3 | dBm/SCS | 1, 2 | -94 | -infinity | -infinity | -infinity | -infinity | -91 |
| | | 3 | -91 | -infinity | -infinity | -infinity | -infinity | -88 |
| Io | dBm/9.36 MHz | 1 | -64.59 | -70. 05 | -70. 05 | -70. 05 | -70. 05 | -62.26 |
| | dBm/9.36 MHz | 2 | -64.59 | -70. 05 | -70. 05 | -70. 05 | -70.05 | -62.26 |
| | dBm/38.16 MHz | 3 | -58.50 | -63.94 | -63.94 | -63.94 | -63.94 | -56.15 |
| Propagation Condition | | 1, 2 | AWGN [220Hz] | | | | | |
| | | 3 | AWGN [500Hz] | | | | | |

| | |
|---|---|
| Note 1: | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. |
| Note 2: | Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to Cell 2 for sending the *RRCReestablishmentRequest* message to Cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell without serving cell timing shall be less than 3s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

$T_{UL_grant}$ = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence $T_{UL_grant}$ is not used.

$$T_{UE_re-establish_delay} = 50\,ms + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq}$ = 2

$T_{identify_intra_NR}$ = 800 ms

$T_{identify_inter_NR}$ = 800 ms

$T_{SI}$ = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

$T_{PRACH}$ = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

## 19.2.3.2

## 19.2.3.3 SA: RRC Connection Release with Redirection for ATG

### 19.2.3.3.0 Minimum conformance requirements

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detectable when for each relevant SSB, the following side conditions are met:

- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.5 for a corresponding NR Band are fulfilled.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depends on the FR of the target NR cell. It is defined in Table 19.2.3.3.0-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and $T_{meas}$ is the

measurement time due to cell selection criteria evaluation. $T_{SI-NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

$T_{RACH:}$ It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. $T_{RACH}$ can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

$T_{rs}$ is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise $T_{rs}$ is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the *measObjectNR*s with the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, $T_{rs}$ is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with $T_{rs}$ = 20 ms if the SSB transmission periodicity is not larger than 20 ms; otherwise,
- there is no requirement if the SSB transmission periodicity is larger than 20 ms.

**Table 19.2.3.3.0-1: Time to identify target NR cell for RRC connection release with redirection to NR**

| FR of target NR cell | $T_{identify-NR}$ |
|---|---|
| FR1 | MAX (680 ms, 11 x $N1^{Note2}$ x $T_{rs}$) |
| NOTE 1: If the UE has been provided with higher layer signalling of *smtc2* specified in TS 38.331 [13] prior to the redirection command, $T_{rs}$ follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. | |
| NOTE 2: For ATG UEs capable of *antennaArrayType-r18*, N1 = 3 when network assistance on ATG cells reference locations is provided, otherwise N1 = 4. Otherwise, N1 = 1. | |

The normative reference for this requirement is TS 38.133 [6] clauses 6.2D.3.2.1.

### 19.2.3.3.1 NR SA FR1-FR1 RRC connection release with Redirection for ATG

Editor's Note: This test case is incomplete:

- MU/TT analysis is missing.
- Test applicability is missing.- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procedures for providing network assistance on ATG cells reference locations are FFS.

#### 19.2.3.3.1.1 Test purpose

This test is to verify RRC connection release with redirection for ATG from NR to NR.

#### 19.2.3.3.1.2 Test applicability

This test applies to all types of NR ATG UE release 18 and forward.

#### 19.2.3.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 19.2.3.3.0.

The normative reference for this requirement is TS 38.133 [6] A.19.2.3.3.1.

#### 19.2.3.3.1.4 Test description

##### 19.2.3.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table19.2.3.3.1.4.1-1.

**Table19.2.3.3.1.4.1-1: Redirection from NR to NR test configurations**

| Config | Description |
|---|---|
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode<br>Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode<br>Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations | |

Configure the test equipment and the DUT according to the parameters in Table19.2.3.3.1.4.1-2.

**Table19.2.3.3.1.4.1-2: Initial conditions for Redirection from NR to NR test case**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table19.2.3.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part | A.3.1.8.2 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameters for PCell and neighbour cell are given in Table19.2.3.3.1.4.1-3 below.
2. Message contents are defined in clause19.2.3.3.1.4.3.
3. There are two carriers and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

**Table19.2.3.3.1.4.1-3: General test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Value | Comment |
|---|---|---|---|---|
| Initial conditions | Active cell | | Cell 1 | |
| | Neighbouring cell | | Cell 2 | |
| Final condition | Active cell | | Cell 2 | |
| Filter coefficient | | | 0 | L3 filtering is not used |
| Access Barring Information | | - | not barred | No additional delays in random access procedure. |
| Time offset between cells | | | 3 μs | Synchronous cells |
| T1 | | s | 5 | |
| T2 | | s | 2.3 | The value applies for UEs that don't support *antennaArrayType-r18* and UEs that support *antennaArrayType-r18* |

#### 19.2.3.3.1.4.2 Test procedure

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table19.2.3.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table19.2.3.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

#### 19.2.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

**Table19.2.3.3.1.4.3-1: RRCRelease for NR RRC redirection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueNR | Frequency of Cell 2 | |
| ssbSubcarrierSpacing | kHz15 | | Config 1,2 |
| | kHz30 | | Config 3 |
| smtc SEQUENCE { | | | |
| duration | sf1 | | SMTC.1 |
| | sf5 | | SMTC.2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table19.2.3.3.1.4.3-2: SIB2**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionInfoCommon SEQUENCE { | | | |
| rangeToBestCell | Not present | | |
| } | | | |

19.2.3.3.1.5 Test requirement

Table19.2.3.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case.

**Table19.2.3.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case**

| Parameter | | Unit | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| NR RF Channel Number | | | 1 | | 2 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| SSB Configuration | Config 1 | | SSB.1 FR1 | | | |
| | Config 2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| TDD configuration | Config 1 | | Not Applicable | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | Config 1 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3 | | 40: $N_{RB,c}$ = 106 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 | | SR.1.1 FDD | | | |
| | Config 2 | | SR.1.1 TDD | | | |
| | Config 3 | | SR 2.1 TDD | | | |
| CORESET Reference Channel | Config 1 | | CR.1.1 FDD | | | |
| | Config 2 | | CR.1.1 TDD | | | |
| | Config 3 | | CR 2.1 TDD | | | |
| OCNG Patterns | | | OP.1 | | | |
| SMTC configuration | Config 1,2 | | SMTC.1 | | | |
| | Config 3 | | SMTC.2 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| | Config 3 | | 30 kHz | | | |
| PRACH configuration | | | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | | DLBWP.0.1 | | | |
| | Dedicated DL BWP | | DLBWP.1.1 | | | |
| | Initial UL BWP | | ULBWP.0.1 | | | |
| | Dedicated UL BWP | | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| | Config 3 | | -95 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 4 | 4 | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | | dB | 4 | 4 | -infinity | 4 |
| Io Note3 | Config 1,2 | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -64.59 |
| | Config 3 | dBm/ | -58.49 | -58.49 | -63.94 | -58.49 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 38.16MHz | | | | |
| Propagation condition | Config 1,2 | - | AWGN + 220 Hz | | AWGN + 220 Hz | |
| | Config 3 | | AWGN + 500 Hz | | AWGN + 500 Hz | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | | | | | |
| Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

For UEs that don't support *antennaArrayType-r1*8 and UEs that support *antennaArrayType-r18*:

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR}$ = 680 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

$T_{RACH}$ = 170 ms in the test.

# 19.4 Signalling characteristics for ATG

## 19.4.1 Radio link monitoring for ATG

### 19.4.1.0 Minimum conformance requirements

#### 19.4.1.0.1 Minimum conformance requirements for SSB based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ period becomes worse than the threshold $Q_{out_SSB}$ within $T_{Evaluate_out_SSB}$ evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ period becomes better than the threshold $Q_{in_SSB}$ within $T_{Evaluate_in_SSB}$ evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in table 19.4.1.0.1-1 for FR1.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency or inter-frequency measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR1 ATG UE with the antenna array,

- P value for an RLM-RS resource to be measured is defined as
  - $P_{sharing\ factor} * N_{total} / N_{outside_MG}$ with $N_{available} = 0$

- $N_{total}$ / $N_{available}$ with $N_{available}$ > 0

  - For a window W of duration max($T_{L1}$, $MGRP_{max}$), where $MGRP_{max}$ is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

  - $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

  - $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

  - $N_{available}$ is

    - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W

  - $T_{L1}$ is periodicity of the target RLM-RS

  - $P_{sharing\ factor}$ = 3.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

**Table 19.4.1.0.1-1: Evaluation period $T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ for FR1**

| Configuration | $T_{Evaluate_out_SSB}$ (ms) | $T_{Evaluate_in_SSB}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil(10 × P) × $T_{SSB}$) | Max(100, Ceil(5 × P) × $T_{SSB}$) |
| DRX cycle≤320 ms | Max(200, Ceil(15 × P) × Max($T_{DRX}$,$T_{SSB}$)) | Max(100, Ceil(7.5 × P) × Max($T_{DRX}$,$T_{SSB}$)) |
| DRX cycle>320 ms | Ceil(10 × P) × $T_{DRX}$ | Ceil(5 × P) × $T_{DRX}$ |
| NOTE: $T_{SSB}$ is the periodicity of the SSB configured for RLM. $T_{DRX}$ is the DRX cycle length. | | |

### 19.4.1.0.2 Minimum conformance requirements for CSI-RS based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI\text{-}RS}$ period becomes worse than the threshold $Q_{out_CSI\text{-}RS}$ within $T_{Evaluate_out_CSI\text{-}RS}$ evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI\text{-}RS}$ period becomes better than the threshold $Q_{in_CSI\text{-}RS}$ within $T_{Evaluate_in_CSI\text{-}RS}$ evaluation period.

- $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ are defined in table 19.4.1.0.2-1 for FR1.

The requirements of $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency or inter-frequency measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and

- P = 1, when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR1 ATG UE with the antenna array,

- P value for an RLM-RS resource to be measured is defined as

  $P_{sharing\ factor}$ * $N_{total}$ / $N_{outside_MG}$ with $N_{available}$ = 0

  $N_{total}$ / $N_{available}$ with $N_{available}$ > 0

  - For a window W of duration max($T_{L1}$, $MGRP_{max}$), where $MGRP_{max}$ is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- $N_{total}$ is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- $N_{available}$ is
  - the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W
- $T_{L1}$ is periodicity of the target RLM-RS
- $P_{sharing\ factor} = 3$.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

The values of $M_{out}$ and $M_{in}$ used in table 19.4.1.0.2-1 are defined as:

- $M_{out} = 20$ and $M_{in} = 10$, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

**Table 19.4.1.0.2-1: Evaluation period $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ for FR1**

| Configuration | $T_{Evaluate_out_CSI\text{-}RS}$ (ms) | $T_{Evaluate_in_CSI\text{-}RS}$ (ms) |
|---|---|---|
| no DRX | Max(200, Ceil($M_{out}$×P)×$T_{CSI\text{-}RS}$) | Max(100, Ceil($M_{in}$×P) × $T_{CSI\text{-}RS}$) |
| DRX ≤ 320 ms | Max(200, Ceil(1.5×$M_{out}$×P)× Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) | Max(100, Ceil(1.5×$M_{in}$×P)× Max($T_{DRX}$, $T_{CSI\text{-}RS}$)) |
| DRX > 320 ms | Ceil($M_{out}$×P) × $T_{DRX}$ | Ceil($M_{in}$×P) × $T_{DRX}$ |
| NOTE: $T_{CSI\text{-}RS}$ is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for $T_{CSI\text{-}RS}$ equal to 5 ms, 10 ms, 20 ms or 40 ms. $T_{DRX}$ is the DRX cycle length. | | |

## 19.4.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- AT Command to set the UE speed and position is not specified in the test procedure
- The specific gNB reference location is missing in test procedure
- Antenna array is FFS

### 19.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in TS 38.133 [6] clause 8.1D.

### 19.4.1.1.2 Test applicability

This test applies to all types of NR ATG UE from release 18.

### 19.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.4.1.1.

#### 19.4.1.1.4 Test description

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 19.4.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in test 1.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

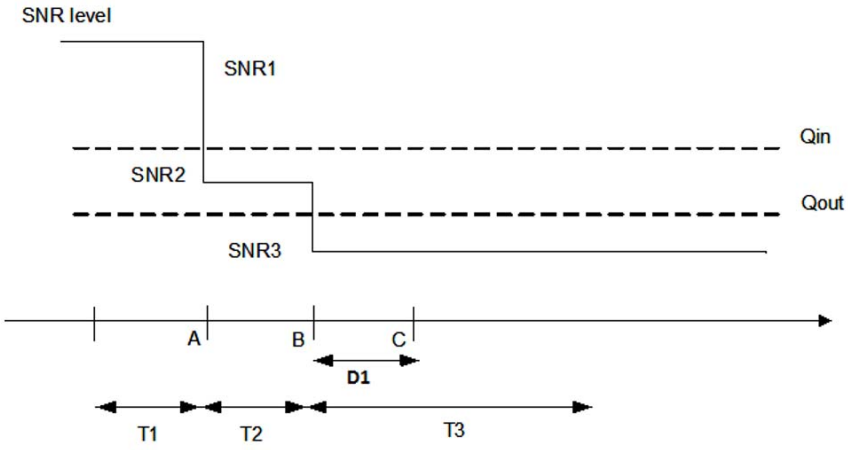



**Figure 19.4.1.1.4-1: SNR variation for out-of-sync testing**

#### 19.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.4.1.1.4.1-1

**Table 19.4.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.4.1.1-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.1-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.1-3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Test environment parameters are given in Table 19.4.1.1.4.1-2.

**Table 19.4.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

1. The general test parameter settings are set up according to tables 19.4.1.1.4.1-3 and 19.4.1.1.4.1-4.
2. Message contents are defined in clause 19.4.1.1.4.3.
3. There is one cell (Cell 1), which is the active NR cell, in the test.

**Table 19.4.1.1.4.1-3: General test parameters for FR1 out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2 | | Table A.3.8.2.1-1 |
| | Config 3 | | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table 19.4.1.1.4.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE: Ensure that RLM RS is partially overlapped with measurement gap | |

### 19.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.1.4.2 with following exceptions:

- Table 6.5.1.1.5-1 is replaced by Table 19.6.5.1.1.5-1.

### 19.4.1.1.4.3 Message contents

Same as the message contents given in clause 6.5.1.1.4.3.

### 19.4.1.1.5 Test requirements

Table 19.4.1.1.4.1-3, 19.4.1.1.5-1, and Table 19.4.1.1.5-2 defines the primary level settings for all tests.

**Table 19.4.1.1.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | |
| EPRE ratio of PSS to SSS | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1+TT | -7+TT | -15+TT |
| | Config 2 | | 1+TT | -7+TT | -15+TT |
| | Config 3 | | 1+TT | -7+TT | -15+TT |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98+TT | | |
| | Config 2 | | -98+TT | | |
| | Config 3 | | -98+TT | | |

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| $N_{oc}$ | Config 1 | dBm/SCS | -98+TT | | |
| | Config 2 | | -98+TT | | |
| | Config 3 | | -95+TT | | |
| Propagation condition | Config 1, 2 | | AWGN+220 Hz | | |
| | Config 3 | | AWGN+500 Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | |
| NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | |
| NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.19.4.1.1.1-1. | | | | | |
| NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. | | | | | |

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

## 19.4.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- AT Command to set the UE speed and position is not specified in the test procedure
- The specific gNB reference location is missing in test procedure

Antenna array is FFS19.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in ts 38.133 [6] clause 8.1D.

### 19.4.1.2.2 Test applicability

This test applies to all types of NR UE from release 18 onwards.

### 19.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.4.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.4.1.2.

### 19.4.1.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.19.4.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

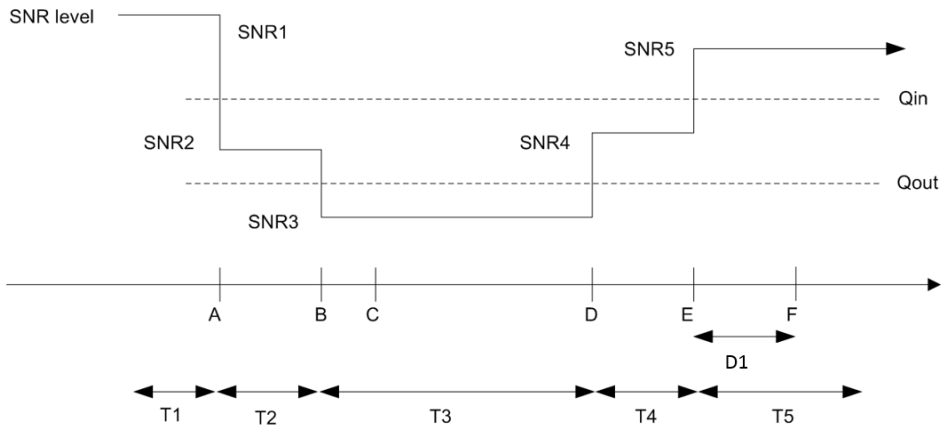



**Figure 19.4.1.2.4: SNR variation for in-sync testing**

### 19.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.4.1.2.4.1-1

**Table 19.4.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.4.1.2-1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 19.4.1.2-2 | TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 19.4.1.2-3 | TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Test environment parameters are given in Table 19.4.1.2.4.1-2.

**Table 19.4.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 19.4.1.2.4.1-3.
2. Message contents are defined in clause 19.4.1.2.4.3.
3. There is one cell (Cell 1), which is the active cell, in the test.

**Table 19.4.1.2.4.1-3: General test parameters for for FR1 in-sync testing in non-DRX mode**

| Parameter | Unit | Value |
|---|---|---|
| | | Test 1 |
| Active PCell | | Cell 1 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| $BW_{channel}$ | Config 1 | MHz | 10: $N_{PRB,c}$ = 52 |
| | Config 2 | | 10: $N_{PRB,c}$ = 52 |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| PRACH Configuration | Config 1, 2 | | Table A.3.8.2.1-1 |
| | Config 3 | | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | | 0 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | | TRS.1.1 FDD |
| | Config 2, 5 | | TRS.1.1 TDD |
| | Config 3, 6 | | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| NOTE 1: All configurations are assigned to the UE prior to the start of time period T1.<br>NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. | | | |

### 19.4.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.1.4.2 with following exceptions:

- Table 6.5.1.2.5-1 is replaced by Table 19.6.5.1.2.5-1.

### 19.4.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

TBD

### 19.4.1.2.5 Test requirements

Table 19.4.1.2.4.1-3, 19.4.1.2.5-1, and Table 19.4.1.2.5-2 defines the primary level settings for all tests.

**Table 19.4.1.2.5-1: Cell specific test parameters for for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | | | | | |
| EPRE ratio of PSS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| | Config 2 | | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| | Config 3 | | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98+TT | | | | |
| | Config 2 | | -98+TT | | | | |
| | Config 3 | | -98+TT | | | | |

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| $N_{oc}$ | Config 1 | dBm/SCS | -98+TT | | | | |
| | Config 2 | | -98+TT | | | | |
| | Config 3 | | -95+TT | | | | |
| Propagation condition | Config 1, 2 | | AWGN +220 Hz | | | | |
| | Config 3 | | AWGN +500 Hz | | | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | |
| NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | | | |
| NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | | | |
| NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.19.4.1.2.1-1. | | | | | | | |
| NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6. | | | | | | | |

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

## 19.4.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- AT Command to set the UE speed and position is not specified in the test procedure
- The specific gNB reference location is missing in test procedure
- Antenna array is FFS

### 19.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1D.

### 19.4.1.3.2 Test applicability

This test applies to all types of NR UE from release 18 onwards.

### 19.4.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.4.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.4.1.3.

### 19.4.1.3.4 Test description

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 19.4.1.3.4-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test. In the test, SSB0 is configured as the BFD-RS.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

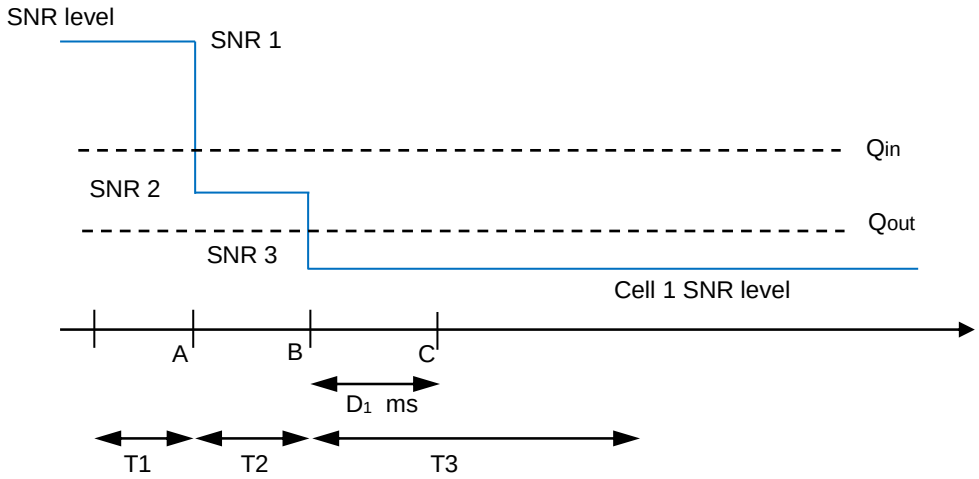



**Figure 19.4.1.3.4-1: SNR variation for CSI-RS out-of-sync testing**

### 19.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.4.1.3.4.1-1

**Table 19.4.1.3.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.4.1.3-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.3-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.3-3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Test environment parameters are given in Table 19.4.1.3.4.1-2.

**Table 19.4.1.3.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.4.1.3.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to tables 19.4.1.3.4.1-3 and 19.4.1.3.4.1-4.
2. Message contents are defined in clause 19.4.1.3.4.3.
3. There is one cell, Cell 1 which is the PCell, in the test.

**Table 19.4.1.3.4.1-3: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | **Test 1** |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.3 FDD |
| | Config 2 | | CCR.1.3 TDD |
| | Config 3 | | CCR.2.2 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | *gp0* |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

**Table 19.4.1.3.4.1-4: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Field | Test 1 |
|---|---|
| | Value |
| gapOffset | 0 |
| NOTE 1: Void | |

### 19.4.1.3.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.5.4.2 with following exceptions:

- Table 6.5.1.5.5-1 is replaced by Table 19.6.5.1.5.5-1.

### 19.4.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Same as the message contents given in clause 6.5.1.5.4.3.

### 19.4.1.3.5 Test requirements

Table 19.4.1.3.4.1-3, 19.4.1.3.5-1, and Table 19.4.1.3.5-2 defines the primary level settings for all tests.

**Table 19.4.1.3.5-1: NR Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS | Config 1 | dB | 1+TT | -7+TT | -15+TT |

| Parameter | | Unit | Test 1 | | |
|---|---|---|---|---|---|
| | | | T1 | T2 | T3 |
| | Config 2 | | 1+TT | -7+TT | -15+TT |
| | Config 3 | | 1+TT | -7+TT | -15+TT |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98+TT | | |
| | Config 2 | | -98+TT | | |
| | Config 3 | | -98+TT | | |
| Propagation condition | Config 1, 2 | | AWGN +220 Hz | | |
| | Config 3 | | AWGN +500 Hz | | |
| NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |
| NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | |
| NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. | | | | | |
| NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. | | | | | |
| NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | | | |
| NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. | | | | | |
| NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | |
| NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.19.4.1.3.1-1. | | | | | |
| NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6]. | | | | | |

The UE behaviour during time durations T1, T2, and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ($D_1$ ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

## 19.4.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- AT Command to set the UE speed and position is not specified in the test procedure
- The specific gNB reference location is missing in test procedure
- Antenna array is FFS

### 19.4.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1D.

### 19.4.1.4.2 Test applicability

This test applies to all types of NR ATG UE from release 18 onwards.

### 19.4.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.4.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.4.1.4.

#### 19.4.1.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 19.4.1.4.4-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

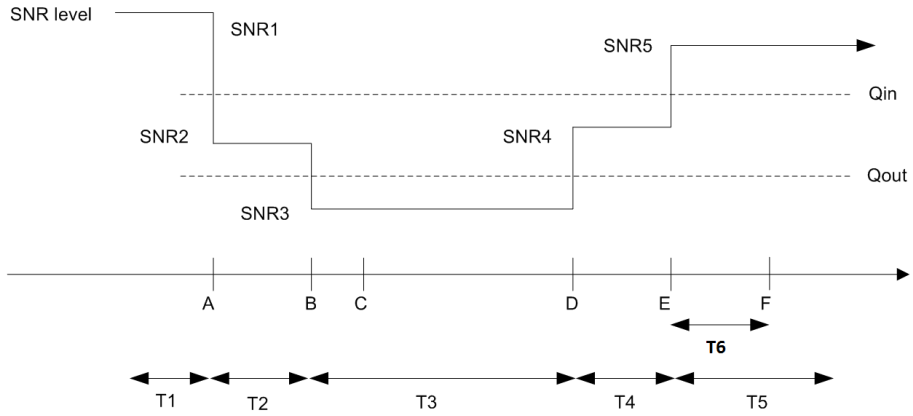



**Figure 19.4.1.4.4-1: SNR variation for CSI-RS in-sync testing**

#### 19.4.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.4.1.4.4.1-1

**Table 19.4.1.4.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.4.1.4-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.4-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.4.1.4-3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Test environment parameters are given in Table 19.4.1.4.4.1-2.

**Table 19.4.1.4.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.4.1.4.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | A.3.1.7.1 | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | A.3.2.3.4 | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to Table 19.4.1.4.4.1-3.

2. Message contents are defined in clause 19.4.1.4.4.3.

3. There is one cell (Cell 1), which is the PCell in the test.

**Table 19.4.1.4.4.1-3: General test parameters for for FR1 PCell for CSI-RS in-sync testing in non-DRX mode**

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| Active PCell | | | Cell 1 |
| RF Channel Number | | | 1 |
| Duplex mode | Config 1 | | FDD |
| | Config 2, 3 | | TDD |
| TDD Configuration | Config 1 | | Not Applicable |
| | Config 2 | | TDDConf.1.1 |
| | Config 3 | | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 | | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 | | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 | | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 | | CR.1.1 FDD |
| | Config 2 | | CR.1.1 TDD |
| | Config 3 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 | | CCR.1.1 FDD |
| | Config 2 | | CCR.1.1 TDD |
| | Config 3 | | CCR.2.1 TDD |
| SSB Configuration | Config 1 | | SSB.1 FR1 |
| | Config 2 | | SSB.1 FR1 |
| | Config 3 | | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | | SMTC.1 |
| | Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 15 kHz |
| | Config 3 | | 30 kHz |
| TRS configuration | Config 1 | | TRS.1.1 FDD |
| | Config 2 | | TRS.1.1 TDD |
| | Config 3 | | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 | | Resource #4 in TRS.1.1 FDD |
| | Config 2 | | Resource #4 in TRS.1.1 TDD |
| | Config 3 | | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | TCI.State. 2 |
| OCNG parameters | | | OP.1 |
| CP length | | | Normal |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low |
| Out of sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 8 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| In sync transmission parameters | DCI format | | 1-0 |
| | Number of Control OFDM symbols | | 2 |
| | Aggregation level | CCE | 4 |

| Parameter | | Unit | Value |
|---|---|---|---|
| | | | Test 1 |
| | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| | DMRS precoder granularity | | REG bundle size |
| | REG bundle size | | 6 |
| DRX | | | *OFF* |
| Gap pattern ID | | | N.A. |
| Layer 3 filtering | | | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | | | 1 |
| N311 | | | 1 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.1.1 FDD |
| | Config 2 | | CSI-RS.1.1 TDD |
| | Config 3 | | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.44 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| T6 | | s | 0.84 |
| NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

#### 19.4.1.4.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.6.4.2 with following exceptions:

- Table 6.5.1.6.5-1 is replaced by Table 19.6.5.1.6.5-1.

#### 19.4.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Same as the message contents given in clause 6.5.1.6.4.3.

### 19.4.1.4.5 Test requirements

Table 19.4.1.4.4.1-3, 19.4.1.4.5-1, and Table 19.4.1.4.5-2 defines the primary level settings for all tests.

**Table 19.4.1.4.5-1: NR Cell specific test parameters FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

| Parameter | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | dB | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | dB | | | | | |

| Parameter | | Unit | Test 1 | | | | |
|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1 | dB | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| | Config 2 | | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| | Config 3 | | 1+TT | -7+TT | -15+TT | -4.5+TT | 1+TT |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -98+TT | | | | |
| | Config 2 | | -98+TT | | | | |
| | Config 3 | | -98+TT | | | | |
| Propagation condition | Config 1, 2 | | AWGN +220 Hz | | | | |
| | Config 3 | | AWGN +500 Hz | | | | |

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.19.4.1.4.1-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90 % with the confidence level of 95%.

# 19.5 Measurement procedure for ATG

## 19.5.1 Intra-frequency measurements

### 19.5.1.0 Minimum conformance requirements

TBD

### 19.5.1.1 SA FR1 event triggered reporting tests without gap without SSB index reading under non-DRX

Editor's Note: This test case is incomplete in following aspects:

TT analysis is missing.

Message contents are FFS

Test procedure is missing

AT Command to set the UE speed and position is not specified

The specific gNB reference location is missing

Antenna array is FFS

#### 19.5.1.1.1 Test purpose

The purpose of this test is to TBD

#### 19.5.1.1.2 Test applicability

This test applies to all types of NR ATG UE from release 18.

#### 19.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause TBD.

The normative reference for this requirement is TS 38.133 [6] clause A.19.5.1.1.

#### 19.5.1.1.4 Test description

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

The specific gNB reference location is emulated by test system.

##### 19.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.5.1.1.4.1-1

**Table 19.5.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.5.1.1-1 | FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.5.1.1-2 | TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth |
| 19.5.1.1-3 | TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth |
| NOTE: The UE is only required to pass in one of the supported test configurations in FR1 | |

Test environment parameters are given in Table 19.5.1.1.4.1-2.

**Table 19.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 7.2.3. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2 |
| Connection Diagram | TE Part | TBD | As specified in TS 38.508-1 [14] Annex A. |
| | DUT Part | TBD | |
| Exceptions to connection diagram | N/A | | |

1. The general test parameter settings are set up according to tables 19.5.1.1.4.1-3 and 19.5.1.1.4.1-4.
2. Message contents are defined in clause 19.5.1.1.4.3.

3. Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in the Table TBD.

**Table 19.5.1.1.4.1-3: General test parameters for TBD**

TBD

19.5.1.1.4.2 Test procedure

TBD

19.5.1.1.4.3 Message contents

TBD

19.5.1.1.5 Test requirements

Table 19.5.1.1.4.1-3, 19.5.1.1.5-1, define the primary level settings for all tests.

**Table 19.5.1.1.5-1: Cell specific test parameters for TBD**

**TBD**

TBD

## 19.5.1.2 SA FR1 event triggered reporting tests with per-UE gaps under non-DRX

## 19.5.1.3 SA FR1 event triggered reporting tests without gap under non-DRX with SSB index reading

## 19.5.1.4 SA FR1 event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

## 19.5.2 Inter-frequency measurements

## 19.5.2.0 Minimum conformance requirements

TBD

#### 19.5.2.1 SA FR1-FR1 event triggered reporting tests without SSB time index detection when DRX is used

#### 19.5.2.2 SA FR1-FR1 event triggered reporting tests with SSB time index detection when DRX is not used

#### 19.5.2.3 SA FR1-FR1 event triggered reporting tests without gap when DRX is not used

## 19.6 Measurement Performance requirements for ATG

### 19.6.1 SS-RSRP for ATG

#### 19.6.1.0 Minimum conformance requirements

##### 19.6.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.1.

##### 19.6.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.2.

##### 19.6.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.3.

##### 19.6.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.4.

#### 19.6.1.1 Intra-frequency measurements for ATG

##### 19.6.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for ATG

###### 19.6.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

###### 19.6.1.1.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

###### 19.6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.1.

#### 19.6.1.1.1.4 Test description

##### 19.6.1.1.1.4.1 Initial conditions

Same as the Initial conditions given in clause 6.7.1.1.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.1.1.1.4.1-1 is replaced by Table 19.6.1.1.1.4.1-1;
- Table 6.7.1.1.1.4.1-2 is replaced by Table 19.6.1.1.1.4.1-2;

**Table 19.6.1.1.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.1.1.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.1.1.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.1.1.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.1.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.1.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

##### 19.6.1.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.1.4.2 with the following exceptions:

- Table 6.7.1.1.1.5-1 is replaced by Table 19.6.1.1.1.5-1.

##### 19.6.1.1.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.1.1.4.3.

#### 19.6.1.1.1.5 Test requirement

Same as the test requirements given in clause 6.7.1.1.1.5 with following exceptions:

- Table 6.7.1.1.1.5-1 is replaced by Table 19.6.1.1.1.5-1.

**Table 19.6.1.1.1.5-1: NR Cell specific test parameters (same as Table 6.7.1.1.1.5-1 with following exceptions)**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Propagation Condition | | 1,2 | AWGN+220Hz | | | |
| | | 3 | AWGN+500Hz | | | |

## 19.6.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for ATG

### 19.6.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

### 19.6.1.1.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

### 19.6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.1.

### 19.6.1.1.2.4 Test description

#### 19.6.1.1.2.4.1 Initial conditions

Same as the Initial conditions given in clause 6.7.1.1.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.1.1.2.4.1-1 is replaced by Table 19.6.1.1.2.4.1-1;
- Table 6.7.1.1.2.4.1-2 is replaced by Table 19.6.1.1.2.4.1-2;

**Table 19.6.1.1.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.1.1.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.1.1.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.1.1.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.1.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.1.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |

| | | | |
|---|---|---|---|
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

#### 19.6.1.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.2.4.2 with the following exceptions:

- Table 6.7.1.1.2.5-1 is replaced by Table 19.6.1.1.2.5-1.

#### 19.6.1.1.2.4.3 Message contents

Same as the message contents given in clause 6.7.1.1.2.4.3.

### 19.6.1.1.2.5 Test requirement

Same as the test requirements given in clause 6.7.1.1.2.5 with following exceptions:

- Table 6.7.1.1.2.5-1 is replaced by Table 19.6.1.1.2.5-1.

**Table 19.6.1.1.2.5-1: NR Cell specific test parameters (Same as Table 6.7.1.1.1.5-1 with exceptions given in Table 6.7.1.1.2.5-1, as well as the following exceptions)**

| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Propagation Condition | | 1,2 | AWGN+220Hz | | | |
| | | 3 | AWGN+500Hz | | | |

## 19.6.1.2 Inter-frequency measurements for ATG

### 19.6.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for ATG

#### 19.6.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 19.6.1.2.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.2.

#### 19.6.1.2.1.4 Test description

##### 19.6.1.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.1.2.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.

- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.1.2.1.4.1-1 is replaced by Table 19.6.1.2.1.4.1-1.
- Table 6.7.1.2.1.4.1-2 is replaced by Table 19.6.1.2.1.4.1-2.

**Table 19.6.1.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.1.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.1.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.1.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.1.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.1.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

### 19.6.1.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.1.4.2 with following exceptions:

- Table 6.7.1.1.1.5-1 is replaced by Table 19.6.1.2.1.5-1.
- Table 6.7.1.1.1.5-2 is replaced by Table 6.7.1.2.1.5-2.

### 19.6.1.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.1.2.1.4.3.

### 19.6.1.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.1.2.1.5 with following exceptions:

- Table 6.7.1.2.1.5-1 is replaced by Table 19.6.1.2.1.5-1.

**Table 19.6.1.2.1.5-1: NR Cell specific test parameters (Same as Table 6.7.1.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

### 19.6.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for ATG

#### 19.6.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 19.6.1.2.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.2.

#### 19.6.1.2.2.4 Test description

##### 19.6.1.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.1.2.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.1.2.2.4.1-1 is replaced by Table 19.6.1.2.2.4.1-1.
- Table 6.7.1.2.2.4.1-2 is replaced by Table 19.6.1.2.2.4.1-2.

**Table 19.6.1.2.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.1.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.1.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.1.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.1.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.1.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

#### 19.6.1.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.2.4.2 with following exceptions:

- Table 6.7.1.1.2.5-1 is replaced by Table 19.6.1.2.2.5-1.
- Table 6.7.1.1.2.5-2 is replaced by Table 6.7.1.2.2.5-2.

#### 19.6.1.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.1.2.1.4.3.

#### 19.6.1.2.2.5 Test requirement

Same as the test requirements given in clause 6.7.1.2.2.5 with following exceptions:

- Table 6.7.1.2.2.5-1 is replaced by Table Table 19.6.1.2.2.5-1.

**Table 19.6.1.2.2.5-1: NR Cell specific test parameters (same as Table 6.7.1.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

## 19.6.2 SS-RSRQ for ATG

### 19.6.2.0 Minimum conformance requirements

#### 19.6.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 4.7.2.0.1.

#### 19.6.2.0.2 Inter-frequency SS-RSRQ absolute measurement accuracy requirements

Same as in clause 4.7.2.0.2.

#### 19.6.2.0.3 Inter-frequency SS-RSRQ relative measurement accuracy requirements

Same as in clause 4.7.2.0.3.

### 19.6.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for ATG

#### 19.6.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

#### 19.6.2.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.2.1.

#### 19.6.2.1.4 Test description

##### 19.6.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.2.1.4.1-1 is replaced by Table 19.6.2.1.4.1-1;
- Table 6.7.2.1.4.1-2 is replaced by Table 19.6.2.1.4.1-2;

**Table 19.6.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

##### 19.6.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.2.1.4.2 with following exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 19.6.2.1.5-1;
- Table 6.7.2.1.5-2 is replaced by Table 19.6.2.1.5-2;

##### 19.6.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.2.1.4.3.

#### 19.6.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.2.1.5 with following exceptions:

- Table 6.7.2.1.5-1 is replaced by Table 19.6.2.1.5-1;

**Table 19.6.2.1.5-1: NR Cell specific test parameters (Same as Table 6.7.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

## 19.6.2.2 Inter-frequency SS-RSRQ measurements for ATG

### 19.6.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for ATG

#### 19.6.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

#### 19.6.2.2.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.2.2.

#### 19.6.2.2.1.4 Test description

##### 19.6.2.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.2.2.1.4.1-1 is replaced by Table 19.6.2.2.1.4.1-1.
- Table 6.7.2.2.1.4.1-2 is replaced by Table 19.6.2.2.1.4.1-2.

**Table 19.6.2.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.2.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.2.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.2.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.2.2.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] sclause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.2.2.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

#### 19.6.2.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.2.1.1.4.2 with following exceptions:

- Table 6.7.2.1.1.5-1 is replaced by Table 19.6.2.2.1.5-1.
- Table 6.7.2.1.1.5-2 is replaced by Table 6.7.2.2.1.5-2.

#### 19.6.2.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.2.2.1.4.3.

#### 19.6.2.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.2.2.1.5 with following exceptions:

- Table 6.7.2.2.1.5-1 is replaced by Table 19.6.2.2.1.5-1.

**Table 19.6.2.2.1.5-1: NR Cell specific test parameters (Same as Table 6.7.2.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

### 19.6.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for ATG

#### 19.6.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 19.6.2.2.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.2.

#### 19.6.2.2.2.4 Test description

##### 19.6.2.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.2.2.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.2.2.2.4.1-1 is replaced by Table 19.6.2.2.2.4.1-1.
- Table 6.7.2.2.2.4.1-2 is replaced by Table 19.6.2.2.2.4.1-2.

**Table 19.6.2.2.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.2.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.2.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.2.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.2.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.2.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

#### 19.6.2.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.1.1.2.4.2 with following exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 19.6.2.2.2.5-1.

#### 19.6.2.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.2.2.1.4.3.

#### 19.6.2.2.2.5 Test requirement

Same as the test requirements given in clause 6.7.2.2.2.5 with following exceptions:

- Table 6.7.2.2.2.5-1 is replaced by Table 19.6.2.2.1.5-1.

## 19.6.3 SS-SINR for ATG

### 19.6.3.0 Minimum conformance requirements

#### 19.6.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.1.

#### 19.6.3.0.2 Inter-frequency SS-SINR absolute measurement accuracy requirements

Same as in clause 4.7.3.0.2.

#### 19.6.3.0.3 Inter-frequency SS-SINR relative measurement accuracy requirements

Same as in clause 4.7.3.0.3.

### 19.6.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for ATG

#### 19.6.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

#### 19.6.3.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting ss-SINR-Meas.

#### 19.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.3.1.

#### 19.6.3.1.4 Test description

##### 19.6.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.3.1.4.1-1 is replaced by Table 19.6.3.1.4.1-1;
- Table 6.7.3.1.4.1-2 is replaced by Table 19.6.3.1.4.1-2;

**Table 19.6.3.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.3.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.3.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.3.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.3.1.4.1-2: Initial conditions**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] clause 4.1. |

| | | | |
|---|---|---|---|
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

#### 19.6.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.1.4.2 with following exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 19.6.3.1.5-1;

#### 19.6.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.3.1.4.3.

### 19.6.3.1.5 Test requirement

Same as the test requirements given in clause 6.7.3.1.5 with following exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 19.6.3.1.5-1;

**Table 19.6.3.1.5-1: NR Cell specific test parameters (Same as Table 6.7.3.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | |

## 19.6.3.2 Inter-frequency SS-SINR measurements for ATG

### 19.6.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for ATG

#### 19.6.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

#### 19.6.3.2.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting ss-SINR-Meas.

#### 19.6.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.3.2.

#### 19.6.3.2.1.4 Test description

##### 19.6.3.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.3.2.1.4.1-1 is replaced by Table 19.6.3.2.1.4.1-1.
- Table 6.7.3.2.1.4.1-2 is replaced by Table 19.6.3.2.1.4.1-2.

**Table 19.6.3.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.3.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.3.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.3.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.3.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] sclause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.3.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

##### 19.6.3.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.1.4.2 with following exceptions:

- Table 6.7.3.1.5-1 is replaced by Table 19.6.3.2.1.5-1.
- Table 6.7.3.1.5-2 is replaced by Table 6.7.3.2.1.5-2.

##### 19.6.3.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.1.4.3.

#### 19.6.3.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.3.2.1.5 with following exceptions:

- Table 6.7.3.2.1.5-1 is replaced by Table 19.6.3.2.1.5-1.

**Table 19.6.3.2.1.5-1: NR Cell specific test parameters (Same as Table 6.7.3.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Propagation Condition | Config 1,2 | - | AWGN+220Hz | | AWGN+220Hz | | AWGN+220Hz | |
| | Config 3 | - | AWGN+500Hz | | AWGN+500Hz | | AWGN+500Hz | |

## 19.6.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for ATG

### 19.6.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

### 19.6.3.2.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting ss-SINR-meas.

### 19.6.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.1.2.

### 19.6.3.2.2.4 Test description

#### 19.6.3.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.3.2.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.3.2.2.4.1-1 is replaced by Table 19.6.3.2.2.4.1-1.
- Table 6.7.3.2.2.4.1-2 is replaced by Table 19.6.3.2.2.4.1-2.

**Table 19.6.3.2.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.3.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.3.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.3.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.3.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.3.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

#### 19.6.3.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.3.2.2.4.2 with following exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 19.6.2.2.1.5-1.

#### 19.6.3.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.3.2.1.4.3.

#### 19.6.3.2.2.5 Test requirement

Same as the test requirements given in clause 6.7.3.2.2.5 with following exceptions:

- Table 6.7.3.2.2.5-1 is replaced by Table 19.6.2.2.1.5-1.

## 19.6.4 L1-RSRP measurement for beam reporting for ATG

### 19.6.4.0 Minimum conformance requirements

#### 19.6.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.1.

#### 19.6.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.2.

#### 19.6.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.3.

#### 19.6.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.4.

### 19.6.4.1 SSB based L1-RSRP measurements for ATG

#### 19.6.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 19.6.4.1.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.4.1.

#### 19.6.4.1.1.4 Test description

##### 19.6.4.1.1.4.1 Initial conditions

Same as the Initial conditions given in clause 6.7.4.1.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.4.1.1.4.1-1 is replaced by Table 19.6.4.1.1.4.1-1;
- Table 6.7.4.1.1.4.1-2 is replaced by Table 19.6.4.1.1.4.1-2;

**Table 19.6.4.1.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.4.1.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.4.1.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.4.1.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.4.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.4.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

#### 19.6.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.1.4.2 with the following exceptions:

- Table 6.7.4.1.1.5-1 is replaced by Table 19.6.4.1.1.5-1.

#### 19.6.4.1.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.1.4.3.

#### 19.6.4.1.1.5 Test requirement

Same as the test requirements given in clause 6.7.4.1.1.5 with following exceptions:

- Table 6.7.4.1.1.5-1 is replaced by Table 19.6.4.1.1.5-1.

**Table 19.6.4.1.1.5-1: NR Cell specific test parameters (Same as Table 6.7.4.1.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Propagation Condition | Config 1,2 | - | AWGN+220 Hz | AWGN+220 Hz |
| | Config 3 | - | AWGN+500 Hz | AWGN+500 Hz |

### 19.6.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 19.6.4.1.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.4.1.

#### 19.6.4.1.2.4 Test description

#### 19.6.4.1.2.4.1 Initial conditions

Same as the Initial conditions given in clause 6.7.4.1.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.

  Table 6.7.4.1.2.4.1-1 is replaced by Table 19.6.4.1.2.4.1-1;
- Table 6.7.4.1.2.4.1-2 is replaced by Table 19.6.4.1.2.4.1-2;

**Table 19.6.4.1.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.4.1.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.4.1.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.4.1.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.4.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.4.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

#### 19.6.4.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.1.2.4.2 with following exceptions:

- Table 6.7.4.1.2.5-1 is replaced by Table 19.6.4.1.1.5-1.

#### 19.6.4.1.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.1.2.4.3.

### 19.6.4.1.2.5 Test requirement

Same as the test requirements given in clause 6.7.4.1.2.5 with following exceptions:

- Table 6.7.4.1.2.5-1 is replaced by Table 19.6.4.1.1.5-1.

## 19.6.4.2 CSI-RS based L1-RSRP measurements for ATG

### 19.6.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

#### 19.6.4.2.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.4.2.

#### 19.6.4.2.1.4 Test description

##### 19.6.4.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.4.2.1.4.1-1 is replaced by Table 19.6.4.2.1.4.1-1;
- Table 6.7.4.2.1.4.1-2 is replaced by Table 19.6.4.2.1.4.1-2;

**Table 19.6.4.2.1.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.4.2.1-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.4.2.1-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.4.2.1-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.4.2.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.4.2.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

#### 19.6.4.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.1.4.2 with following exceptions:

- Table 6.7.4.2.1.5-1 is replaced by Table 19.6.4.2.1.5-1.

#### 19.6.4.2.1.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.1.4.3.

#### 19.6.4.2.1.5 Test requirement

Same as the test requirements given in clause 6.7.4.2.1.5 with following exceptions:

- Table 6.7.4.2.1.5-1 is replaced by Table 19.6.4.2.1.5-1.

**Table 19.6.4.2.1.5-1: NR Cell specific parameters (Same as Table 6.7.4.2.1.5-1 with following exceptions)**

| Parameter | Test configuration | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Propagation Condition | Config 1,2 | - | AWGN+220 Hz | AWGN+220 Hz |

| | | | | |
|---|---|---|---|---|
| | Config 3 | - | AWGN+500 Hz | AWGN+500 Hz |

### 19.6.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

#### 19.6.4.2.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards.

#### 19.6.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.4.2.

#### 19.6.4.2.2.4 Test description

##### 19.6.4.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.4.2.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.4.2.2.4.1-1 is replaced by Table 19.6.4.2.2.4.1-1;
- Table 6.7.4.2.2.4.1-2 is replaced by Table 19.6.4.2.2.4.1-2;

**Table 19.6.4.2.2.4.1-1: Supported test configurations**

| Test Case ID | Description |
|---|---|
| 19.6.4.2.2-1 | NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD |
| 19.6.4.2.2-2 | NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD |
| 19.6.4.2.2-3 | NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table 19.6.4.2.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.4.2.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | N/A | |

#### 19.6.4.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.4.2.2.4.2 with following exceptions:

- Table 6.7.4.2.2.5-1 is replaced by Table 19.6.4.2.1.5-1.

#### 19.6.4.2.2.4.3 Message contents

Same as the message contents given in clause 6.7.4.2.2.4.3.

#### 19.6.4.2.2.5 Test requirement

Same as the test procedure given in clause 6.7.4.2.2.5 with following exceptions:

- Table 6.7.4.2.2.5-1 is replaced by Table 19.6.4.2.1.5-1.

## 19.6.5 L1-SINR measurement for beam reporting for ATG

### 19.6.5.0 Minimum conformance requirements

#### 19.6.5.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured

Minimum requirements given in clause 6.7.9.0.1 applies.

#### 19.6.5.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

Minimum requirements given in clause 6.7.9.0.2 applies.

#### 19.6.5.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

Minimum requirements given in clause 6.7.9.0.3 applies.

### 19.6.5.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR for ATG

#### 19.6.5.1.1 NR SA FR1 L1-SINR absolute measurement accuracy with CSI-RS based CMR and no dedicated IMR for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.5.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 19.6.5.1.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting L1-SINR measurements.

#### 19.6.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.5.1.

#### 19.6.5.1.1.4 Test description

##### 19.6.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.9.1.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.9.1.1.4.1-1 is replaced by Table 19.6.5.1.1.4.1-1;
- Table 6.7.9.1.1.4.1-2 is replaced by Table 19.6.5.1.1.4.1-2;

**Table 19.6.5.1.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.5.1.1-1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.5.1.1-2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.5.1.1-3 | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 19.6.5.1.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.5.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

##### 19.6.5.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.9.1.1.4.2 with following exceptions:

- Table 6.7.9.1.1.5-1 is replaced by Table 19.6.5.1.1.5-1.

##### 19.6.5.1.1.4.3 Message contents

Same as the message contents given in clause 6.7.9.1.1.4.3.

#### 19.6.5.1.1.5 Test requirement

Same as the test requirements given in clause 6.7.9.1.1.5 with following exceptions:

- Table 6.7.9.1.1.5-1 is replaced by Table 19.6.5.1.1.5-1.

**Table 19.6.5.1.1.5-1: NR Cell specific test parameters (Same as Table 6.7.9.1.1.5-1 with following exceptions)**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Propagation condition | 1, 2 | | AWGN+220 Hz | AWGN+220 Hz |
| | 3 | | AWGN+500 Hz | AWGN+500 Hz |

## 19.6.5.1.2 NR SA FR1 L1-SINR relative measurement accuracy with CSI-RS based CMR and no dedicated IMR for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

### 19.6.5.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

### 19.6.5.1.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting L1-SINR measurements.

### 19.6.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.5.1.

### 19.6.5.1.2.4 Test description

#### 19.6.5.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.9.1.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.9.1.2.4.1-1 is replaced by Table 19.6.5.1.2.4.1-1;
- Table 6.7.9.1.2.4.1-2 is replaced by Table 19.6.5.1.2.4.1-2;

**Table 19.6.5.1.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.5.1.2-1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.5.1.2-2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.5.1.2-3 | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 19.6.5.1.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.5.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

#### 19.6.5.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.9.1.2.4.2 with following exceptions:

- Table 6.7.9.1.1.5-1 is replaced by Table 19.6.5.1.1.5-1;

#### 19.6.5.1.2.4.3 Message contents

Same as the message contents given in clause 6.7.9.1.1.4.3.

### 19.6.5.1.2.5 Test requirement

Same as the test requirements given in clause 6.7.9.1.2.5 with following exceptions:

- Table 6.7.9.1.1.5-1 is replaced by Table 19.6.5.1.1.5-1;

## 19.6.5.2 NR SA FR1 L1-SINR absolute measurement accuracy with SSB based CMR and dedicated IMR for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

### 19.6.5.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

### 19.6.5.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting L1-SINR measurements.

### 19.6.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.5.2.

### 19.6.5.2.4 Test description

#### 19.6.5.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.9.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.9.2.4.1-1 is replaced by Table 19.6.5.2.4.1-1;
- Table 6.7.9.2.4.1-2 is replaced by Table 19.6.5.2.4.1-2;

**Table 19.6.5.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.5.2-1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.5.2-2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.5.2-3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 19.6.5.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.5.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

### 19.6.5.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.9.2.4.2 with following exceptions:

- Table 6.7.9.2.5-1 is replaced by Table 19.6.5.2.5-1.

### 19.6.5.2.4.3 Message contents

Same as the message contents given in clause 6.7.9.2.4.3.

### 19.6.5.2.5 Test requirement

Same as the test requirements given in clause 6.7.9.2.5 with following exceptions:

- Table 6.7.9.2.5-1 is replaced by Table 19.6.5.2.5-1.

**Table 19.6.5.2.5-1: NR Cell specific test parameters (Same as Table 6.7.9.2.5-1 with following exceptions)**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Propagation condition | 1, 2 | | AWGN+220 Hz | AWGN+220 Hz |
| | 3 | | AWGN+500 Hz | AWGN+500 Hz |

## 19.6.5.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR for ATG

### 19.6.5.3.1 NR SA FR1 L1-SINR absolute measurement accuracy with CSI-RS based CMR and dedicated IMR for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

#### 19.6.5.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

#### 19.6.5.3.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting L1-SINR measurements.

#### 19.6.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.5.3.

#### 19.6.5.3.1.4 Test description

##### 19.6.5.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.9.3.1.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.9.3.1.4.1-1 is replaced by Table 19.6.5.3.1.4.1-1;
- Table 6.7.9.3.1.4.1-2 is replaced by Table 19.6.5.3.1.4.1-2;

**Table 19.6.5.3.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.5.3.1-1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.5.3.1-2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.5.3.1-3 | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 19.6.5.3.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.5.3.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

##### 19.6.5.3.1.4.2 Test procedure

Same as the test procedure given in clause 6.7.9.3.1.4.2 with following exceptions:

- Table 6.7.9.3.1.5-1 is replaced by Table 19.6.5.3.1.5-1.

#### 19.6.5.3.1.4.3 Message contents

Same as the message contents given in clause 6.7.9.3.1.4.3.

### 19.6.5.3.1.5 Test requirement

Same as the test requirements given in clause 6.7.9.3.1.5 with following exceptions:

- Table 6.7.9.3.1.5-1 is replaced by Table 19.6.5.3.1.5-1.

**Table 19.6.5.3.1.5-1: NR Cell specific test parameters (Same as Table 6.7.9.3.1.5-1 with following exceptions)**

| Parameter | Config | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Propagation condition | 1, 2 | | AWGN+220 Hz | AWGN+220 Hz |
| | 3 | | AWGN+500 Hz | AWGN+500 Hz |

## 19.6.5.3.2 NR SA FR1 L1-SINR relative measurement accuracy with CSI-RS based CMR and dedicated IMR for ATG

Editor's Note: This test case is incomplete in following aspect:

- TT analysis is still missing.

### 19.6.5.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

### 19.6.5.3.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 onwards and supporting L1-SINR measurements.

### 19.6.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 19.6.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.5.3.

### 19.6.5.3.2.4 Test description

#### 19.6.5.3.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.7.9.3.2.4.1 with following exceptions:

- During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
- During the test, the specific gNB reference location is emulated by test system.
- Table 6.7.9.3.2.4.1-1 is replaced by Table 19.6.5.3.2.4.1-1;
- Table 6.7.9.3.2.4.1-2 is replaced by Table 19.6.5.3.2.4.1-2;

**Table 19.6.5.3.2.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.5.3.2-1 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.5.3.2-2 | NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.5.3.2-3 | NR 30 kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table 19.6.5.3.2.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.5.3.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 1 | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 1 | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | N/A | | |

#### 19.6.5.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.7.9.3.2.4.2 with following exceptions:

- Table 6.7.9.3.1.5-1 is replaced by Table 19.6.5.3.1.5-1.

#### 19.6.5.3.2.4.3 Message contents

Same as the message contents given in clause 6.7.9.3.1.4.3.

#### 19.6.5.3.2.5 Test requirement

Same as the test requirements given in clause 6.7.9.3.2.5 with following exceptions:

- Table 6.7.9.3.1.5-1 is replaced by Table 19.6.5.3.1.5-1.

## 19.6.6 CSI-RSRP for ATG

### 19.6.6.0 Minimum conformance requirements

#### 19.6.6.0.1 Intra-frequency absolute CSI-RSRP measurement accuracy for ATG

Same as the minimum requirements given in sub-clause 4.7.8.0.1.

#### 19.6.6.0.2 Intra-frequency relative CSI-RSRP measurement accuracy for ATG

Same as the minimum requirements given in sub-clause 4.7.8.0.2.

#### 19.6.6.0.3 Inter-frequency absolute CSI-RSRP measurement accuracy for ATG

Same as the minimum requirements given in sub-clause 4.7.8.0.3.

#### 19.6.6.0.4 Inter-frequency relative CSI-RSRP measurement accuracy for ATG

Same as the minimum requirements given in sub-clause 4.7.8.0.4.

### 19.6.6.1 Intra-frequency measurements for ATG

#### 19.6.6.1.1 NR SA FR1 CSI-RSRP absolute measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspects.

- Message content is missing
- Test procedure is missing
- Test requirements are missing
- TT analysis is missing
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procrdures for providing network assistance on ATG cells reference locations are FFS.

#### 19.6.6.1.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clauses 10.1.2.3.1 for CSI-RS intra-frequency measurements

#### 19.6.6.1.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 19.6.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 19.6.6.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.6.1.

#### 19.6.6.1.1.1.4 Test description

##### 19.6.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.6.6.1.1.4.1-1.

**Table 19.6.6.1.1.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.6.6.1.1-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.6.1.1-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.6.1.1-3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.6.6.1.1.4.1-2.

**Table 19.6.6.1.1.4-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.6.1.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |

| | | |
|---|---|---|
| Exceptions to connection diagram | - Without LTE link | |

1. Message contents are defined in clause 19.6.6.1.1.4.3.
2. There are two cells on the same frequency. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.
3. During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
4. During the test, the specific gNB reference location is emulated by test system.

### 19.6.6.1.1.4.2 Test procedure

TBD

### 19.6.6.1.1.4.3 Message contents

TBD

### 19.6.6.1.1.5 Test requirement

Table 19.6.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRP measurement report for each of the tests shall meet the corresponding absolute accuracy requirements in Table 19.6.6.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 19.6.6.1.1.5-3 for test configurations 3.

**Table 19.6.6.1.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | | 489 | 0 | 489 | 0 | 489 | 0 |
| SSB ARFCN | | | freq1 | | | | | |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | N/A | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | | | |
| BWP BW | Config 1,2 | MHz | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | | | |
| Initial DL BWP configuration | | | DLBWP.0.1 | | | | | |
| Dedicated DL BWP configuration | | | DLBWP.1.1 | | | | | |
| Initial UL BWP configuration | | | ULBWP.0.1 | | | | | |
| Dedicated UL BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| DRX cycle | | ms | N/A | | | | | |
| PDSCH RMC | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET RMC | Config 1 | | CR.1.1 FDD | | CR.1.1 FDD | | CR.1.1 FDD | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Config 2 | | CR.1.1 TDD | - | CR.1.1 TDD | - | CR.1.1 TDD | - |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| Time offset with Cell 1 | Config 1,2 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3 | | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1 | | SMTC.2 | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | |
| CSI-RS configuration for RRM | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS[Note 1] | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | | | | | |
| $N_{oc}$ [Note2] | Config 1,2 | dBm/ 15 kHz | -106+TT | | -88+TT | | -114+$\Delta_{BG_offset}$+TT | |
| | Config 3 | | N/A[Note 5] | | -94+TT | | -114+$\Delta_{BG_offset}$+TT | |
| $N_{oc}$ [Note2] | Config 1,2 | dBm/ SCS | -106+TT | | -88+TT | | -114+$\Delta_{BG_offset}$+TT | |
| | Config 3 | | N/A[Note 5] | | -91+TT | | -111+$\Delta_{BG_offset}$+TT | |
| $\hat{E}_s/I_{ot}$ for SSB/CSI-RS | | dB | 2.46+TT | -5.97+TT | 2.46+TT | -5.97+TT | -0.01+TT | -4.76+TT |
| $\hat{E}_s/N_{oc}$ for SSB/CSI-RS | | dB | 6+TT | 1+TT | 6+TT | 1+TT | 3+TT | 0+TT |
| SS-RSRP/CSI-RSRP[Note3] | Config 1,2 | dBm/ SCS | -100+TT | -105+TT | -82+TT | -87+TT | -111+$\Delta_{BG_offset}$+TT | -114+$\Delta_{BG_offset}$+TT |
| | Config 3 | | N/A[Note 5] | N/A[Note 5] | -85+TT | -90+TT | -108+$\Delta_{BG_offset}$+TT | -111+$\Delta_{BG_offset}$+TT |
| Io[Note3] | Config 1,2 | dBm/ Ch BW | -70.09+TT | | -52.09+TT | | -80.03+$\Delta_{BG_offset}$+TT | |
| | Config 3 | | N/A[Note 5] | | -51.99+TT | | -73.94+$\Delta_{BG_offset}$+TT | |
| Propagation condition | Config 1,2 | | AWGN+220 Hz | | | | | |
| | Config 3 | | AWGN+500 Hz | | | | | |
| Antenna configuration | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

NOTE 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Subtest 1 is not used when testing with 30 kHz SSB and CSI-RS SCS.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 19.6.6.1.1.5-2: CSI-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1 and 2**

| Normal Conditions | Test 1 All bands | Test 2 All bands | Test 3 Depending on band group | |
|---|---|---|---|---|
| Lowest reported value (Cell 2) | TBD | TBD | NR_FDD_FR1_A, NR_TDD_FR1_A | TBD |
| | | | NR_FDD_FR1_B | TBD |
| | | | NR_TDD_FR1_C | TBD |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | TBD |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | TBD |
| | | | NR_FDD_FR1_G | TBD |
| | | | NR_FDD_FR1_H | TBD |
| Highest reported value (Cell 2) | TBD | TBD | NR_FDD_FR1_A, NR_TDD_FR1_A | TBD |
| | | | NR_FDD_FR1_B | TBD |
| | | | NR_TDD_FR1_C | TBD |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | TBD |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | TBD |
| | | | NR_FDD_FR1_G | TBD |
| | | | NR_FDD_FR1_H | TBD |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 Depending on band group** | |
| Lowest reported value (Cell 2) | TBD | TBD | NR_FDD_FR1_A, NR_TDD_FR1_A | TBD |
| | | | NR_FDD_FR1_B | TBD |
| | | | NR_TDD_FR1_C | TBD |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | TBD |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | TBD |
| | | | NR_FDD_FR1_G | TBD |
| | | | NR_FDD_FR1_H | TBD |
| Highest reported value (Cell 2) | TBD | TBD | NR_FDD_FR1_A, NR_TDD_FR1_A | TBD |
| | | | NR_FDD_FR1_B | TBD |
| | | | NR_TDD_FR1_C | TBD |
| | | | NR_FDD_FR1_D, NR_TDD_FR1_D | TBD |
| | | | NR_FDD_FR1_E, NR_TDD_FR1_E | TBD |
| | | | NR_FDD_FR1_G | TBD |
| | | | NR_FDD_FR1_H | TBD |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | | |

**Table 19.6.6.1.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configuration 3**

| Normal Conditions | Test 2 All bands | Test 3 Depending on band group | |
|---|---|---|---|
| Lowest reported value (Cell 2) | TBD | NR_TDD_FR1_A | TBD |
| | | NR_TDD_FR1_C | TBD |
| | | NR_TDD_FR1_D | TBD |
| | | NR_TDD_FR1_E | TBD |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | TBD | NR_TDD_FR1_A | TBD |
| | | NR_TDD_FR1_C | TBD |
| | | NR_TDD_FR1_D | TBD |
| | | NR_TDD_FR1_E | TBD |
| **Extreme Conditions** | **Test 2 All bands** | **Test 3 Depending on band group** | |
| Lowest reported value (Cell 2) | TBD | NR_TDD_FR1_A | TBD |
| | | NR_TDD_FR1_C | TBD |
| | | NR_TDD_FR1_D | TBD |
| | | NR_TDD_FR1_E | TBD |
| Highest reported value (Cell 2) | TBD | NR_TDD_FR1_A | TBD |
| | | NR_TDD_FR1_C | TBD |
| | | NR_TDD_FR1_D | TBD |
| | | NR_TDD_FR1_E | TBD |
| Note 1: NR operating band groups are as defined in Section 3A.4.1. | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

### 19.6.6.1.2 NR SA FR1 CSI-RSRP relative measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspects.

- Message content is missing
- Test procedure is missing
- Test requirements are missing
- TT analysis is missing
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procrdures for providing network assistance on ATG cells reference locations are FFS.

#### 19.6.6.1.2.1 Test purpose

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] clauses 10.1.2.3.2 for CSI-RS intra-frequency measurements

#### 19.6.6.1.2.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 19.6.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 19.6.6.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.19.6.6.1.

#### 19.6.6.1.2.1.4 Test description

#### 19.6.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 19.6.6.1.2.4.1-1.

**Table 19.6.6.1.2.4.1-1: Supported test configurations**

| Configuration | Description |
|---|---|
| 19.6.6.1.2-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |

| | |
|---|---|
| 19.6.6.1.2-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.6.1.2-3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.6.6.1.2.4.1-2.

**Table 19.6.6.1.2.4-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.6.1.2.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without LTE link | | |

1. Message contents are defined in clause 19.6.6.1.2.4.3.
2. There are two cells on the same frequency. Cell 1 is the PCell, and Cell 2 is the target cell for CSI-RSRP measurements.
3. During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
4. During the test, the specific gNB reference location is emulated by test system.

### 19.6.6.1.2.4.2 Test procedure

TBD

### 19.6.6.1.2.4.3 Message contents

Same as the message contents given in sub-clause 19.6.6.1.1.4.3.

### 19.6.6.1.2.5 Test requirement

Table 19.6.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRP measurement report for each of the tests shall meet the corresponding relative accuracy requirements in Table 19.6.6.1.2.5-2.

**Table 19.6.6.1.2.5-1: Same as Table 6.7.1.1.1.5-1**

**Table 19.6.6.1.2.5-2: CSI-RSRP Intra frequency relative accuracy requirements for the reported values**

| **Normal Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
|---|---|---|---|
| Lowest reported value (Cell 2) | RSRP_x - TT | RSRP_x - TT | RSRP_x - TT |
| Highest reported value (Cell 2) | RSRP_x + TT | RSRP_x + TT | RSRP_x + TT |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | RSRP_x - TT | RSRP_x - TT | RSRP_x - TT |

| | | | |
|---|---|---|---|
| Highest reported value (Cell 2) | RSRP_x + TT | RSRP_x + TT | RSRP_x + TT |
| Note 1: RSRP_x is the reported value of Cell 1 | | | |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 19.6.7 CSI-RSRQ for ATG

### 19.6.7.0 Minimum conformance requirements

#### 19.6.7.0.1 Intra-frequency CSI-RSRQ absolute accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.9.0.1.1.

#### 19.6.7.0.2 Inter-frequency CSI-RSRQ absolute accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.9.0.2.1.

#### 19.6.7.0.3 Inter-frequency CSI-RSRQ relative accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.9.0.2.2.

### 19.6.7.1 NR SA FR1 CSI-RSRQ absolute measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspects.

- Message content is missing
- Test procedure is missing
- Test requirements are missing
- TT analysis is missing
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procrdures for providing network assistance on ATG cells reference locations are FFS.

#### 19.6.7.1.1 Test purpose

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] sub-clause 10.1.7.2 for CSI-RS intra-frequency measurements.

#### 19.6.7.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 and forward supporting CSI-RS based RSRP and RSRQ measurement.

#### 19.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 19.6.7.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.19.6.7.1.

### 19.6.7.1.4 Test description

#### 19.6.7.1.4.1 Initial conditions

Supported test configuration are shown in Table 19.6.7.1.4.1-1.

**Table 19.6.7.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.7.1-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.7.1-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.7.1-3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.6.7.1.4.1-2.

**Table 19.6.7.1.4.1-2: Initial conditions**

| Parameter | Value | | Comment |
|---|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] Clause 4.3.1. | | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.7.1.4.1-1. | | |
| Propagation conditions | AWGN | | As specified in Annex C.2.2. |
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | Without the LTE link | | |

1. Message contents are defined in Clause 19.6.7.2.4.3.
2. In this test case all cells are on the same carrier frequency. Cell 1 is the NR serving cell (PCell). Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for CSI-RSRQ measurements..
3. During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
4. During the test, the specific gNB reference location is emulated by test system.

#### 19.6.7.1.4.2 Test procedure

TBD

#### 19.6.7.1.4.3 Message contents

TBD

### 19.6.7.1.5 Test Requirements

Table 19.6.7.1.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-RSRQ measurement report for each of the tests shall meet the corresponding absolute accuracy requirements in Table 19.6.7.1.5-2.

**Table 19.6.7.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | | Test 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Duplex mode | Config 1 | | FDD | | | | | |
| | Config 2,3 | | TDD | | | | | |
| TDD configuration | Config 1 | | N/A | | | | | |
| | Config 2 | | TDDConf.1.1 | | | | | |
| | Config 3 | | TDDConf.2.1 | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 10: $N_{PRB,c}$ = 52 | | | | | |
| | Config 3 | | 40: $N_{PRB,c}$ = 106 | | | | | |
| Initial DL BWP configuration | | | DLBWP.0.1 | | | | | |
| Dedicated DL BWP configuration | | | DLBWP.1.1 | | | | | |
| Initial UL BWP configuration | | | ULBWP.0.1 | | | | | |
| Dedicated UL BWP configuration | | | ULBWP.1.1 | | | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | - | TRS.1.1 FDD | - | TRS.1.1 FDD | - |
| | Config 2 | | TRS.1.1 TDD | | TRS.1.1 TDD | | TRS.1.1 TDD | |
| | Config 3 | | TRS.1.2 TDD | | TRS.1.2 TDD | | TRS.1.2 TDD | |
| DRX cycle | | ms | N/A | | | | | |
| PDSCH RMC | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESETRMC | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | |
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | |
| Control channel RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR2.1 TDD | | CCR2.1 TDD | | CCR2.1 TDD | |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | | | |
| | Config 3 | | SSB.2 FR1 | | | | | |
| Time offset with Cell 1 | Config 1,2 | μs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3 | | - | 2.35 | - | 2.35 | - | 2.35 |
| SMTC configuration | Config 1 | | SMTC.2 | | | | | |
| | Config 2,3 | | SMTC.1 | | | | | |
| CSI-RS configuration for RRM | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| OCNG Patterns | | | OP.1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| | Config 3 | | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/ | -85+TT | | -101+TT | | -114+$\Delta_{BG_offset}$+TT | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Config 3 | 15 kHz | -91+TT | | - | | -114+$\Delta_{BG_offset}$+TT | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/ | -85+TT | | -101+TT | | -114+$\Delta_{BG_offset}$+TT | |
| | Config 3 | SCS | -88+TT | | - | | -111+$\Delta_{BG_offset}$+TT | |
| $\hat{E}_s/I_{ot}$ for SSB/CSI-RS | | dB | -1.76+TT | -1.76+TT | -4.7+TT | -4.7+TT | -5.46+TT | -5.46+TT |
| $\hat{E}_s/N_{oc}$ for SSB/CSI-RS | | dB | 3+TT | 3+TT | -2.9+TT | -2.9+TT | -4+TT | -4+TT |
| SS-RSRP/CSI-RSRP Note3 | Config 1,2 | dBm/ SCS | -82+TT | -82+TT | -103.9+TT | -103.9+TT | -118+$\Delta_{BG_offset}$+TT | -118+$\Delta_{BG_offset}$+TT |
| | Config 3 | | -85+TT | -85+TT | - | - | -115+$\Delta_{BG_offset}$+TT | -115+$\Delta_{BG_offset}$+TT |
| SS-RSRQ/CSI-RSRQ Note3 | | dB | -14.77 | -14.77 | -16.76 | -16.76 | -17.34 | -17.34 |
| Io Note3 | Config 1,2 | dBm/ | -50+TT | | -70+TT | | -83.5+$\Delta_{BG_offset}$+TT | |
| | Config 3 | Ch BW | -50+TT | | - | | -77.4+$\Delta_{BG_offset}$+TT | |
| Propagation condition | Config 1,2 | | AWGN+220 Hz | | | | | |
| | Config 3 | | AWGN+500 Hz | | | | | |
| Antenna configuration | | | 1x2 | | | | | |

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
NOTE 3: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRQ/CSI-RSRQ, SS-RSRP/CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

**Table 19.6.7.1.5-2: CSI-RSRQ Intra frequency absolute accuracy requirements for the reported values**

| **Normal Condition** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
|---|---|---|---|
| Lowest reported value (Cell 2) | TBD | TBD | TBD |
| Highest reported value (Cell 2) | TBD | TBD | TBD |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** | **Test 3 All bands** |
| Lowest reported value (Cell 2) | TBD | TBD | TBD |
| Highest reported value (Cell 2) | TBD | TBD | TBD |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

## 19.6.8 CSI-SINR for ATG

### 19.6.8.0 Minimum conformance requirements

#### 19.6.8.0.1 Intra-frequency CSI-SINR absolute accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.10.0.1.1.

#### 19.6.8.0.2 Inter-frequency CSI-SINR absolute accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.10.0.2.1.

#### 19.6.8.0.3 Inter-frequency CSI-SINR relative accuracy requirements for ATG

Same as the minimum conformance requirements given in sub-clause 4.7.10.0.2.2.

### 19.6.8.1 NR SA FR1 CSI-SINR absolute measurement accuracy for ATG

Editor's Note: This test case is incomplete in following aspects.

- Message content is missing
- Test procedure is missing
- Test requirements are missing
- TT analysis is missing
- AT commands for UE positioning and UE speed setting are FFS.
- UE specific positioning and the specific gNB reference location emulated by test system are FFS.
- Test procrdures for providing network assistance on ATG cells reference locations are FFS.

#### 19.6.8.1.1 Test purpose

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in TS 38.133 [6] sub-clause 10.1.12.2.1 for CSI-RS intra-frequency measurements.

#### 19.6.8.1.2 Test applicability

This test applies to all types of NR ATG UE from Release 18 and forward supporting CSI-RS based SINR measurements.

#### 19.6.8.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in Clause 19.6.8.0.1.

The normative reference for this requirement is in TS 38.133 [6] A.19.6.8.1.

#### 19.6.8.1.4 Test description

##### 19.6.8.1.4.1 Initial conditions

Supported test configuration are shown in Table 19.6.8.1.4.1-1.

**Table 19.6.8.1.4.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 19.6.8.1-1 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 19.6.8.1-2 | NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 19.6.8.1-3 | NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Configure the test equipment and the DUT according to the parameters in Table 19.6.8.1.4.1-2.

**Table 19.6.8.1.4.1-2: Initial conditions for CSI-SINR intra frequency accuracy in FR1**

| Parameter | Value | Comment |
|---|---|---|
| Test environment | NC, TL/VL, TL/VH, TH/VL, TH/VH | As specified in TS 38.508-1 [14] Clause 4.1. |
| Test frequencies | As specified in Annex E, Table E.17-1 and TS 38.508-1 [14] Clause 4.3.1. | |
| Channel bandwidth | As specified by the test configuration selected from Table 19.6.8.1.4.1-1. | |
| Propagation conditions | AWGN | As specified in Annex C.2.2. |

| | | | |
|---|---|---|---|
| Connection Diagram | TE Part 2Rx | A.3.1.8.2 with n = 2 and $\varphi_1$ = 5 Hz | As specified in TS 38.508-1 [14] Annex A. |
| | TE Part 4Rx | A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz | |
| | DUT Part 2Rx | A.3.2.3.4 | |
| | DUT Part 4Rx | A.3.2.5.2 | |
| Exceptions to connection diagram | - Without the LTE link | | |

1. Message contents are defined in Clause 19.6.8.1.4.3.
2. In this test case all cells are on the same carrier frequency. Cell 1 is the NR serving cell (PCell). Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for CSI-RSRQ measurements..
3. During the test, UE positioning and UE speed are set by AT command. UE speed is 0km/h, UE specific positioning is emulated by test system.
4. During the test, the specific gNB reference location is emulated by test system.

### 19.6.8.1.4.2 Test procedure

TBD

### 19.6.8.1.4.3 Message contents

TBD

### 19.6.8.1.5 Test Requirements

Table 19.6.8.1.5-1 defines the primary level settings including test tolerances for all tests.

Each CSI-SINR measurement report for each of the tests shall meet the corresponding absolute accuracy requirements in Table 19.6.8.1.5-2.

**Table 19.6.8.1.5-1: NR Cell specific test parameters**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | | | freq1 | | freq1 | |
| Duplex mode | Config 1 | | FDD | | | |
| | Config 2,3 | | TDD | | | |
| TDD configuration | Config 1 | | N/A | | | |
| | Config 2 | | TDDConf.1.1 | | | |
| | Config 3 | | TDDConf.2.1 | | | |
| Initial DL BWP configuration | | | DLBWP.0.1 | | | |
| Dedicated DL BWP configuration | | | DLBWP.1.1 | | | |
| Initial UL BWP configuration | | | ULBWP.0.1 | | | |
| Dedicated UL BWP configuration | | | ULBWP.1.1 | | | |
| DRX cycle | | ms | N/A | | | |
| TRS configuration | Config 1 | | TRS.1.1 FDD | | | |
| | Config 2 | | TRS.1.1 TDD | | | |
| | Config 3 | | TRS.1.2 TDD | | | |
| PDSCH RMC | Config 1 | | SR.1.1 FDD | - | SR.1.1 FDD | - |
| | Config 2 | | SR.1.1 TDD | | SR.1.1 TDD | |
| | Config 3 | | SR.2.1 TDD | | SR2.1 TDD | |
| RMSI CORESET RMC | Config 1 | | CR.1.1 FDD | - | CR.1.1 FDD | - |
| | Config 2 | | CR.1.1 TDD | | CR.1.1 TDD | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Config 3 | | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET RMC | Config 1 | | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| | Config 2 | | CCR.1.1 TDD | | CCR.1.1 TDD | |
| | Config 3 | | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | OP.1 | | | |
| CSI-RSSI-Measurement | | | N/A | | | |
| Time offset with Cell 1 | Config 1,2 | µs | - | 2.35 | - | 2.35 |
| | Config 3 | | - | 1.17 | - | 1.17 |
| SSB configuration | Config 1,2 | | SSB.1 FR1 | | | |
| | Config 3 | | SSB.2 FR1 | | | |
| SMTC configuration | Config 1 | | SMTC.2 | | | |
| | Config 2,3 | | SMTC.1 | | | |
| CSI-RS for mobility | Config 1 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | Config 2 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | Config 3 | | CSI-RS.RRM.FR1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 | | | |
| | Config 3 | | 30 | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ Note2 | | dBm/15kHz | -93+TT | | -116+$\Delta_{BG_offset}$+TT | |
| $N_{oc}$ Note2 | Config 1,2 | dBm/SCS | -93+TT | | -116+$\Delta_{BG_offset}$+TT | |
| | Config 3 | | -90+TT | | -113+$\Delta_{BG_offset}$+TT | |
| $\hat{E}_s / I_{ot}$ | | dB | 0+TT | -3.19+TT | -5.46+TT | -5.46+TT |
| $\hat{E}_s / N_{oc}$ | | dB | 4.54+TT | 2.66+TT | -4+TT | -4+TT |
| SS-RSRP/CSI-RSRP Note3 | Config 1,2 | dBm/SCS | -88.46+TT | -90.34+TT | -120+$\Delta_{BG_offset}$+TT | -120+$\Delta_{BG_offset}$+TT |
| | Config 3 | | -85.46+TT | -87.34+TT | -117+$\Delta_{BG_offset}$+TT | -117+$\Delta_{BG_offset}$+TT |
| CSI-SINR Note3 | | dB | 0+TT | -3.19+TT | -5.46+TT | -5.46+TT |
| Io Note3 | Config 1,2 | dBm/Ch BW | -57.5+TT | | -85.51+$\Delta_{BG_offset}$ +TT | |
| | Config 3 | | -51.41+TT | | -79.41+$\Delta_{BG_offset}$ +TT | |
| Propagation condition | Config 1,2 | - | AWGN+220 Hz | | | |
| | Config 3 | | AWGN+500 Hz | | | |
| Antenna configuration | | - | 1x2 | | | |

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.

Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: CSI-SINR, CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Clause 3.5.2 in TS 38.133 [6].

| |
|---|
| Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. |

**Table 19.6.8.1.5-2: CSI-SINR Intra frequency absolute accuracy requirements for the reported values**

| **Normal Condition** | **Test 1 All bands** | **Test 2 All bands** |
|---|---|---|
| Lowest reported value (Cell 2) | TBD | TBD |
| Highest reported value (Cell 2) | TBD | TBD |
| **Extreme Conditions** | **Test 1 All bands** | **Test 2 All bands** |
| Lowest reported value (Cell 2) | TBD | TBD |
| Highest reported value (Cell 2) | TBD | TBD |

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

# Annex A (normative): RRM test configurations

## A.1 Reference measurement channels

### A.1.0 General

This clause contains the Reference Measurement Channels (RMC) to be used for the RRM test scenarios in Clauses 4 to 18 of this document.

### A.1.1 PDSCH

#### A.1.1.1 FDD

**Table A.1.1.1-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for FDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | SR.1.1 FDD | SR.1.2 FDD |
| Channel bandwidth | MHz | Defined in test case | Defined in test case by the parameter $N_{RB,c}$ |
| Number of transmitter antennas | | 1 | 1 |
| Allocated resource blocks for PDSCH Note 1 | | 24 | Defined by test case |
| Allocated slots per Radio Frame | | 10 | 10 |
| Radio frame containing SSB | slots | Note 5 | Note 5 |
| Radio frame not containing SSB | slots | 10 | 10 |
| MCS index | | 4 | 4 |
| Modulation | | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 |
| Number of control symbols | | 2 | 2 |
| PDSCH mapping type | | Type A | Type A |
| Information Bit Payload | | | |
| For slots with RMSI Note 2 | Bits | 1608 | 1608 |
| For slots without RMSI | Bits | 1864 | 1864 |
| Number of Code Blocks per slot | | 1 | 1 |
| Binary Channel Bits Per slot | | | |
| For slots with RMSI Note 2, 4 | Bits | 5184 | 5184 |
| For slots without RMSI Note 6 | Bits | 6048 | 6048 |

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10ms] – drx-InactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

## A.1.1.2 TDD

**Table A.1.1.2-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for TDD**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | SR.1.1 TDD | SR.1.2 TDD |
| Channel bandwidth | MHz | Defined in test case | Defined in test case |
| Number of transmitter antennas | | 1 | 1 |
| Allocated resource blocks for PDSCH Note 1 | | 24 | 24 |
| Allocated slots per Radio Frame | | | |
| Radio frame containing SSB | slots | Note 5 | Note 5 |
| Radio frame not containing SSB | slots | 4 | 6 |
| MCS table | | 64QAM | 64QAM |
| MCS index | | 4 | 4 |
| Modulation | | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 |
| Number of control symbols | | 2 | 2 |
| PDSCH mapping type | | Type A | Type A |
| Information Bit Payload | | | |
| For slots with RMSI Note 2 | Bits | 1608 | 1608 |
| For slots without RMSI | Bits | 1864 | 1864 |
| For special slots | Bits | N/A | 1128 |
| Number of Code Blocks per slot | | 1 | |
| Binary Channel Bits Per slot | | | |
| For slots with RMSI Note 2, 4 | Bits | 5184 | 5184 |
| For slots without RMSI Note 6 | Bits | 6048 | 6048 |
| For special slots Note 6 | Bits | - | 3744 |

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms – drx-InactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

**Table A.1.1.2-2: PDSCH Reference Measurement Channels for SCS = 30 kHz for TDD**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | SR.2.1 TDD |
| Channel bandwidth | MHz | Defined in test case |
| Number of transmitter antennas | | 1 |
| Allocated resource blocks for PDSCH Note 1 | | 24 |
| Allocated slots per Radio Frame | | |
| Radio frame containing SSB | slots | Note 5 |
| Radio frame not containing SSB | slots | 10 |
| MCS table | | 64QAM |
| MCS index | | 4 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Number of control symbols | | 2 |
| PDSCH mapping type | | Type A |
| Information Bit Payload | | |
| For slots with RMSI Note 2 | Bits | 1608 |
| For slots without RMSI | Bits | 1864 |

| | | |
|---|---|---|
| Number of Code Blocks per slot | | 1 |
| Binary Channel Bits Per slot | | |
| For slots with RMSI Note 2, 4 | Bits | 5184 |
| For slots without RMSI Note 6 | Bits | 6048 |

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms – drxInactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

**Table A.1.1.2-3: PDSCH Reference Measurement Channels for SCS = 120 kHz for TDD**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | SR.3.1 TDD | SR.3.2 TDD | SR.3.3 TDD |
| Channel bandwidth | MHz | 100 | 100 | 100 |
| Number of transmitter antennas | | 1 | 1 | 1 |
| Allocated resource blocks for PDSCH | | 24 Note 1 | 24 Note 7 | 48 Note 7 |
| Allocated slots per Radio Frame | | | | |
| Radio frame containing SSB | slots | Note 5 | Note 8 | Note 5 |
| Radio frame not containing SSB | slots | 48 | 48 | 48 |
| MCS table | | 64QAM | 64QAM | 64QAM |
| MCS index | | 4 | 4 | 4 |
| Modulation | | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 |
| Number of control symbols | | 2 | 2 | 2 |
| PDSCH mapping type | | Type A | Type A | Type A |
| Information Bit Payload | | | | |
| For slots with RMSI | Bits | 1608 | 1608 | 3104 |
| For slots without RMSI | Bits | 1864 | 1864 | 3624 |
| Number of Code Blocks per slot | | 1 | 1 | 1 |
| Binary Channel Bits Per slot | | | | |
| For slots with RMSI Note 4 | Bits | 5184 | 5184 | 10368 |
| For slots without RMSI Note 6 | Bits | 6048 | 6048 | 12096 |

NOTE 1: Allocated in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: Void
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: Allocated in the same resource blocks as the CORESET.
NOTE 8: When DRX is configured, PDSCH is scheduled only while *drx-onDurationTimer* is running, unless otherwise specified in the test case.

## A.1.2 CORESET for RMSI scheduling

### A.1.2.1 FDD

**Table A.1.2.1-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for FDD**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | CR.1.1 FDD | CR.1.2 FDD | CR.1.3 FDD | CR.1.4 FDD |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |
| Subcarrier spacing for RMSI CORESET | kHz | 15 | 15 | 15 | 15 |
| Allocated resource blocks for RMSI CORESET | | 24 (NOTE 8) | 12 (NOTE 9) | 15 (NOTE 10) | 20 (NOTE 11) |
| Subcarrier spacing for SSB | kHz | 15 | 15 | 15 | 15 |
| SSB and RMSI CORESET multiplexing configuration | | Pattern 1 | Pattern 1 | Pattern 1 | Pattern 1 |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (NOTE 8) | 0 (NOTE 9) | 0 (NOTE 10) | 0 (NOTE 11) |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 | | Index 4 | Index 4 | Index 4 | Index 4 |
| Number of transmitter antennas | | 1 | 1 | 1 | 1 |
| Duration of RMSI CORESET | symbols | 2 (NOTE 8) | 2 (NOTE 9) | 3 (NOTE 10) | 3 (NOTE 11) |
| DCI Format Note 1 | | Note 2 | Note 2 | Note 2 | Note 2 |
| Aggregation level | CCE | 8 | 4 | 8 | 8 |
| DMRS precoder granularity | | 6 | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |
| REG bundle size | | 6 | 6 | 6 | 6 |
| Mapping from REG to CCE | | Distributed (NOTE 8) | Distributed (NOTE 9) | Non-Distributed (NOTE 10) | Distributed (NOTE 11) |
| Cell ID | | Note 5 | Note 5 | Note 5 | Note 5 |
| Payload (without CRC) | Bits | Note 6 | Note 6 | Note 6 | Note 6 |

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: Other values can be used to align with GSCN as long as SSB does not overlap the RMC
NOTE 8: The configuration of set of resource blocks, slot symbols, RB offset and REG to CCE mapping of control resource set for Type0-PDCCH search space corresponds to index 0 in table 13-1 in TS 38.213 [3]
NOTE 9: The configuration of set of resource blocks, slot symbols, RB offset and REG to CCE mapping of control resource set for Type0-PDCCH search space corresponds to index 0 in table 13-0 in TS 38.213 [3]
NOTE 10: The configuration of set of resource blocks, slot symbols, RB offset and REG to CCE mapping of control resource set for Type0-PDCCH search space corresponds to index 8 in table 13-0 in TS 38.213 [3]
NOTE 11: The configuration of set of resource blocks, slot symbols, RB offset and REG to CCE mapping of control resource set for Type0-PDCCH search space corresponds to index 11 in table 13-0 in TS 38.213 [3]

### A.1.2.2 TDD

**Table A.1.2.2-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for TDD**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CR.1.1 TDD |
| Channel bandwidth | MHz | Defined in test case |
| Subcarrier spacing for RMSI CORESET | kHz | 15 |
| Allocated resource blocks for RMSI CORESET Note 7 | | 24 |
| SSB and RMSI CORESET multiplexing configuration | | Pattern 1 |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note 8) |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 | | Index 4 |
| Number of transmitter antennas | | 1 |
| Duration of RMSI CORESET Note 7 | symbols | 2 |

| | | |
|---|---|---|
| DCI Format Note 1 | | Note 2 |
| Aggregation level | CCE | 8 |
| DMRS precoder granularity | | 6 |
| REG bundle size | | 6 |
| Mapping from REG to CCE | | Distributed |
| Cell ID | | Note 5 |
| Payload (without CRC) | Bits | Note 6 |

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

**Table A.1.2.2-2: RMSI CORESET Reference Measurement Channels for SCS = 30 kHz for TDD**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CR.2.1 TDD |
| Channel bandwidth | MHz | Defined in test case |
| Subcarrier spacing for RMSI CORESET | kHz | 30 |
| Allocated resource blocks for RMSI CORESET Note 7 | | 24 |
| SSB and RMSI CORESET multiplexing configuration | | Pattern 1 |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note 8) |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 | | Index 4 |
| Number of transmitter antennas | | 1 |
| Duration of RMSI CORESET Note 7 | symbols | 2 |
| DCI Format Note 1 | | Note 2 |
| Aggregation level | CCE | 8 |
| DMRS precoder granularity | | 6 |
| REG bundle size | | 6 |
| Mapping from REG to CCE | | Distributed |
| Cell ID | | Note 5 |
| Payload (without CRC) | Bits | Note 6 |

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

**Table A.1.2.2-3: RMSI CORESET Reference Measurement Channels for SCS = 120 kHz for TDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | CR.3.1 TDD | CR.3.2 TDD |
| Channel bandwidth | MHz | 100 | 100 |
| Subcarrier spacing for RMSI CORESET | kHz | 120 | 120 |

| | | | |
|---|---|---|---|
| Allocated resource blocks for RMSI CORESET | | 24 Note 7 | 48 Note 9 |
| Subcarrier spacing for SSB | kHz | 120 | 120 |
| SSB and RMSI CORESET multiplexing configuration | | Pattern 1 Note 7 | Pattern 1 Note 9 |
| Offset between SSB and RMSI CORESET Note 3 | RB | 0 (Note 8) Note 7 | 0 (Note 8) Note 9 |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 | | Index 4 | Index 4 |
| Number of transmitter antennas | | 1 | 1 |
| Duration of RMSI CORESET | symbols | 2 Note 7 | 2 Note 9 |
| DCI Format Note 1 | | Note 2 | Note 2 |
| Aggregation level | CCE | 8 | 8 |
| DMRS precoder granularity | | 6 | 6 |
| REG bundle size | | 6 | 6 |
| Mapping from REG to CCE | | Distributed | Distributed |
| Cell ID | | Note 5 | Note 5 |
| Payload (without CRC) | Bits | Note 6 | Note 6 |

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC
NOTE 9: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 2 in Table 13-10 in TS 38.213 [8].

## A.1.3 CORESET for RMC scheduling

### A.1.3.1 FDD

**Table A.1.3.1-1: Control Channel RMC for SCS = 15 kHz for FDD**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | CCR.1.1 FDD | CCR.1.2 FDD | CCR.1.3 FDD | CCR.1.4 FDD | CCR.1.5 FDD | CCR.1.6 FDD | CCR.1.7 FDD | CCR.1.8 FDD |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 | 3MHz | 3MHz | 5MHz |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Allocated resource blocks for CORESET Note 3 | | 24 | 18 | 24 | 18 | 24 | 12 | 12 | 18 |
| Number of transmitter antennas | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| monitoringSymbolsWithinSlot | | 1000000 0000000 | 1000000 0000000 | 1000000 0000000 | 1000000 0000000 | 0010000 0000000 | 1000000 0000000 | 1000000 0000000 | 1000000 0000000 |
| REG bundle size | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Non-Interleaved | Interleaved |
| Interleave n_shift | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Interleave size | | 2 | 2 | 2 | 2 | 2 | 2 | N/A | 2 |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 | 4 | 4 | 8 |
| DCI formats | | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | 1-0 | 1-0 | 1-0 |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | | |

**Table A.1.3.1-2: FFS**

**Table A.1.3.1-3: Control Channel RMC for SCS = 15 kHz for FDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | CCR.3.1 FDD | CCR.3.2 FDD | | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | | | |
| Subcarrier spacing | kHz | 15 | 15 | | | |
| Allocated resource blocks for CORESET Note 3 | | 48 | 48 | | | |
| Number of transmitter antennas | | 1 | 1 | | | |
| Duration of CORESET | symbols | 2 | 2 | | | |
| monitoringSymbolsWithinSlot | | 1000000 0000000 | 1000000 0000000 | | | |
| REG bundle size | | 6 | 6 | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | | | |
| CCE to REG mapping | | Interleaved | Interleaved | | | |
| Interleave n_shift | | 0 | 0 | | | |
| Interleave size | | 2 | 2 | | | |
| Beamforming Pre-Coder | | N/A | N/A | | | |
| Aggregation level | CCE | 8 | 16 | | | |
| DCI formats | | Note 1 | Note 1 | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | |

## A.1.3.2 TDD

**Table A.1.3.2-1: Control Channel RMC for SCS = 15 kHz for TDD**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CCR.1.1 TDD | CCR.1.2 TDD | CCR.1.3 TDD | CCR.1.4 TDD | CCR.1.5 TDD | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 | | |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 18 | 24 | 18 | 18 | | |
| Number of transmitter antennas | | 1 | 1 | 1 | 1 | 1 | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 | | |
| monitoringSymbolsWithinSlot | | 1000000 0000000 | 1000000 0000000 | 1000000 0000000 | 1000000 0000000 | 0010000 0000000 | | |
| REG bundle size | | 6 | 6 | 6 | 6 | 6 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | | |
| Interleave n_shift | | 0 | 0 | 0 | 0 | 0 | | |
| Interleave size | | 2 | 2 | 2 | 2 | 2 | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A | N/A | | |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 | | |
| DCI formats | | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | |

**Table A.1.3.2-2: Control Channel RMC for SCS = 30 kHz for TDD**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | CCR.2.1 TDD | CCR.2.2 TDD | CCR.2.3 TDD | CCR.2.4 TDD |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |
| Subcarrier spacing for RMSI CORESET | kHz | 30 | 30 | 30 | 30 |
| Allocated resource blocks for CORESET[3] | | 24 | 24 | 18 | 18 |
| Number of transmitter antenna | | 1 | 1 | 1 | 1 |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 |
| REG bundle size | | 6 | 6 | 6 | 6 |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved |
| Interleave n_shift | | 0 | 0 | 0 | 0 |
| Interleave size | | 2 | 2 | 2 | 2 |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A |
| Aggregation level | CCE | 4 | 8 | 4 | 2 |
| DCI formats | | Note 1 | Note 1 | Note 1 | Note 1 |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | |

**Table A.1.3.2-3: Control Channel RMC for SCS = 120 kHz for TDD**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CCR.3.1 TDD | CCR.3.2 TDD | CCR.3.3 TDD | CCR.3.4 TDD | CCR.3.5 TDD | CCR.3.6 TDD | CCR.3.7 TDD |
| Channel bandwidth | MHz | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Subcarrier spacing for RMSI CORESET | kHz | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Allocated resource blocks for CORESET[Note 3] | | 24 | 24 | 24 | 24 | 24 | 24 | 48 |
| Number of transmitter antenna | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| monitoringSlotPeriodicityAndOffset[Note 4] | | sl160 0 | sl160 0 | sl160 80 | sl160 0 | sl160 0 | sl160 80 | sl160 0 |
| monitoringSymbolsWithinSlot | | 11000000000000 | 00110000000000 | 11000000000000 | 10000000000000 | 00010000000000 | 10000000000000 | 11000000000000 |
| Duration of CORESET | symbols | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| REG bundle size | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved |
| Interleave n_shift | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Interleave size | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Aggregation level | CCE | 4 | 4 | 4 | 8 | 8 | 8 | 4 |
| DCI formats | | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: DCI format shall depend upon the test configuration.<br>NOTE 2: Payload size shall depend upon the test configuration<br>NOTE 3: Allocated in the same resource blocks where the associated PDSCH RMC is scheduled.<br>NOTE 4: *monitoringSlotPeriodicityAndOffset* can be set to other values depending on test purpose of respective test cases, as needed, e.g. *monitoringSlotPeriodicityAndOffset* is set to “sl1 0” if it is specifically stated that cell(s) configured with one of the control channel RMCs above shall transmit PDCCHs continuously. | | | | | | | | |

**Table A.1.3.2-4: Control Channel RMC for SCS = 15 kHz for TDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | CCR.4.1 TDD | CCR.4.2 TDD | | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | | | |
| Subcarrier spacing | kHz | 15 | 15 | | | |
| Allocated resource blocks for CORESET Note 3 | | 48 | 48 | | | |
| Number of transmitter antennas | | 1 | 1 | | | |
| Duration of CORESET | symbols | 2 | 2 | | | |
| monitoringSymbolsWithinSlot | | 10000000000000 | 10000000000000 | | | |
| REG bundle size | | 6 | 6 | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | | | |
| CCE to REG mapping | | Interleaved | Interleaved | | | |
| Interleave n_shift | | 0 | 0 | | | |
| Interleave size | | 2 | 2 | | | |
| Beamforming Pre-Coder | | N/A | N/A | | | |
| Aggregation level | CCE | 8 | 16 | | | |
| DCI formats | | Note 1 | Note 1 | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | |

**Table A.1.3.2-5: Control Channel RMC for SCS = 30 kHz for TDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | CCR.5.1 TDD | CCR.5.2 TDD | | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | | | |
| Subcarrier spacing | kHz | 30 | 30 | | | |
| Allocated resource blocks for CORESET Note 3 | | 48 | 48 | | | |
| Number of transmitter antennas | | 1 | 1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Duration of CORESET | symbols | 2 | 2 | | | |
| REG bundle size | | 6 | 6 | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | | | |
| CCE to REG mapping | | Interleaved | Interleaved | | | |
| Interleave n_shift | | 0 | 0 | | | |
| Interleave size | | 2 | 2 | | | |
| Beamforming Pre-Coder | | N/A | N/A | | | |
| Aggregation level | CCE | 8 | 16 | | | |
| DCI formats | | Note 1 | Note 1 | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | | |

## A.1.4 CSI-RS

### A.1.4.1 FDD

**Table A.1.4.1-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for FDD**

| | **CSI-RS.1.1 FDD** | **CSI-RS.1.2 FDD** | **CSI-RS.1.3 FDD** | **CSI-RS.1.4 FDD** | **CSI-RS.1.5 FDD** | **CSI-RS.1.6 FDD** | **CSI-RS.1.7 FDD** |
|---|---|---|---|---|---|---|---|
| **Resource Type** | **periodic** | **periodic** | **aperiodic** | **aperiodic** | **aperiodic** | **periodic** | **periodic** |
| **Resource Set Config** | | | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | 6 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** | | | | | | | |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 2 for resource #0 |
| | | | | 1 for resource #1 | | | |
| | | | | 2 for resource #2 | | | |
| | | | | 3 for resource #3 | | | |
| | | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 | | 3 for resource #1 |
| | | | | 5 for resource #5 | | | |
| | | | | 6 for resource #6 | | | |
| | | | | 7 for resource #7 | | | |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 | db0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | n.a. | slot40 | slot10 |
| Offset | 1 | 1 | n.a. | n.a. | n.a. | 1 | 1 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
| | | TCI.State.1 | | | | | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 | 5 for resource #0 | 6 for resource #0 |
| | | | | 1 for resource #1 | | | |
| | | | | 2 for resource #2 | | | |
| | | | | 3 for resource #3 | | | |
| | | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. | | 10 for resource #1 |
| | | | | 5 for resource #5 | | | |
| | | | | 6 for resource #6 | | | |
| | | | | 7 for resource #7 | | | |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | | |

**Table A.1.4.1-1A: CSI-RS Reference Measurement Channels for SCS=15 kHz for FDD**

| | CSI-RS.1.1A FDD | CSI-RS.1.2A FDD | CSI-RS.1.3A FDD |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 0 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |

| | | | |
|---|---|---|---|
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

## A.1.4.2 TDD

**Table A.1.4.2-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for TDD**

| | **CSI-RS.1.1 TDD** | **CSI-RS.1.2 TDD** | **CSI-RS.1.3 TDD** | **CSI-RS.1.4 TDD** | **CSI-RS.1.5 TDD** | **CSI-RS.1.6 TDD** |
|---|---|---|---|---|---|---|
| Resource Type | periodic | periodic | aperiodic | aperiodic | periodic | periodic |
| **Resource Set Config** | | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** | | | | | | |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| | | 1 for resource #1 | 1 for resource #1 | 1 for resource #1 | | 1 for resource #1 |
| | | | | 2 for resource #2 | | 2 for resource #2 |
| | | | | 3 for resource #3 | | 3 for resource #3 |
| | | | | 4 for resource #4 | | 4 for resource #4 |
| | | | | 5 for resource #5 | | 5 for resource #5 |
| | | | | 6 for resource #6 | | 6 for resource #6 |
| | | | | 7 for resource #7 | | 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | slot40 | slot10 |
| Offset | 1 | 1 | n.a. | n.a. | 1 | 1 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
| | | TCI.State.1 | | | | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 2 | 1 |
| | | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | | 6 for resource #0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 10 for resource #1 | 10 for resource #1 | 1 for resource #1<br>2 for resource #2<br>3 for resource #3<br>4 for resource #4<br>5 for resource #5<br>6 for resource #6<br>7 for resource #7 | 5 for resource #0 | 10 for resource #1 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | |

**Table A.1.4.2-1A: CSI-RS Reference Measurement Channels for SCS=15 kHz for TDD**

| | **CSI-RS.1.1A TDD** | **CSI-RS.1.2A TDD** | **CSI-RS.1.3A TDD** |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 0 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

**Table A.1.4.2-2: CSI-RS Reference Measurement Channels for SCS = 30 kHz for TDD**

| | CSI-RS.2.1 TDD | CSI-RS.2.2 TDD | CSI-RS.2.3 TDD | CSI-RS.2.4 TDD | CSI-RS.2.5 TDD | CSI-RS.2.6 TDD | CSI-RS.2.7 TDD |
|---|---|---|---|---|---|---|---|
| **Resource Type** | **periodic** | **periodic** | **aperiodic** | **aperiodic** | **aperiodic** | **periodic** | **periodic** |
| **Resource Set Config** | | | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | 6 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** | | | | | | | |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0<br>1 for resource #1 | 0 for resource #0<br>1 for resource #1 | 0 for resource #0<br>1 for resource #1<br>2 for resource #2<br>3 for resource #3<br>4 for resource #4<br>5 for resource #5<br>6 for resource #6<br>7 for resource #7 | 0 for resource #0<br>1 for resource #1 | 0 for resource #0 | 2 for resource #0<br>3 for resource #1 |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot10 | slot20 | n.a. | n.a. | n.a. | slot80 | slot20 |
| Offset | 2 | 2 | n.a. | n.a. | n.a. | 2 | 2 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0<br>TCI.State.1 | n.a. | n.a. | n.a. | TCI.State.0 | TCI.State.0<br>TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0<br>10 for resource #1 | 6 for resource #0<br>10 for resource #1 | 0 for resource #0<br>1 for resource #1<br>2 for resource #2<br>3 for resource #3<br>4 for resource #4<br>5 for resource #5<br>6 for resource #6<br>7 for resource #7 | Specified in the test case for resource #0<br>n.a. | 5 for resource #0 | 6 for resource #0<br>10 for resource #1 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |

Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.

**Table A.1.4.2-2A: CSI-RS Reference Measurement Channels for SCS=30 kHz for TDD**

| | CSI-RS.2.1A TDD | CSI-RS.2.2A TDD | CSI-RS.2.3A TDD |
|---|---|---|---|

| Resource Type | periodic | aperiodic | periodic |
|---|---|---|---|
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 0 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot40 | n.a. | slot20 |
| Offset | 2 | n.a. | 4 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

**Table A.1.4.2-3: CSI-RS Reference Measurement Channels for SCS = 120 kHz for TDD**

| | CSI-RS.3.1 TDD | CSI-RS.3.2 TDD | CSI-RS.3.3 TDD | CSI-RS.3.4 TDD | CSI-RS.3.5 TDD | CSI-RS.3.6 TDD |
|---|---|---|---|---|---|---|
| Resource Type | periodic | periodic | aperiodic | aperiodic | periodic | periodic |
| **Resource Set Config** | | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 4 | 4 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** | | | | | | |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 2 for resource #0 |
| | | | | 1 for resource #1 | | |
| | | | | 2 for resource #2 | | |
| | | | | 3 for resource #3 | | |
| | | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | | 3 for resource #1 |
| | | | | 5 for resource #5 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 6 for resource #6 | | |
| | | | | 7 for resource #7 | | |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot40 | slot80 | n.a. | n.a. | slot320 | slot80 |
| Offset | 8 | 16 | n.a. | n.a. | 8 | 16 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
| | | TCI.State.1 | | | | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | 5 for resource #0 | 6 for resource #0 |
| | | | | 1 for resource #1 | | |
| | | | | 2 for resource #2 | | |
| | | | | 3 for resource #3 | | |
| | | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | | 10 for resource #1 |
| | | | | 5 for resource #5 | | |
| | | | | 6 for resource #6 | | |
| | | | | 7 for resource #7 | | |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | |

**Table A.1.4.2-3A: CSI-RS Reference Measurement Channels for SCS=120 kHz for TDD**

| | **CSI-RS.3.1A TDD** | **CSI-RS.3.2A TDD** | **CSI-RS.3.3A TDD** |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot160 | n.a. | slot80 |
| Offset | 8 | n.a. | 16 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |

| | | | |
|---|---|---|---|
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

# A.1.4A CSI-RS for tracking

## A.1.4A.1 FR1

### A.1.4A.1.1 FDD

**Table A.1.4A.1.1-1: CSI-RS for tracking FDD**

| **Parameter** | **Unit** | **Value** | |
|---|---|---|---|
| **Reference channel** | | TRS.1.1 FDD | TRS.1.2 FDD |
| Bandwidth | | BW of Active BWP[1] | BW of Active BWP[1] |
| SCS | kHz | 15 | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 20 for CSI-RS resource 1,2,3,4 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 2<br>11 for CSI-RS resource 3 and 4 | 20 for CSI-RS resource 1 and 2<br>21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 | 0 |
| TCI state | | TCI.State.0 | TCI.State.0 |
| NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases | | | |

**Table A.1.4A.1.1-2: Aperiodic CSI-RS for tracking**

| **Parameter** | **Unit** | **Value** | |
|---|---|---|---|
| Reference channel | | TRS.1.3 FDD | TRS.1.4 FDD |
| Bandwidth | | BW of Active BWP[Note 1] | BW of Active BWP[Note 1] |
| SCS | kHz | 15 | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2<br>3 for CSI-RS resource 3 and 4 | 2 for CSI-RS resource 1 and 2<br>3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0[Note 2] | 0[Note 2] |
| TCI state | | TCI.State.0 | TCI.State.0 |

| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases |
|---|

### A.1.4A.1.2 TDD

**Table A.1.4A.1.2-1: CSI-RS for TDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| **Reference channel** | | TRS.1.1 TDD | TRS.1.2 TDD |
| Bandwidth | | BW of Active BWP[1] | BW of Active BWP[1] |
| SCS | kHz | 15 | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 20 for CSI-RS resource 1,2,3,4 | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 2<br>11 for CSI-RS resource 3 and 4 | 20 for CSI-RS resource 1 and 2<br>21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 | 0 |
| TCI state | | TCI.State.0 | TCI.State.0 |
| NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases | | | |

**Table A.1.4A.1.2-2: Aperiodic CSI-RS for tracking**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | TRS.1.3 TDD | TRS.1.4 TDD |
| Bandwidth | | BW of Active BWP[Note 1] | BW of Active BWP[Note 1] |
| SCS | kHz | 15 | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2<br>3 for CSI-RS resource 3 and 4 | 2 for CSI-RS resource 1 and 2<br>3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0[Note 2] | 0[Note 2] |
| TCI state | | TCI.State.0 | TCI.State.0 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases | | | |

## A.1.4A.2 FR2

### A.1.4A.2.1 TDD

**Table A.1.4A.2.1-1: CSI-RS for tracking for TDD FR2**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| **Reference channel** | | TRS.2.1 TDD | TRS.2.2 TDD | TRS.2.4 TDD | TRS.2.5 TDD |
| Bandwidth | | BW of Active BWP[Note 1, 2] | BW of Active BWP[Note 1,2] | BW of Active BWP[Note 1,2] | BW of Active BWP[Note 1,2] |
| SCS | kHz | 120 | 120 | 120 | 120 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 | $k_0$=0 for CSI-RS resource 1,2,3,4 |

| | | | | | |
|---|---|---|---|---|---|
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 1 for CSI-RS resource 1 and 3<br>$l_0$ = 5 for CSI-RS resource 2 and 4 | $l_0$ = 2 for CSI-RS resource 1 and 3<br>$l_0$ = 6 for CSI-RS resource 2 and 4 | $l_0$ = 3 for CSI-RS resource 1 and 3<br>$l_0$ = 7 for CSI-RS resource 2 and 4 | $l_0$ = 4 for CSI-RS resource 1 and 3<br>$l_0$ = 8 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 | 80 for CSI-RS resource 1,2,3,4 | 80 for CSI-RS resource 1,2,3,4 | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4 | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4 | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4 | 40 for CSI-RS resource 1 and 2<br>41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 | 0 | 0 | 0 |
| TCI state | | TCI.State.0 Note 3 | TCI.State.1 Note 3 | TCI.State.2 | TCI.State.3 |
| NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases<br>NOTE 2: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size.<br>NOTE 3: If unified TCI states are configured, the TCI state ID is defined in each test case and from A.10A.2 Unified TCI state Configuration | | | | | |

**Table A.1.4A.2.1-2: Aperiodic CSI-RS for tracking for SCS=120kHz Set 1**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | TRS.2.3 TDD |
| Bandwidth | | BW of Active BWP Note 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 1 for CSI-RS resource 1 and 3<br>$l_0$ = 5 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) | | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type | | 'No CDM' for CSI-RS resource 1,2,3,4 |
| Density (ρ) | | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2<br>3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 Note 2 |
| TCI state | | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases<br>Note 2: Unless otherwise specified in the test case<br>Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

# A.1.4B CSI-IM configurations

## A.1.4B.1 FDD

**Table A.1.4B.1-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| | CSI-IM.1.1 FDD | CSI-IM.1.2 FDD | CSI-IM.1.3 FDD |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |

| | | | |
|---|---|---|---|
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

## A.1.4B.2 TDD

**Table A.1.4B.2-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| | **CSI-IM.1.1 TDD** | **CSI-IM.1.2 TDD** | **CSI-IM.1.3 TDD** |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

**Table A.1.4B.2-2: CSI-IM Reference Measurement Channels for SCS=30kHz**

| | **CSI-IM.2.1 TDD** | **CSI-IM.2.2 TDD** | **CSI-IM.2.3 TDD** |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |

| | | | |
|---|---|---|---|
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot40 | n.a. | slot40 |
| Offset | 2 | n.a. | 4 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

**Table A.1.4B.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz**

| | **CSI-IM.3.1 TDD** | **CSI-IM.3.2 TDD** | **CSI-IM.3.3 TDD** |
|---|---|---|---|
| **Resource Type** | **periodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot160 | n.a. | slot80 |
| Offset | 8 | n.a. | 16 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP. | | | |

## A.1.5 TDD UL/DL configuration

**Table A.1.5-1: TDD UL/DL configuration for SCS=15kHz**

| **Parameter** | **Unit** | **Value** | | |
|---|---|---|---|---|
| Reference channel | | TDDConf.1.1 | TDDConf.1.2 | |
| *referenceSubcarrierSpacing* | kHz | 15 | 15 | |
| TDD UL/DL pattern 1 Note 2 | | ‘DSUU’ S=‘10DL:2GP:2UL’ | ‘DSUU’ S=’ 6DL: 2GP: 6UL’ | |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 4 | |
| *nrofDownlinkSlots* | | 1 | 1 | |
| *nrofDownlinkSymbols* | | 10 | 6 | |
| *nrofUplinkSlot* | | 2 | 2 | |
| *nrofUplinkSymbols* | | 2 | 6 | |
| TDD UL/DL pattern 2 Note 2 | | ‘D’ | ‘D’ | |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | 1 | |
| *nrofDownlinkSlots* | | 1 | 1 | |

| | | | | |
|---|---|---|---|---|
| *nrofDownlinkSymbols* | | 0 | 0 | |
| *nrofUplinkSlot* | | 0 | 0 | |
| *nrofUplinkSymbols* | | 0 | 0 | |
| NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13].<br>NOTE 2: For information | | | | |

**Table A.1.5-2: TDD UL/DL configuration for SCS=30kHz**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | TDDConf.2.1 | TDDConf.2.2 | TDDConf.2.3 |
| *referenceSubcarrierSpacing* | kHz | 30 | 30 | 30 |
| TDD UL/DL pattern 1 Note 2 | | '3D1S4U'<br>S='6DL:4GP:4UL' | '1D1S2U'<br>S='11DL: 1GP:2UL' | '3D1S4U'<br>S='4DL:4GP:6UL' |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 2 | 4 |
| *nrofDownlinkSlots* | | 3 | 1 | 3 |
| *nrofDownlinkSymbols* | | 6 | 11 | 4 |
| *nrofUplinkSlot* | | 4 | 2 | 4 |
| *nrofUplinkSymbols* | | 4 | 2 | 6 |
| TDD UL/DL pattern 2 Note 2 | | 'DD' | Not configured | 'DD' |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | | 1 |
| *nrofDownlinkSlots* | | 2 | | 2 |
| *nrofDownlinkSymbols* | | 0 | | 0 |
| *nrofUplinkSlot* | | 0 | | 0 |
| *nrofUplinkSymbols* | | 0 | | 0 |
| NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13].<br>NOTE 2: For information | | | | |

**Table A.1.5-3: TDD UL/DL configuration for SCS=120kHz**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | TDDConf.3.1 | TDDConf.3.2 | |
| *referenceSubcarrierSpacing* | kHz | 120 | 120 | |
| TDD UL/DL pattern 1 Note 2 | | 'DDDSU'<br>S='10DL:2GP:2UL' | 'DDDSU'<br>S=' 6DL: 2GP: 6UL' | |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 | 0.625 | |
| *nrofDownlinkSlots* | | 3 | 3 | |
| *nrofDownlinkSymbols* | | 10 | 6 | |
| *nrofUplinkSlot* | | 1 | 1 | |
| *nrofUplinkSymbols* | | 2 | 6 | |
| TDD UL/DL pattern 2 Note 2 | | Not configured | Not configured | |
| *dl-UL-TransmissionPeriodicity* | ms | Not configured | Not configured | |
| *nrofDownlinkSlots* | | Not configured | Not configured | |
| *nrofDownlinkSymbols* | | Not configured | Not configured | |
| *nrofUplinkSlot* | | Not configured | Not configured | |
| *nrofUplinkSymbols* | | Not configured | Not configured | |
| NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13].<br>NOTE 2: For information | | | | |

## A.1.6 PUSCH

This rule applies to NR cell(s), which the UE is connected to. The UE is in RRC_CONNECTED mode.

When signalling or data payloads are expected to be sent on the PUSCH, the UE may be provided in advance with PUSCH resources by the SS. For sake of simplicity, the PUSCH scheduling may also occur continuously over many consecutive subframes. These options shall not be used if:
1) stated otherwise in the test description, or
2) the transmission of PUSCH and UL scheduling information affects the test purpose (e.g. DRX, PUCCH reception etc.)

# A.1A Reference measurement channels under CCA

## A.1A.0 General

This clause contains the Reference Measurement Channels (RMC) under CCA to be used for the RRM test scenarios in Clauses 10 to 12 of this document.

## A.1A.1 PDSCH

### A.1A.1.1 FDD

**Table A.1A.1.1-1: PDSCH Reference Measurement Channels under CCA for SCS=30kHz**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | SR.1.1 CCA | | | | | | |
| Channel bandwidth | MHz | 40 | | | | | | |
| Number of transmitter antennas | | 1 | | | | | | |
| Allocated resource blocks for PDSCH Note 1 | | 24 | | | | | | |
| Allocated slots per Radio Frame | | | | | | | | |
| Radio frame containing SSB | slots | Note 5 | | | | | | |
| Radio frame not containing SSB | slots | Note 7 | | | | | | |
| MCS table | | 64QAM | | | | | | |
| MCS index | | 4 | | | | | | |
| Modulation | | QPSK | | | | | | |
| Target Coding Rate | | 1/3 | | | | | | |
| Number of control symbols | | 2 | | | | | | |
| PDSCH mapping type | | Type A | | | | | | |
| Information Bit Payload | | | | | | | | |
| For slots with RMSI Note 2 | bits | 1608 | | | | | | |
| For slots without RMSI | bits | 1864 | | | | | | |
| Number of Code Blocks per slot | | 1 | | | | | | |
| Binary Channel Bits Per slot | | | | | | | | |
| For slots with RMSI Note 2, Note 4 | bits | 5184 | | | | | | |
| For slots without RMSI Note 6 | bits | 6048 | | | | | | |

Note 1: Allocated outside the discovery burst transmission window in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
Note 2: PDSCH is scheduled on the slots with RMSI.
Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [8].
Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3A.
Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
Note 7: PDSCH is transmitted during the RMC burst as specified in A.1A.5.

# A.1A.2 CORESET for RMSI scheduling

## A.1A.2.1 TDD

**Table A.1A.2.1-1: RMSI CORESET Reference Channel under CCA for SCS=30KHz**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CR.1.1 CCA | | | | | | |
| Channel bandwidth | MHz | 40 | | | | | | |
| Subcarrier spacing | kHz | 30 | | | | | | |
| Allocated resource blocks for RMSI CORESET Note 7 | | 48 | | | | | | |
| SSB and RMSI CORESET multiplexing configuration Note 7 | | Pattern 1 | | | | | | |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note 8) | | | | | | |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 | | Index 0 | | | | | | |
| Number of transmitter antennas | | 1 | | | | | | |
| Duration of RMSI CORESET Note 7 | symbols | 2 | | | | | | |
| DCI Format Note 1 | | Note 2 | | | | | | |
| Aggregation level | CCE | 8 | | | | | | |
| DMRS precoder granularity | | 6 | | | | | | |
| REG bundle size | | 6 | | | | | | |
| Mapping from REG to CCE | | Distributed | | | | | | |
| Cell ID | | Note 5 | | | | | | |
| Payload (without CRC) | bits | Note 6 | | | | | | |

Note 1: DCI formats are defined in TS 38.212 [31].
Note 2: DCI format shall depend upon the test configuration.
Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
Note 5: Cell ID shall depend upon the test configuration.
Note 6: Payload size shall depend upon the test configuration.
Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 4 in Table 13-4A in TS 38.213 [8].
Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

# A.1A.3 CORESET for RMC scheduling

## A.1A.3.1 TDD

**Table A.1A.3.1-1: Control Channel RMC under CCA with SCS=30KHz**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CCR.1.1 CCA | CCR.1.2 CCA | CCR.1.3 CCA | | | | |
| Channel bandwidth | MHz | 40 | 40 | 40 | | | | |
| Subcarrier spacing | kHz | 30 | 30 | 30 | | | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 24 | 18 | | | | |
| Number of transmitter antennas | | 1 | 1 | 1 | | | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| REG bundle size | | 6 | 6 | 6 | | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | | | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | | | | |
| Interleave n_shift | | 0 | 0 | 0 | | | | |
| Interleave size | | 2 | 2 | 2 | | | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | | | | |
| Aggregation level | CCE | 4 | 8 | 4 | | | | |
| DCI formats | | Note 1 | Note 1 | Note 1 | | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | | | | |

# A.1A.4 TDD UL/DL configuration

## A.1A.4.1 TDD

**Table A.3.1A.4-1: TDD UL/DL configuration under CCA for SCS=30kHz**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | TDDConf.1.1 CCA | | |
| *referenceSubcarrierSpacing* | kHz | N/A | | |
| TDD UL/DL pattern 1 Note 2, Note 3 | | '3D1S4U' S='6DL:4GP:4UL' | | |
| *dl-UL-TransmissionPeriodicity* | ms | N/A | | |
| *nrofDownlinkSlots* | | N/A | | |
| *nrofDownlinkSymbols* | | N/A | | |
| *nrofUplinkSlot* | | N/A | | |
| *nrofUplinkSymbols* | | N/A | | |
| TDD UL/DL pattern 2 Note 2, Note 3 | | 'DD' | | |
| *dl-UL-TransmissionPeriodicity* | ms | N/A | | |
| *nrofDownlinkSlots* | | N/A | | |
| *nrofDownlinkSymbols* | | N/A | | |
| *nrofUplinkSlot* | | N/A | | |
| *nrofUplinkSymbols* | | N/A | | |
| Note 1: As specified in TS 38.213 [8] and TS 38.331 [13].<br>Note 2: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration<br>Note 3: The UE will be scheduled via DCI according to the TDD pattern defined in the table. | | | | |

# A.1A.5 RMC burst transmission model

RMC not conveying RMSI is scheduled during the RMC burst. The length of the transmission burst in slots is defined as N. The burst transmission format is determined according to the steps below:

1. Select N randomly from a given set of the number of slots $S_1 = \{1,3,5\}$ with equal probability as the total length of RMC burst transmission format.

2. A uniform random variable from 0 to 1 is generated. If the random variable is less than $P_{CCA_DL}$, a burst of N fully occupied slots is transmitted. Otherwise, the RMC burst transmission is muted and the muting duration is the same as the number N of slots for determined burst format.

RMC burst transmission is scheduled outside discovery burst transmission window. If transmission occurred in the previous slot, transmission is muted for a duration of one slot. Additionally, if the start time of the candidate RMC burst transmission is within 5 slots of the start of the discovery burst transmission window, RMC transmission is not performed.

# A.2 Reference OCNG configuration

## A.2.1 Generic OFDMA channel noise generator (OCNG)

The OCNG pattern is used in a test for modelling the allocation of unused resourced in the channel bandwidth to virtual UEs (UEs that are not under test). The OCNG pattern simulates both PDCCH and PDSCH transmissions to the virtual UEs. For the cells operating under CCA, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during the slots for which CCA attempt is unsuccessful or during DBT windows.

**Table A.2.1-1: OP.1: Generic OCNG pattern for all unused REs**

| OCNG Parameters | Control Region | Data Region |
|---|---|---|
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.<br>NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case. | | |

**Table A.2.1-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup**

| OCNG Parameters | Control Region | Data Region |
|---|---|---|
| Probe | Transmitting the serving beam | |
| Resource allocation | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.<br>NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case.<br>NOTE 3: No OCNG is transmitted from the probe transmitting non-serving beam. | | |

**Table A.2.1-3: OP.3: Generic OCNG pattern for unused REs in the same BW as CORESET**

| OCNG Parameters | Control Region | Data Region |
|---|---|---|
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |

| | | |
|---|---|---|
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.<br>NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell. | | |

**Table A.2.1-4: OP.4: Generic OCNG pattern for all unused REs outside SSB slot(s)**

| OCNG Parameters | Control Region | Data Region |
|---|---|---|
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell.<br>NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell. | | |

**Table A.2.1-5: OP.5: Generic OCNG pattern for unused REs in the same BW as CORESET for 2AoA setup**

| OCNG Parameters | Control Region | Data Region |
|---|---|---|
| Probe | Transmitting the serving beam | |
| Resource allocation | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.<br>NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.<br>NOTE 3: No OCNG is transmitted from the probe transmitting non-serving beam. | | |

# A.3 Reference SSB configuration

## A.3.1 SSB configuration for FR1

**Table A.3.1-1: SSB allocation for FR1**

| SSB Parameters | Unit | Value | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSB Pattern | | SSB.1 FR1 | SSB.2 FR1 | SSB.3 FR1 | | SSB.4 FR1 | | SSB.5 FR1 | SSB.6 FR1 | SSB.7 FR1 | | SSB.8 FR1 | | SSB.13 FR1 | | | | | |
| Channel bandwidth | MHz | 10 | 40 | 10 | | 40 | | 10 | 40 | 10 | | 40 | | 3 | | | | | |
| SSB SCS | kHz | 15 | 30 | 15 | | 30 | | 15 | 30 | 15 | | 30 | | 15 | | | | | |
| SSB periodicity ($T_{SSB}$) | ms | 20 | | | | | | | | | | | | | | | | | |
| Number of SSBs per SS-burst | | 1 | 1 | 2 | | 2 | | 1 | 1 | 2 | | 2 | | 1 | | | | | |
| SS/PBCH block index | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 3 | 2 | 3 | 0 | | | | | |
| Indices of symbols containing SSB | | 2-5 | 4-7 or 2-5 Note 2 | 2-5 | 8-11 | 4-7 or 2-5 Note 2 | 8-11 | 2-5 | 4-7 or 2-5 Note 2 | 2-5 | 8-11 | 4-7 or 2-5 Note 2 | 8-11 | 2-5 | | | | | |
| Indices of slots containing SSB | | 0 | | | | | | | | | | | | | | | | | |
| Indices of SFN containing SSB | | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | | | | | | SFN mod (max($T_{SSB}$,10ms)/10ms) = 1 | | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | | | | | | | | | |
| RB numbers containing SSB within channel BW | | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)Note 1 | | | | | | | | | | | | ($RB_J$, $RB_{J+1}$,…., $RB_{J+11}$)Note 1 | | | | | |

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: Symbols 4-7 are chosen if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [28]; Otherwise, symbols 2-5 are chosen.

## A.3.2 SSB configuration for FR2

**Table A.3.2-1: SSB allocation for FR2**

| SSB Parameters | Unit | Value | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSB Pattern | | SSB.1 FR2 | | SSB.2 FR2 | | SSB.3 FR2 | SSB.4 FR2 | | SSB.5 FR2 | | SSB.6 FR2 | | SSB.7 FR2 | SSB.8 FR2 | | SSB.9 FR2 | | SSB.10 FR2 | |
| Channel bandwidth | MHz | 100 | | | | | | | | | | | | | | | | | |
| SSB SCS | kHz | 120 | | 240 | | 120 | 240 | | 120 | | 240 | | 120 | 240 | | 120 | | 240 | |
| SSB periodicity ($T_{SSB}$) | ms | 20 | | | | | | | | | | | | | | | | | |
| Number of SSBs per SS-burst | | 2 | | 2 | | 1 | 1 | | 2 | | 2 | | 1 | 1 | | 2 | | 2 | |
| SS/PBCH block index | | 0 | 1 | 0 | 1 | 0 | 0 | | 2 | 3 | 2 | 3 | 1 | 1 | | 2 | 3 | 2 | 3 |
| Indices of symbols containing SSB | | 4-7 | 8-11 | 8-11 | 12-13, 0-1 | 4-7 | 8-11 | | 2-5 | 6-9 | 2-5 | 6-9 | 8-11 | 12-13, 0-1 | | 2-5 | 6-9 | 4-7 | 8-11 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indices of slots containing SSB | | 0 | 0 | 0-1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0-1 | 1 | 1 | 1 | 1 |
| Indices of SFN containing SSB | | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | | | | | | | | | | | | | | |
| RB numbers containing SSB within channel BW | | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)[Note 1] | | | | | | | | | | | | | | |
| NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28]. | | | | | | | | | | | | | | | | |

# A.3A Reference SSB configuration under CCA

## A.3A.1 SSB configuration under CCA for FR1

### A.3A.1.1 SSB pattern 1 under CCA for semi-static channel access: SSB allocation for SSB SCS=30kHz in 40MHz

**Table A.3A.1.1-1: SSB.1 CCA: SSB Pattern 1 for SSB under CCA for SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values |
|---|---|
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity ($T_{SSB}$) | 20 ms |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 1 |
| Number of SS/PBCH block candidates per SSB index | 1 |
| SS/PBCH block candidate position | 0 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB [Note 2] | 2-5 |
| Slot numbers containing SSB [Note 2] | 0 |
| SFN containing SSB | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)[Note 1] |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28]. | |
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves | |

### A.3A.1.2 SSB pattern 2 under CCA for dynamic channel access: SSB allocation for SSB SCS=30kHz in 40MHz

**Table A.3A.1.2-1: SSB.2 CCA: SSB Pattern 2 for SSB under CCA for SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values | |
|---|---|---|
| Channel bandwidth | 40 MHz | |
| SSB SCS | 30 kHz | |
| SSB periodicity ($T_{SSB}$) | 20 ms | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 1 | |
| Number of SS/PBCH block candidates per SSB index | 2 | |
| SS/PBCH block candidate position | 0 | 2 |
| SS/PBCH block index | 0 | 0 |
| Symbol numbers containing SSB [Note 2] | 2-5 | 2-5 |
| Slot numbers containing SSB [Note 2] | 0 | 1 |
| SFN containing SSB | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)[Note 1] | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28]. | | |

| |
|---|
| Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves |

### A.3A.1.3 SSB pattern 3 under CCA for semi-static channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3A.1.3-1: SSB.3 CCA: SSB Pattern 3 for SSB under CCA for SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values | |
|---|---|---|
| Channel bandwidth | 40 MHz | |
| SSB SCS | 30 kHz | |
| SSB periodicity ($T_{SSB}$) | 20 ms | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 2 | |
| Number of SS/PBCH block candidates per SSB index | 1 | |
| SS/PBCH block candidate position | 0 | 1 |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSB Note 2 | 2-5 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 | 0 |
| SFN containing SSB | SFN mod ($\max(T_{SSB},10ms)/10ms$) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].<br>Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves. | | |

### A.3A.1.4 SSB pattern 4 under CCA for dynamic channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3A.1.4-1: SSB.4 CCA: SSB Pattern 4 for SSB under CCA for SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values | | | |
|---|---|---|---|---|
| Channel bandwidth | 40 MHz | | | |
| SSB SCS | 30 kHz | | | |
| SSB periodicity ($T_{SSB}$) | 20 ms | | | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 2 | | | |
| Number of SS/PBCH block candidates per SSB index | 2 | | | |
| SS/PBCH block candidate position | 0 | 2 | 1 | 3 |
| SS/PBCH block index | 0 | 0 | 1 | 1 |
| Symbol numbers containing SSB Note 2 | 2-5 | 2-5 | 8-11 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 | 1 | 0 | 1 |
| SFN containing SSB | SFN mod ($\max(T_{SSB},10ms)/10ms$) = 0 | | | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) Note 1 | | | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].<br>Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves. | | | | |

## A.3B Reference SSB configuration for RedCap

### A.3B.1 SSB configuration for FR1

**Table A.3B.1-1: SSB allocation for FR1**

| SSB Parameters | Unit | Value |
|---|---|---|

| SSB Pattern | | | SSB.1 RedCap FR1 | SSB.2 RedCap FR1 | SSB.3 RedCap FR1 | SSB.4 RedCap FR1 | SSB.5 RedCap FR1 | SSB.6 RedCap FR1 | SSB.7 RedCap FR1 |
|---|---|---|---|---|---|---|---|---|---|
| Channel bandwidth | | MHz | 20 | 20 | 20 | 10 | 20 | 10 | 20 |
| SSB SCS | | kHz | 30 | 30 | 30 | 15 | 30 | 15 | 30 |
| SSB periodicity ($T_{SSB}$) | | ms | 20 | 20 | 20 | 20 | 20 | 80 | 80 |
| Number of SSBs per SS-burst | | | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Symbol numbers containing SSB Note 4 | SSB #0 | | 4-7 or 2-5 Note 3 | 4-7 or 2-5 Note 3 | 4-7 or 2-5 Note 3 | 2-5 | 4-7 or 2-5 Note 3 | 2-5 | 4-7 or 2-5 Note 3 |
| | SSB #1 | | N/A | 8-11 | N/A | N/A | N/A | N/A | N/A |
| Slot numbers containing SSB Note 4 | | | 0 | | | | | | |
| SFN containing SSB | | | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 1 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 |
| RB numbers containing SSB within channel BW | | | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)Note 1 | | | | | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)Note 2 | |

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [28].
NOTE 3: Symbols 4-7 are chosen if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [28]; Otherwise, symbols 2-5 are chosen.
NOTE 4: These values have been derived from other parameters for information purposes (as per TS 38.213). They are not settable parameters themselves

# A.3B.2 SSB configuration for FR2

**Table A.3B.2-1: SSB allocation for FR2**

| SSB Parameters | | Unit | Value | | | | |
|---|---|---|---|---|---|---|---|
| SSB Pattern | | | SSB.1 RedCap FR2 | SSB.2 RedCap FR2 | SSB.3 RedCap FR2 | SSB.4 RedCap FR2 | SSB.5 RedCap FR2 |
| Channel bandwidth | | MHz | 100 | 100 | 100 | 100 | 100 |
| SSB SCS | | kHz | 120 | 120 | 120 | 240 | 240 |
| SSB periodicity ($T_{SSB}$) | | ms | 20 | 40 | 80 | 40 | 80 |
| Number of SSBs per SS-burst | | | 1 | 1 | 1 | 1 | 1 |
| Symbol numbers containing SSB Note 3 | SSB #0 | | 4-7 | 4-7 | 4-7 | 8-11 | 8-11 |
| | SSB #1 | | N/A | N/A | N/A | N/A | N/A |
| Indices of slots containing SSB Note 3 | | | 0 | | | | |
| Indices of SFN containing SSB | | | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 | SFN mod ($T_{SSB}$ /10ms) = 0 |
| RB numbers containing SSB within channel BW | | | ($RB_J$,$RB_{J+1}$,….,$RB_{J+19}$)Note 1 | | ($RB_J$,$RB_{J+1}$,…., $RB_{J+19}$)Note 2 | ($RB_J$,$RB_{J+1}$,…., $RB_{J+19}$)Note 1 | ($RB_J$,$RB_{J+1}$,…., $RB_{J+19}$)Note 2 |

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [28].
NOTE 3: These values have been derived from other parameters for information purposes (as per TS 38.213). They are not settable parameters themselves

# A.4 Reference SMTC configuration

**Table A.4-1: SMTC configurations set1**

| SMTC Parameters | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SMTC Pattern | | SMTC.1 | SMTC.2 | SMTC.3 | SMTC.4 | SMTC.5 | SMTC.6 | SMTC.7 | SMTC.8 |
| SMTC periodicity | ms | 20 | 20 | 160 | 20 | 20 | 20 | 20 | 10 |
| SMTC offset | ms | 0 | 0 | 0 | 10 | 10 | 17 | 5 | 0 |
| SMTC duration | ms | 1 | 5 | 1 | 1 | 5 | 5 | 5 | 1 |

**Table A.4-2: SMTC configurations set2**

| SMTC Parameters | Unit | Value | | | |
|---|---|---|---|---|---|
| SMTC Pattern | | SMTC.9 | SMTC.10 | SMTC.11 | SMTC.12 |
| SMTC periodicity | ms | 20 | 80 | 80 | 20 |
| SMTC offset | ms | 13 | 0 | 5 | 4 |
| SMTC duration | ms | 1 | 1 | 5 | 5 |

# A.4A Reference SMTC configuration for RedCap

**Table A.4A-1: SMTC configurations**

| SMTC Parameters | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| SMTC Pattern | | SMTC.1 RedCap | SMTC.2 RedCap | SMTC.3 RedCap | SMTC.4 RedCap | | |
| SMTC periodicity | ms | 40 | 80 | 40 | 80 | | |
| SMTC offset | ms | 0 | 0 | 20 | 0 | | |
| SMTC duration | ms | 1 | 1 | 1 | 5 | | |

# A.5 Reference DRX configurations

The reference DRX configurations for the NR serving cell are captured in Table A.5-1. The reference DRX configurations for the E-UTRA serving cell for EN-DC and inter-RAT test cases are captured in Table A.5-2.

**Table A.5-1: DRX configurations for NR serving cell**

| Parameter | Unit | Value | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DRX Configuration | | DRX.1 | DRX.2 | DRX.3 | DRX.6 | DRX.7 | DRX.8 | DRX.11 | DRX.X1 | DRX.14 |
| drx-onDurationTimer | ms | 1 | 1 | 6 | 1 | 6 | 6 | 6 | 6 | 6 |
| drx-InactivityTimer | ms | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| drx-RetransmissionTimerDL | slot | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| drx-RetransmissionTimerUL | slot | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| drx-LongCycleStartOffset | ms | 40 | 640 | 40 | 320 | 640 | 320 | 20 | 80 | 160 |
| shortDRX | - | disabled | disabled | disabled | disabled | disabled | disabled | disabled | disabled | disabled |
| TimeAlignmentTimer | ms | 500 | 500 | Infinity | 500 | Infinity | Infinity | Infinity | Infinity | Infinity |
| NOTE 1: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | | | | | | | | | | |

**Table A.5-2: DRX configurations for E-UTRA serving cell**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| DRX Configuration | | DRX.4 | DRX.5 | DRX.9 | DRX.10 | DRX.12 |
| drx-onDurationTimer | ms | psf2 | psf6 | psf2 | psf6 | psf6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| drx-InactivityTimer | ms | psf2 | psf1920 | psf100 | psf1920 | psf2 |
| drx-RetransmissionTimerDL | slot | psf16 | psf16 | psf16 | psf16 | psf16 |
| drx-LongCycleStartOffset | ms | sf160, 0 | sf320. 0 | sf40, 0 | sf640. 0 | sf640, 0 |
| shortDRX | - | disabled | disabled | disabled | disabled | disabled |
| TimeAlignmentTimer | ms | Infinity | Infinity | 500 | 500 | Infinity |
| NOTE 1: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 36.331 [29] | | | | | | |

# A.6 EN-DC test setup

The purpose of this Annex is to specify the EN-DC configuration for the test cases in Chapters 4 and 5 of this test specification.

## A.6.1 E-UTRA serving cell parameters

This clause defines the cell power levels and other specific cell parameters of the E-UTRA serving cell for EN-DC.

### A.6.1.1 E-UTRA serving cell parameters for EN-DC tests with NR FR1

Table A.6.1.1-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR1 cell(s), defined in Chapter 4 of this test specification and for iRAT tests with E-UTRA serving cell and NR FR1 cell(s) defined in Chapter 8 of this test specification. Unless otherwise stated within the test, all measurements in Clauses 4 and 5 are performed only on the NR carrier. The E-UTRA PCell shall be configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

**Table A.6.1.1-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR1**

| Parameter | Unit | E-UTRAN Cell1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ [Note 6] | | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2, Note 6] | | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD<br>5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2, Note 6] | | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD<br>5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD |
| OCNG Patterns[Note 2] | | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD<br>5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |

| | | |
|---|---|---|
| PDSCH_RB | dB | |
| OCNG_RA Note 3 | dB | |
| OCNG_RB Note 3 | dB | |
| $N_{oc}$ Note 4 | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP Note 5 | dBm/15 kHz | -87 |
| SCH_RP Note 5 | dBm/15 kHz | -87 |
| Io Note 5 | dBm/Ch BW | -59.13 + 10log($N_{RB,c}$ /50) |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |
| NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24]. | | |
| NOTE 2: DL RMCs and OCNG patterns are specified in clauses A.1, A.2 and D.1 of TS 36.521-3 [26]. | | |
| NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |
| NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled. | | |
| NOTE 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |
| NOTE 6: For E-UTRA anchor configuration, pick 5 MHz as default channel bandwidth setting in the tests as it is supported by all E-UTRA bands. If none of the UE supported EN-DC band combos support 5MHz E-UTRA carrier, pick 20 MHz channel BW or 10 MHz channel BW, in that order, | | |

**Table A.6.1.1-2: *CQI-ReportConfig-DEFAULT:* Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | NOT PRESENT | | |
| cqi-ReportPeriodic | NOT PRESENT | | |
| } | | | |

**Table A.6.1.1-3:*PhysicalConfigDedicated-DEFAULT:* Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.8.2, Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| soundingRS-UL-ConfigDedicated | Not present | | RBC |
| } | | | |

**Table A.6.1.1-4:*MAC-MainConfig-RBC*: Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| timeAlignmentTimerDedicated | Infinity | | |

## A.6.1.2 E-UTRA serving cell parameters for EN-DC tests with NR FR2

Table A.6.1.2-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR2 cell(s), defined in Chapter 5 of this test specification and for iRAT tests with E-UTRA serving cell and NR FR1 cell(s) defined in Chapter 8 of this test specification. Unless otherwise stated within the test, all measurements in Clauses 5 and 7 are performed only on the NR carrier. The E-UTRA PCell shall configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

**Table A.6.1.2-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR2**

| Parameter | Unit | E-UTRAN Cell1 |
|---|---|---|
| E-UTRA RF Channel Number | | 1 |
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration Note1 | | 6 |
| TDD uplink-downlink configuration Note1 | | 1 |

| | | |
|---|---|---|
| $BW_{channel}$ Note 5 | MHz | 5MHz: $N_{RB,c}$ = 25<br>10MHz: $N_{RB,c}$ = 50<br>20MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel Note2, Note 5 | | 5MHz: R.7 FDD<br>10MHz: R.3 FDD<br>20MHz: R.6 FDD<br>5MHz: R.4 TDD<br>10MHz: R.0 TDD<br>20MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel Note2, Note 5 | | 5MHz: R.11 FDD<br>10MHz: R.6 FDD<br>20MHz: R.10 FDD<br>5MHz: R.11 TDD<br>10MHz: R.6 TDD<br>20MHz: R.10 TDD |
| OCNG Patterns Note2, Note 5 | | 5MHz: OP.20 FDD<br>10MHz: OP.10 FDD<br>20MHz: OP.17 FDD<br>5MHz: OP.9 TDD<br>10MHz: OP.1 TDD<br>20MHz: OP.7 TDD |
| PBCH_RA | dB | 0 |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA Note3 | dB | |
| OCNG_RB Note3 | dB | |

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 1, A.2 and D.1 of TS 36.521-3 [26].
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and is not expected to influence the NR FR2 requirement.
NOTE 5: The For E-UTRA anchor configuration, pick 5 MHz as default channel bandwidth setting in the tests as it is supported by all E-UTRA bands. If none of the UE supported EN-DC band combos support 5MHz E-UTRA carrier, pick 20 MHz channel BW or 10 MHz channel BW, in that order,

**Table A.6.1.2-2: *CQI-ReportConfig-DEFAULT:* Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | NOT PRESENT | | |
| cqi-ReportPeriodic | NOT PRESENT | | |
| } | | | |

**Table A.6.1.2-3:*PhysicalConfigDedicated-DEFAULT:* Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.8.2, Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| soundingRS-UL-ConfigDedicated | Not present | | RBC |
| } | | | |

**Table A.6.1.2-4:*MAC-MainConfig-RBC*: Additional E-UTRA Anchor Configuration**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| timeAlignmentTimerDedicated | Infinity | | |

# A.6A NR FR1-FR2 test setup

Some test cases in clause 7 have NR cells in both FR1 and FR2. Unless otherwise stated within the test, the NR FR1 Cell signal is required only to provide a link to the UE under test. The Test Equipment shall provide a stable and noise-free NR FR1 signal without need of precise propagation modelling, path loss and polarization control. Further details of the NR FR1 signal configuration are not defined as part of the cell specific test parameters, since the NR FR1 link is not under performance verification and is not expected to influence the test purpose.

# A.6B EN-DC test setup with unlicensed bands

## A.6B.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) under CCA in FR1

Table A.6B.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells under CCA in FR1. Unless otherwise stated within the test, all measurements are performed only on the unlicensed NR carrier. The E-UTRA serving cell shall configured to not interfere with NR operation and the E-UTRA serving cell signal power shall not be critical to the test purpose.

**Table A.6B.1-1: E-UTRAN cell specific test parameters for tests with all NR cells user CCA in FR1**

| Parameter | Unit | E-UTRAN Cell |
|---|---|---|
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>20 MHz: OP.7 TDD |
| PBCH_RA | dB | |
| PBCH_RB | dB | |
| PSS_RA | dB | |
| SSS_RA | dB | |

| | | |
|---|---|---|
| PCFICH_RB | dB | |
| PHICH_RA | dB | |
| PHICH_RB | dB | 0 |
| PDCCH_RA | dB | |
| PDCCH_RB | dB | |
| PDSCH_RA | dB | |
| PDSCH_RB | dB | |
| OCNG_RA Note3 | dB | |
| OCNG_RB Note3 | dB | |
| $N_{oc}$ Note4 | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | $-59.13+10\log(N_{RB,c}/50)$ |
| Propagation Condition | | AWGN |
| Antenna Configuration | | 1x2 |

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.
Note 3: OCNG shall be used such that all cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.7 Reference PRACH configurations

This clause provides the typical PRACH configurations used for all RRM test cases defined in this test specification. Parameters not listed in this clause can be derived from the configuration of each test.

## A.7.1 PRACH configurations for FR1

Table A.7.1-1 defines the PRACH configurations for FR1. Each of the PRACH configurations defined in Table A.7.1-1 have different applicabilities:

- PRACH.1 FR1 for SSB-based contention based random access in FR1.
- PRACH.2 FR1 for SSB-based non-contention based random access in FR1.
- PRACH.3 FR1 for CSI-RS based non-contention based random access in FR1.
- PRACH.4 FR1 for CSI-RS based non-contention based random access in FR1 to convey BFR.
- PRACH.6 FR1 for SSB-based contention free random access in FR1.

The PRACH configuration defined in Table A.7.1-2 has the following applicability:

- PRACH.5 FR1 for LTM early UL synchronization on candidate cell in FR1.

**Table A.7.1-1 Parameters for PRACH Configurations for FR1**

| Field | Value | | | | | Comment |
|---|---|---|---|---|---|---|
| PRACH Configuration | PRACH.1 FR1 | PRACH.2 FR1 | PRACH.3 FR1 | PRACH.4 FR1 | PRACH.6 FR1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *prach-ConfigurationIndex* | 102 | 102 | 102 | 102 | 102 | 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7]. |
| *msg1-SubcarrierSpacing* | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | |
| *totalNumberOfRA-Preambles* | 48 | 48 | 48 | 48 | 48 | Total number of preambles used for contention based and contention free random access |
| *numberOfRA-PreamblesGroupA* | 48 | 48 | 48 | 48 | 48 | No group B. |
| *prach-RootSequenceIndex* | 0 | 0 | 0 | 0 | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| *ssb-perRACH-OccasionAndCB-PreamblesPerSSB* | oneFourth, n48 | - | - | - | oneFourth, n16 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB |
| *ssb-perRACH-Occasion* | - | oneFourth | oneFourth | oneFourth | - | OneFourth: 1 SSB associated with 4 RACH occasions |
| *msg1-FDM* | One | One | One | One | One | One PRACH transmission occasions FDMed in one time instance. |
| *rsrp-ThresholdSSB* | RSRP_51 | RSRP_51 | N/A | RSRP_51 | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| *rsrp-ThresholdCSI-RS* | N/A | N/A | RSRP_51 | N/A | N/A | |
| *ra-ContentionResolutionTimer* | sf48 | - | - | - | sf48 | 48 sub-frames |
| *powerRampingStep* | dB2 | dB2 | dB2 | dB2 | dB2 | |
| *preambleReceivedTargetPower* | dBm-120 | dBm-120 | dBm-120 | dBm-120 | dBm-120 | |
| *preambleTransMax* | n6 | n6 | n6 | n200 | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| *ra-ResponseWindow* | sl10 | sl10 | sl10 | sl1 | sl10 | 10 slots |
| *zeroCorrelationZoneConfig* | 11 | 11 | 11 | 11 | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 2 | 2 | 2 | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| *ssb-ResourceList* | - | present | N/A | N/A | - | Associated with SSB index 0 |
| ra-PreambleIndex | - | 40 | N/A | N/A | - | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| *BFR-SSB-Resource* | - | present | N/A | N/A | - | Associated with SSB index 0 |
| ra-PreambleIndex | - | 40 | N/A | N/A | - | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| *csirs-ResourceList* | N/A | N/A | present | present | N/A | Associated with CSI-RS configured |
| ra-PreambleIndex | N/A | N/A | 40 | 40 | N/A | Associated with CSI-RS configured |
| *ra-OccasionList* | - | - | 1 | 1 | - | RA occasions allowed corresponding to CSI-RS |
| *ra-ssb-OccasionMaskIndex* | - | 1 | N/A | N/A | - | PRACH occasion index 1 is allowed |
| NOTE: For further information see Clause 6.3.2 in TS 38.331 [13]. | | | | | | |

**Table A.7.1-2 Parameters for LTM early UL synchronization PRACH Configuration for FR1**

| Field | Value | Comment |
|---|---|---|
| PRACH Configuration | PRACH.5 FR1 | |
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [7]. |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msg1-FrequencyStart | 0 | |

| | | |
|---|---|---|
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| preambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | |
| powerRampingStep | dB2 | |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ltm-prach-SubcarrierSpacing | Same as UL carrier SCS | |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

# A.7.1A PRACH configurations for FR1 under CCA

## A.7.1A.1 FR1 PRACH configuration 1 under CCA

Table A.7.1A.1-1 provides PRACH configuration 1 for SSB-based contention based random access in FR1 under CCA.

**Table A.7.1A.1-1: Parameters for FR1 PRACH configuration 1 under CCA**

| Field | Value | Comment |
|---|---|---|
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [7]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS | |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| rsrp-ThresholdSSB | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| powerRampingStep | dB2 | |
| preambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 PRACH configuration 1 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| ra-ResponseWindow | Sl20 | 20 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

## A.7.1A.2 FR1 PRACH configuration 2 under CCA

Table A.7.1A.2-1 provides PRACH configuration 2 for SSB-based contention based random access in FR1 under CCA.

**Table A.7.1A.2-1: Parameters for FR1 PRACH configuration 2 under CCA**

| Field | Value | Comment |
|---|---|---|
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [7]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS | |

| | | |
|---|---|---|
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 | |
| preambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 PRACH configuration 2 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| ra-ResponseWindow | sl20 | 20 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| *ssb-ResourceList* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| *BFR-SSB-Resource* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| rsrp-ThresholdSSB | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

## A.7.2 PRACH configurations for FR2

Table A.7.2-1 defines the PRACH configurations for FR2. Each of the PRACH configurations defined in Table A.7.2-1 have different applicabilities:

- PRACH.1 FR2 for SSB-based contention based random access in FR2.
- PRACH.2 FR2 for SSB-based non-contention based random access in FR2.
- PRACH.3 FR2 for CSI-RS based non-contention based random access in FR2.
- PRACH.4 FR2 for CSI-RS based non-contention based random access in FR2 to convey BFR.
- PRACH.6 FR2 for SSB-based contention free random access in FR2.

The PRACH configuration defined in Table A.7.2-2 has the following applicability:

- PRACH.5 FR2 for LTM early UL synchronization on candidate cell in FR2.

**Table A.7.2-1 Parameters for PRACH Configurations for FR2**

| Field | Value | | | | | Comment |
|---|---|---|---|---|---|---|
| PRACH Configuration | PRACH.1 FR2 | PRACH.2 FR2 | PRACH.3 FR2 | PRACH.4 FR2 | PRACH.6 FR2 | |
| *prach-ConfigurationIndex* | 190 | 190 | 190 | 190 | 190 | Preamble format C2, 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [7]. |

| | | | | | | |
|---|---|---|---|---|---|---|
| *msg1-SubcarrierSpacing* | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | Same as UL carrier SCS | |
| *totalNumberOfRA-Preambles* | 48 | 48 | 48 | 48 | 48 | Total number of preambles used for contention based and contention free random access |
| *numberOfRA-PreamblesGroupA* | 48 | 48 | 48 | 48 | 48 | No group B. |
| *prach-RootSequenceIndex* | 0 | 0 | 0 | 0 | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| *ssb-perRACH-OccasionAndCB-PreamblesPerSSB* | oneFourth, n48 | N/A | N/A | N/A | oneFourth, n16 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB |
| *ssb-perRACH-Occasion* | N/A | oneFourth | oneFourth | oneFourth | N/A | OneFourth: 1 SSB associated with 4 RACH occasions |
| *msg1-FDM* | One | One | One | One | One | One PRACH transmission occasions FDMed in one time instance. |
| *rsrp-ThresholdSSB* | RSRP_51 | RSRP_51 | N/A | RSRP_51 | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [13]. |
| *rsrp-ThresholdCSI-RS* | N/A | N/A | RSRP_51 | N/A | N/A | |
| *ra-ContentionResolutionTimer* | sf48 | N/A | N/A | N/A | sf48 | 48 sub-frames |
| *powerRampingStep* | dB2 | dB2 | dB2 | dB2 | dB2 | |
| *preambleReceivedTargetPower* | dBm-120 | dBm-120 | dBm-120 | dBm-120 | dBm-120 | |
| *preambleTransMax* | n6 | n6 | n6 | n200 | n6 | Max number of RA preamble transmission performed before declaring a failure |
| *ra-ResponseWindow* | sl10 | sl10 | sl10 | sl40 | sl10 | |
| *zeroCorrelationZoneConfig* | 11 | 11 | 11 | 11 | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 2 | 2 | 2 | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| *ssb-ResourceList* | - | present | N/A | N/A | - | Associated with SSB index 0 |
| ra-PreambleIndex | - | 40 | N/A | N/A | - | Associated with SSB index 0 |
| *csirs-ResourceList* | N/A | present | present | present | N/A | Associated with CSI-RS configured |
| ra-PreambleIndex | N/A | 40 | 40 | 40 | N/A | Associated with CSI-RS configured |
| *ra-OccasionList* | - | - | 1 | 1 | - | RA occasions allowed corresponding to CSI-RS |
| *ra-ssb-OccasionMaskIndex* | - | 1 | N/A | N/A | - | PRACH occasion index 1 is allowed |
| NOTE: For further information see Clause 6.3.2 in TS 38.331 [13]. | | | | | | |

**Table A.7.2-2 Parameters for LTM early UL synchronization PRACH Configuration for FR2**

| Field | Value | Comment |
|---|---|---|
| PRACH Configuration | PRACH.5 FR2 | |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [7] |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msg1-FrequencyStart | 0 | |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| preambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | |
| powerRampingStep | dB2 | |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ltm-prach-SubcarrierSpacing | Same as UL carrier SCS | |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

# A.7A Reference MsgA configurations

This clause provides the typical PRACH and PUSCH configurations for MsgA used for all RRM test cases defined in this test specification. Parameters not listed in this clause can be derived from the configuration of each test.

## A.7A.1 MsgA configurations for FR1

Table A.7A.1-1 defines the MsgA configurations for FR1. Each of the MsgA configurations defined in Table A.7A.1-1 have different applicabilities:

- MsgA.1 FR1 for SSB-based 2-step contention based random access in FR1.
- MsgA.2 FR1 for SSB-based 2-step non-contention based random access in FR1.

**Table A.7A.1-1 Parameters for MsgA Configurations for FR1**

| Field | Value | | Comment |
|---|---|---|---|
| MsgA Configuration | MsgA.1 FR1 | MsgA.2 FR1 | |
| msgA-prach-ConfigurationIndex | 102 | 102 | 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | - | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | dBm-120 | |
| preambleTransMax | n6 | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| ssb-ResourceList | - | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | - | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | - | 1 | PRACH occasion index 1 is allowed |
| msgA-MCS | 1 | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | 1 | Number of time domain PUSCH occasions in each slot |

| | | | |
|---|---|---|---|
| msgA-PUSCH-TimeDomainOffset | 1 | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | 0 | |
| PUSCH allocation length | 14 | 14 | |
| mappingTypeMsgA-PUSCH | typeA | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 0 | 0 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 2dB | 2dB | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Disabled | Whether to apply delta MCS |
| NOTE: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

# A.7A.1A MsgA configurations for FR1 under CCA

## A.7A.1A.1 FR1 MsgA configuration 1 under CCA

Table A.7A.1A.1-1 provides MsgA configuration 1 for SSB-based contention based random access for 2-step RA in FR1 under CCA.

**Table A.7A.1A.1-1: Parameters for FR1 MsgA configuration 1 under CCA**

| Field | Value | Comment |
|---|---|---|
| msgA-prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [7]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 MsgA configuration 1 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| msgB-ResponseWindow | sl20 | 20 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |

| | | |
|---|---|---|
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 0 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

## A.7A.1A.2 FR1 MsgA configuration 2 under CCA

Table A.7A.1A.2-1 provides MsgA configuration 2 for SSB-based contention based random access for 2-step RA in FR1 under CCA.

**Table A.7A.1A.2-1: Parameters for FR1 MsgA configuration 2 under CCA**

| Field | Value | Comment |
|---|---|---|
| msgA-prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [7]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 MsgA configuration 2 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| msgB-ResponseWindow | sl20 | 20 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |
| ssb-ResourceList | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |

| | | |
|---|---|---|
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 0 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [13]. | | |

# A.7A.2 MsgA configurations for FR2

Table A.7A.2-1 defines the MsgA configurations for FR2. Each of the MsgA configurations defined in Table A.7A.2-1 have different applicabilities:

- MsgA.1 FR2 for SSB-based contention based random access in FR2.
- MsgA.2 FR2 for SSB-based non-contention based random access in FR2.

**Table A.7A.2-1 Parameters for MsgA Configurations for FR2**

| Field | Value | | Comment |
|---|---|---|---|
| MsgA Configuration | MsgA.1 FR2 | MsgA.2 FR2 | |
| msgA-prach-ConfigurationIndex | 190 | 190 | Preamble Format C2, 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | - | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | dBm-120 | |
| preambleTransMax | n6 | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [12]. |

| | | | |
|---|---|---|---|
| ssb-ResourceList | - | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | - | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | - | 1 | PRACH occasion index 1 is allowed |
| msgA-MCS | 1 | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | 0 | |
| PUSCH allocation length | 10 | 10 | |
| mappingTypeMsgA-PUSCH | typeA | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 0 | 0 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 2 | 2 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Disabled | Whether to apply delta MCS |
| NOTE: For further information see clause 6.3.2 in TS 38.331 [13]. | | | |

# A.8 Reference BWP configurations

This clause provides the typical BWP configurations used for RRM test cases defined in this test specification. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.8.1 and for uplink BWP, dedicated BWP configurations are specified in clause A.8.2. Parameters not listed in this clause can be derived from the configuration of each test.

## A.8.1 Downlink BWP configurations

Table A.8.1-1 defines the different downlink initial BWP configurations. Table A.8.1-2 defines the different downlink dedicated BWP configurations.

**Table A.8.1-1: Downlink BWP patterns for initial BWP configuration**

| BWP Parameters | Unit | Values | | |
|---|---|---|---|---|
| **DL BWP** | | **DLBWP.0.1** | **DLBWP.0.2** | |
| Starting PRB index | | 0 | $RB_c$ Note 1 | |
| Bandwidth | | Same as RF channel defined in each test | same as RMSI CORSET(CORE SET #0) defined in each test | |
| NOTE 1: $RB_c$ is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.1.2. | | | | |

**Table A.8.1-2: Downlink BWP patterns for dedicated BWP configuration**

| BWP Parameters | Unit | Values | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DL BWP** | | **DLBWP.1.1** | **DLBWP.1.2** | | | | **DLBWP.1.3** | | | | **DLBWP.1.4** | | **DLBWP.1.7** | | | |
| Starting PRB index | | 0 | $RB_b$ Note 1 | | | | $RB_a$ Note 2 | | | | 0 | | $RB_c$ Note 3 | | | |
| SSB SCS | kHz | | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 | 120 | 240 | 15 | 30 | 120 | 240 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bandwidth | RB | Same as RF channel defined for the serving cell in each test | 25 | 51 | 32 | 48 | 25 | 51 | 32 | 48 | 24 | 24 | 25 | 51 | 32 | 48 |

NOTE 1: $RB_b$ is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.
NOTE 2: $RB_a$ is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.
NOTE 3: $RB_c$ is the PRB index having an offset of 6 PRBs with respect to the start of SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.

## A.8.2 Uplink BWP configurations

Table A.8.2-1 defines the uplink initial BWP configurations. Table A.8.2-2 defines the uplink dedicated BWP configurations.

**Table A.8.2-1: Uplink BWP patterns for initial BWP configurations**

| BWP Parameters | Values | |
|---|---|---|
| UL BWP | ULBWP.0.1 | ULBWP.0.2 |
| Staring PRB index | 0 | $RB_c$ Note 1 |
| Bandwidth | Same as RF channel defined in each test | same as RMSI CORESET(CORSET #0) defined in each test |

NOTE 1: RBc is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.1.2.

**Table A.8.2-2: Uplink BWP patterns for dedicated BWP configurations**

| BWP Parameters | Unit | Values | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UL BWP | | ULBWP.1.1 | ULBWP.1.2 | | | | ULBWP.1.3 | | | | ULBWP.1.4 | | ULBWP.1.7 | | | | |
| Staring PRB index | | 0 | $RB_b$ Note 1 | | | | $RB_a$ Note 2 | | | | 0 | | $RB_c$ Note 3 | | | | |
| SSB SCS | kHz | | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 | 120 | 240 | 15 | 30 | 120 | 240 | |
| Bandwidth | RB | Same as RF channel defined for the serving cell in each test | 25 | 51 | 32 | 48 | 25 | 51 | 32 | 48 | 24 | 24 | 25 | 51 | 32 | 48 | |

NOTE 1: $RB_b$ is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.
NOTE 2: $RB_a$ is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.
NOTE 3: $RB_c$ is the PRB index having an offset of 6 PRBs with respect to the start of SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.

# A.8A Reference BWP configurations for RedCap

This clause provides the typical BWP configurations used for RedCap RRM test cases defined in Annex A. RedCap downlink dedicated BWP configurations are specified in clause A.8A.1 and RedCap uplink dedicated BWP configurations are specified in clause A.8A.2. Other parameters not listed in this clause can be derived from the setup of each test.

## A.8A.1 Downlink BWP configurations

**Table A.8A.1-1: Downlink BWP patterns for RedCap dedicated BWP configuration**

| BWP Parameters | Unit | Values | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DL BWP | | DLBWP.1.1 RedCap | | | | DLBWP.1.2 RedCap | | | | DLBWP.1.3 RedCap | | | |
| Starting PRB index | | $RB_a$ Note 1 | | | | $RB_b$ Note 2 | | | | $RB_c$ Note 3 | | | |
| SSB SCS | kHz | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 |
| Bandwidth | RB | 25 | 25 | 32 | 16 | 25 | 25 | 32 | 16 | 25 | 25 | 32 | 16 |

NOTE 1: $RB_a$ is the lowest PRB index to guarantee the BWP including SSB PRB index ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) which is defined in Clause A.3.
NOTE 2: $RB_b$ is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) which is defined in Clause A.3.
NOTE 3: $RB_c$ is the lowest PRB index to guarantee the BWP including SSB PRB index ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) which is defined in Clause A.3A.

## A.8A.2 Uplink BWP configurations

**Table A.8A.2-1: Uplink BWP patterns for dedicated BWP configurations**

| BWP Parameters | Unit | Values | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UL BWP | | ULBWP.1.1 RedCap | | | | ULBWP.1.2 RedCap | | | | ULBWP.1.3 RedCap | | | |
| Starting PRB index | | $RB_a$ Note 1 | | | | $RB_b$ Note 2 | | | | $RB_c$ Note 3 | | | |
| SSB SCS | kHz | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 | 15 | 30 | 120 | 240 |
| Bandwidth | RB | 25 | 25 | 32 | 16 | 25 | 25 | 32 | 16 | 25 | 25 | 32 | 16 |
| NOTE 1: $RB_a$ is the same as $RB_a$ for DLBWP.1.1 RedCap. | | | | | | | | | | | | | |
| NOTE 2: $RB_b$ is the same as $RB_b$ for DLBWP.1.2 RedCap. | | | | | | | | | | | | | |
| NOTE 3: $RB_c$ is the same as $RB_c$ for DLBWP.1.3 RedCap. | | | | | | | | | | | | | |

# A.9 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in clause 5 and 7. The applicable AoA setup is defined in each test case in clause 5 and 7.

## A.9.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [3]).

## A.9.2 Setup 2: Single AoA in non Rx beam peak direction

### A.9.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

### A.9.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS). Unless otherwise specified by the test case, the TE shall alternate between a minimum of 33 different AoAs. The minimum separation between AoAs used in consecutive iterations shall be 30° in great-circle distance.

NOTE: if it is not possible to find at least 33 different test points meeting the required criteria (FFS), the test shall alternate between all the available test points.

## A.9.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The relative angular offset between the

directions (AoAs) of the 2 active probes, shall be changed for each test iteration. Unless otherwise specified by the test case, the TE shall alternate between a minimum of 33 different test points. A test point comprehends the relative angular offset between the active probes, and the AoA of each of the signals from the UE point of view. The relative angular offset between the active probes shall change for consecutive test points.

The applicable set of relative angular offsets between the 2 active probes is given in Table A.9.3-1 for each UE power class.

**Table A.9.3-1: Set of relative angular offsets between active probes for each power class**

| UE Power class | Relative angular offset between active probes |
|---|---|
| 1 | 30°, 60°, 90° and 120° |
| 2 | FFS |
| 3 | 30°, 60°, 90°, 120° and 150° |
| 4 | FFS |

NOTE: if it is not possible to find at least 33 different test points meeting the required criteria (that is, the two AoAs are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and the angular offset between them corresponds to one of the offsets in Table A.9.3-1 for the corresponding UE power class), the test shall alternate between all the available test points.

## A.9.4 Setup 4: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak

### A.9.4.1 Setup 4a: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak without change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [3]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The direction (AoA) of the non Rx beam peak signal shall not be changed between test iterations.

### A.9.4.2 Setup 4b: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak with change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [3]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class.

For UE power class 3, the relative angular offset between the directions (AoAs) of the 2 active probes shall be changed for each test iteration, within the probe alignment described above. The applicable set of relative angular offsets between the 2 active probes is given in Table A.9.3-1 for each UE power class. Unless otherwise specified by the test case, the TE shall alternate between a minimum of 5 different test points. A test point comprehends the relative angular offset between the active probes, and the AoA of each of the signals from the UE point of view, one of them being the Rx beam peak direction. The relative angular offset between the active probes shall change for consecutive test points.

NOTE: if it is not possible to find at least 5 different test points meeting the required criteria (that is, the two AoAs are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and the angular offset between them corresponds to one of the offsets in Table A.9.3-1 for the corresponding UE power class), the test shall alternate between all the available test points.

## A.9.5 Setup 5: 2 AoAs for simultaneous reception with QCL Type-D

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. The 2 AoAs (AoA1 and AoA2) for simultaneous reception with different QCL-typeD are from the set of AoA pairs, denoted by (AoA1, AoA2) that can support 2 AoA reception for UE declared AoA angular separation and declared

orientation in the positioner of the test system according to the spherical coverage requirement for simultaneous reception from multiple directions as defined in clause 7.3K.3 of TS 38.101-2 [3] for UE power class 3 supporting simultaneous reception from multiple directions. The angular separation between the directions (AoA1 and AoA2) of the 2 active probes is declared from Table 7.3K.3-1 in clause 7.3K.3 of TS 38.101-2 [3] and shall not be changed for each test iteration.

AoA1 needs to satisfy the spherical coverage requirement in Table 7.3.4.3-1 of TS 38.101-2 [3].

NOTE: The chosen AoA pair (AoA1, AoA2) is up to RAN5.

### A.9.6 Setup 6: 3 AoAs for simultaneous reception with different QCL Type-D

There are 3 active probes in the test and the DL signals and noise are transmitted from the three active probes.

Out of the three AoAs, one AoA (AoA1) is aligned to a direction which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for UE power class 3 and other 2 AoAs (AoA2 and AoA3) are from the set of AoA pairs, denoted by (AoA2, AoA3) that can support 2 AoA reception for UE declared AoA angular separation and declared orientation in the positioner of the test system according to the spherical coverage requirement for simultaneous reception from multiple directions as defined in clause 7.3K.3 of TS 38.101-2 [3] for power class 3 supporting simultaneous reception from multiple directions.

The angular offset between the directions of the AoA pair (AoA2, AoA3) is declared from Table 7.3K.3-1 in clause 7.3K.3 of TS 38.101-2 [3] and shall not be changed for each test iteration.

NOTE: The chosen AoA pair (AoA2, AoA3) is up to RAN5.

### A.9.7 Setup 7: 3 AoAs

There are 3 active probes in the test. The DL signals, and noise if applicable, transmitted from the three active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The relative angular offset between the directions (AoAs) of the 3 active probes, shall be changed for each test iteration. Any combinations of two relative angular offsets between 2 active probes specified in Table A.9.3-1, is considered as a valid applicable relative angular offsets between 3 active probes for the respective power class.

## A.10 TCI State Configuration

### A.10.1 Introduction

This clause provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this clause are configured in each test when applicable to indicate that certain DL signals are quasi-collocated with the referenceSignal configured in the TCI states.

### A.10.2 TCI states

**Table A.10.2-1: TCI States**

| Parameter | TCI.State.0 | TCI.State.1 | TCI.State.2 | TCI.State.3 |
|---|---|---|---|---|
| tci-StateId | Id0 | Id1 | Id2 | Id3 |
| qcl-Type1 | typeC | typeC | typeA | typeA |
| qcl-Type2[Note1] | typeD | typeD | typeD | typeD |
| referenceSignal | SSB0 | SSB1 | Resource #4 in TRS resource set 1 [Note3] | Resource #4 in TRS resource set 2 [Note3] |
| NOTE 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2<br>NOTE 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.<br>NOTE 3: Reference TRS resource sets are defined in A.1.4A, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. | | | | |

# A.10A Unified TCI State Configuration

## A.10A.1 Introduction

This clause provides the configurations for unified TCI states towards either SSB or CSI-RS. The DLorJoint TCI states defined in this clause are configured in each test when applicable to indicate that certain DL (and UL, if joint DL/UL operation is configured) signals are QCL'ed with the referenceSignal configured in the TCI states. The UL TCI states defined in this clause are configured in each test when applicable to indicate that certain UL signals are QCL'ed with the referenceSignal configured in the TCI states.

## A.10A.2 DLorJoint TCI states

**Table A.10A.2-1: DLorJoint TCI States**

| Parameter | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | DLorJoint TCI.State.2 | DLorJoint TCI.State.3 | DLorJoint TCI.State.4 | DLorJoint TCI.State.5 |
|---|---|---|---|---|---|---|
| tci-StateUnifiedId | Id0 | Id1 | Id2 | Id3 | Id4 | Id5 |
| qcl-Type1 | typeA | typeA | typeA | typeA | typeC | typeC |
| qcl-Type2 Note1 | typeD | typeD | typeD | typeD | typeD | typeD |
| referenceSignal Note2 | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 2 Note 5 | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 2 Note3 | SSB0 | SSB1 from the cell with different PCI |
| pathlossReferenceRS | N/A | N/A | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 1 Note3 | N/A | N/A |
| additionalPCI | N/A | configured Note4 | N/A | N/A | N/A | configured Note4 |

Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2
Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.
Note 3: Reference TRS resource sets are defined in A.1.4A, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. The TCI state of the TRS is the DLorJoint TCI.State.4.
Note 4: Only one PCI than serving cell PCI is included in the additionalPCIList, and the additionalPCIIndex is configured as 0.
Note 5: Reference TRS resource sets are defined in A.1.4A, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. The TCI state of the TRS is the DLorJoint TCI.State.5.

## A.10A.3 UL TCI states

**Table A.10A.3-1: UL TCI States**

| Parameter | UL TCI.State.0 | UL TCI.State.1 | UL TCI.State.2 | UL TCI.State.3 | UL TCI.State.4 | UL TCI.State.5 |
|---|---|---|---|---|---|---|
| ul-TCIState-Id | Id0 | Id1 | Id2 | Id3 | Id4 | Id5 |
| referenceSignal Note1 | SSB0 | SSB1 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 2 Note2 | Resource #4 in TRS resource set 3 Note2 | Resource #4 in TRS resource set 4 Note2 |
| pathlossReferenceRS | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 2 Note2 | Resource #4 in TRS resource set 3 Note2 | Resource #4 in TRS resource set 4 Note2 |
| additionalPCI | N/A | configured Note3 | N/A | N/A | N/A | N/A |

Note 1: referenceSignal configurations towards which the UL TCI states are configured are defined in a test-specific manner.

| | |
|---|---|
| Note 2: | Reference TRS resource sets are defined in A.1.4A, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. |
| Note 3: | Only one PCI than serving cell PCI is included in the additionalPCIList, and the additionalPCIIndex is configured as 0. |

# A.10B LTM Candidate TCI State Configuration

## A.10B.1 Introduction

This clause provides the configurations for TCI states of LTM candidate cell(s) towards either SSB or TRS. The LTM candidate DLorJoint TCI states defined in this clause are configured in each test when applicable to indicate that certain DL (and UL, if joint DL/UL operation is configured) signals are QCL'ed with the referenceSignal configured in the TCI states. The UL TCI states defined in this clause are configured in each test when applicable to indicate that certain UL signals are QCL'ed with the referenceSignal configured in the TCI states.

## A.10B.2 LTM candidate DLorJoint TCI states

**Table B.10B.2-1: LTM candidate DLorJoint TCI States**

| Parameter | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.3 |
|---|---|---|---|---|
| Candidatetci-StateId | Id0 | Id1 | Id2 | Id3 |
| qcl-Type1 | typeA | typeA | typeA | typeA |
| referenceSignal of qcl-Type 1 Note2 | SSB0 | Resource #4 in TRS resource set 1 Note3 | SSB0 | Resource #4 in TRS resource set 1 Note3 |
| qcl-Type2Note1 | typeD | typeD | typeD | typeD |
| referenceSignal of qcl-Type2 Note2 | SSB0 | Resource #4 in TRS resource set 1 Note3 | SSB0 | Resource #4 in TRS resource set 1 Note3 |
| pathlossReferenceRS | SSB0 | SSB0 | N/A | N/A |
| additionalPCI | N/A | N/A | N/A | N/A |

| | |
|---|---|
| Note 1: | qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2 |
| Note 2: | referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner. |
| Note 3: | Reference TRS resource sets are defined in A.1.4A, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured for a candidate cell in a test case, it is considered as resource set 1. The TCI state of the TRS is the CandidateDLorJoint TCI.State.2. |

## A.10B.3 LTM candidate UL TCI states

**Table A.10B.3-1: LTM candidate UL TCI States**

| Parameter | Candidate UL TCI.State.0 |
|---|---|
| Candidateul-TCIState-Id | Id0 |
| referenceSignal Note1 | SSB0 |
| pathlossReferenceRS | SSB0 |
| additionalPCI | N/A |

| | |
|---|---|
| Note 1: | referenceSignal configurations towards which the UL TCI states are configured are defined in a test-specific manner. |

# A.11 NR sidelink communication

## A.11.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

## A.11.2 Reference resource pool configurations for NR Sidelink Communication

**Table A.11.2-1: NR sidelink SL-BWP configuration**

| Field | Value | Comment |
|---|---|---|
| SL-BWP-ConfigCommon-r16 | | |
| sl-BWP-Generic-r16 | | |
| sl-LengthSymbols-r16 | sym14 | All 14 symbols in a slot without S-SSB are used for sidelink |
| sl-StartSymbol-r16 | sym0 | Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB |
| sl-BWP-PoolConfigCommon-r16 | | |
| sl-RxPool-r16 | | Indicates the resource pool for reception on the configured BWP.<br>1 entry |
| SL-ResourcePool-r16[1] | Set according to Table A.11.2-2 | Entry 1 |
| sl-TxPoolSelectedNormal-r16 | | Indicates the resources pool for mode 2 sidelink communication on the configured BWP.<br>1 entry |
| SL-ResourcePoolConfig-r16[1] | | Entry 1 |
| sl-ResourcePool-r16 | Set according to Table A.11.2-3 | |
| sl-TxPoolExceptional-r16 | Not present | |

**Table A.11.2-2:NR sidelink resource pool configuration**

| Field | Value | Comment |
|---|---|---|
| SL-ResourcePool-r16 | | |
| sl-PSCCH-Config-r16 | Set according to Table A.11.3-1 | |
| sl-PSSCH-Config-r16 | Set according to Table A.11.3-2 | |
| sl-PSFCH-Config-r16 | Not present | |
| sl-SyncAllowed-r16 | | Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool. |
| gnss-Sync-r16 | true | |
| gnbEnb-Sync-r16 | true | |
| ue-Sync-r16 | true | |
| sl-SubchannelSize-r16 | n10 | Subchannel bandwidth is 10 RB |
| sl-StartRB-Subchannel-r16 | 0 | The offset of lowest RB index of the subchannel with the lowest index in the resource pool with respect to the lowest RB index of a SL BWP |
| sl-NumSubchannel-r16 | 1 | Number of subchannels for SL transmission |
| sl-UE-SelectedConfigRP-r16 | | |

| | | |
|---|---|---|
| sl-Thres-RSRP-List-r16 | Set according to the specific test configuration | Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold. |
| sl-MultiReserveResource-r16 | Not present | |
| sl-MaxNumPerReserve-r16 | n2 | At most 2 PSCCH/PSSCH resources can be reserved by a single SCI. |
| sl-SensingWindow-r16 | ms100 | Length of resource sensing window specified in TS 38.214 [9] subclause 8.1.4. which is 100ms. |
| sl-SelectionWindowList-r16 | | Parameter that determines the end of the selection window for each priority level<br>8 entries |
| SL-SelectionWindowConfig-r16[k,k=1..8] | | entry k |
| sl-Priority-r16 | k | priority k |
| sl-SelectionWindow-r16 | n20 | Length of resource selection window specified in TS 38.214 [9] subclause 8.1.4. which is $20 \cdot 2^{\mu}$slots, where μ=0,1,2,3 refers to SCS 15,30,60,120 kHz respectively |
| sl-ResourceReservePeriodList-r16 | Not present | |
| sl-RS-ForSensing-r16 | pssch | PSSCH-RSRP measurement is used in the sensing operation. |
| sl-RxParametersNcell | Not present | |
| sl-ZoneConfigMCR-List-r16 | Not present | |
| sl-PreemptionEnable-r16 | enabled | |
| sl-MinMaxMCS-List-r16 | | 1 entry |
| SL-MinMaxMCS-Config-r16[1] | | Entry 1 |
| sl-MCS-Table-r16 | qam64 | TS 38.214 [9] Table 5.1.3.1-1 is the MCS table used in the resource pool. |
| sl-TimeResource-r16 | 11111111111111 111111 | Every slot in a period of 20 slots during a SFN or DFN cycle can be used for sidelink |

**Table A.11.3-3: NR sidelink UE autonomous resource selection configuration**

| Field | Value | Comment |
|---|---|---|
| SL-UE-SelectedConfig-r16 | | |
| sl-PSSCH-TxConfigList-r16 | | 1 entry |
| SL-PSSCH-TxConfig-r16[1] | | Entry 1 |
| sl-TypeTxSync-r16 | Not present | When this filed is absent, the configuration is applicable for all synchronization reference types. |
| sl-ThresUE-Speed-r16 | kmph200 | UE shall apply the parameters in sl-ParametersAboveThres-r16 if UE absolute speed is higher than 200 km/h, otherwise UE shall apply the parameters in sl-ParametersBelowThres-r16 |
| sl-ParametersAboveThres-r16 | | |
| sl-MinMCS-PSSCH-r16 | 0 | The minimum MCS index value can be used for PSSCH transmission. |
| sl-MaxMCS-PSSCH-r16 | 15 | The maximum MCS index value can be used for PSSCH transmission. |
| sl-MinSubChannelNumPSSCH-r16 | 1 | The minimum number of subchannels can be used for PSSCH transmission. |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | The maximum number of subchannels can be used for PSSCH transmission. |
| sl-MaxTxTransNumPSSCH-r16 | 1 | The maximum transmission number for PSSCH (including new transmission and retransmission). |

| | | |
|---|---|---|
| sl-MaxTxPower-r16 | Not present | Not applicable |
| sl-ParametersBelowThres-r16 | | |
| sl-MinMCS-PSSCH-r16 | 4 | Same as above |
| sl-MaxMCS-PSSCH-r16 | 25 | Same as above |
| sl-MinSubChannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxTransNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxPower-r16 | Not present | Same as above |
| sl-ProbResourceKeep-r16 | v0dot8 | The probability of UE keeping current resource is 80% when the resource reselection counter reaches 0 (see TS 38.321 [12]). |
| sl-ReselectAfter-r16 | n1 | Resource reselection is triggered after 1 sidelink transmission is skipped (see TS 38.321 [12]). |

## A.11.3 Reference measurement channels for NR Sidelink Communication

**Table A.11.3-1: PSCCH Reference Measurement Channels**

| Parameter | | Unit | Value |
|---|---|---|---|
| Reference channel | | | CC.1A HD |
| Channel bandwidth | | MHz | Note2 |
| Number of PSCCH symbols per slot | | | 2 |
| Number of PSCCH RB | | | 10 |
| Modulation | | | QPSK |
| Information Bit Payload (without CRC) | | Bits | 26 |
| Information Bit | Number of DMRS ports | | 0 (1 port) |
| | Priority | | As set by higher layers |
| | Resource reservation period | | N/A |
| | Modulation and coding scheme | | Set as the PSSCH MCS specified in the test |
| | DMRS pattern | | 0 (2 DMRS) |
| | 2nd stage SCI format | | 00 (SCI format 2-A) |
| | Beta offset indicator | | Set as specified in the test |
| | Frequency resource assignment | | Set as per PSSCH RB allocation specific in the test |
| | Time resource assignment | | Set as per PSSCH slot allocation specific in the test |
| | Reserved bits | | Set all these bits to 0 |
| Transport block CRC | | Bits | 24 |
| Binary Channel Bits (Note 1) | | Bits | 360 |
| Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe.<br>Note 2: Channel bandwidth depends on test configuration. | | | |

**Table A.11.3-2: PSSCH Reference Measurement Channels**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CD.1A HD |
| Sidelink transmission mode | | 2 |
| Channel bandwidth | MHz | Note1 |
| Allocated PSSCH resource blocks | | 10 |
| Number of PSSCH symbols per slot | | 10 |
| Modulation | | QPSK |
| Target Code Rate | | 1/3 |
| Information Bit Payload (Transport block size) | Bits | 672 |
| Transport block CRC | Bits | 24 |
| Number of PSSCH HARQ retransmissions | | 0 |
| Binary Channel Bits | Bits | 2160 |
| Note 1: Channel bandwidth depends on test configuration. | | |

| Note 2: 2nd state SCI and PSFCH are not allocated per slot. |
|---|

# A.12 Discovery Burst Transmission Window configuration under CCA

## A.12.1 DBT Window pattern 1: DBT Window period = 20 ms with DBT Window duration = 1 ms

**Table A.12.1-1: DBT.1: DBT Window Pattern 1 for DBT Window period = 20 ms and duration = 1 ms**

| SMTC Parameters | Values |
|---|---|
| Discovery burst transmission window periodicity | 20 ms |
| Discovery burst transmission window offset | 0 ms |
| Discovery burst transmission window duration | 1 ms |

# A.13 Channel bandwidth (CBW) configurations

## A.13.1 DL UE specific CBW

**Table A.13.1-1: DL CBW patterns for UE specific CBW configuration**

| BWP Parameters | Unit | Values | |
|---|---|---|---|
| Reference CBW | | DLCBW.1.1 | DLCBW.1.2 |
| OffsetToCarrier | RB | $RB_y$ Note 2 | $RB_x$ Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: $RB_x$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_x$ has to be within the CBW of BS. | | | |
| Note 2: $RB_y$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_y$ has to be within the CBW of BS and different with $RB_x$, and CBW should include SSB and CORESET#0. | | | |

## A.13.2 UL UE specific CBW

**Table A.13.2-1: UL CBW patterns for UE specific CBW configuration**

| BWP Parameters | Unit | Values | |
|---|---|---|---|
| Reference CBW | | ULCBW.1.1 | ULCBW.1.2 |
| OffsetToCarrier | RB | $RB_y$ Note 2 | $RB_x$ Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: $RB_x$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_x$ has to be within the CBW of BS. | | | |
| Note 2: $RB_y$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_y$ has to be within the CBW of BS and different with $RB_x$. | | | |

# A.14 Satellite access configuration

**Table A.14.1-1: SSC.1: Satellite specific configuration pattern 1 for serving cell in GSO scenario**

| Parameter | SSC.1 |
|---|---|
| Interval between adjacent epoch time | 10.24s |
| ntn-UlSyncValidityDuration | 900s |
| cellSpecificKoffset | 258 slots |
| ta-Common | 0 |

| | |
|---|---|
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |

**Table A.14.1-2: SSC.2: Satellite specific configuration pattern 2 for serving cell in NGSO scenario**

| Parameter | SSC.2 |
|---|---|
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |

## A.14.2 Satellite specific configuration for neighbour cell

**Table A.14.2-1: NSC.1: Satellite specific configuration pattern 1 for neighbour cell in GSO scenario**

| Parameter | NSC.1 |
|---|---|
| Interval between adjacent epoch time | 10.24s |
| ntn-UlSyncValidityDuration | 900s |
| cellSpecificKoffset | 258 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |

**Table A.14.2-2: NSC.2: Satellite specific configuration pattern 2 for neighbour cell in NGSO scenario**

| Parameter | NSC.2 |
|---|---|
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [14] |

# A.15 SRS Configurations

## A.15.1 SRS Configuration for SCS=15kHz

**Table A.15.1-1: Sounding Reference Symbol Configuration for SCS=15kHz**

| | SRS.1 TDD | SRS.4 TDD | POS-SRS.1 | |
|---|---|---|---|---|
| **Field** | **Value** | **Value** | | **Comment** |
| c-SRS | 12 | 12 | Same as NRB,c in the test case | |
| b-SRS | 0 | 0 | n.a. | |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | antennaSwitching | n.a. | |
| startPosition | 1 | 1 | 5 | resourceMapping setting |
| nrofSymbols | 1 | 1 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n2 | n4 | |
| combOffset | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift | 0 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Aperiodic | Periodic | |
| periodicityAndOffset-p | sl40, 1 | N/A | sl160, 20 | SRS transmission periodicity |

## A.15.2 SRS Configuration for SCS=30kHz

**Table A.15.2-1: Sounding Reference Symbol Configuration for SCS=30kHz**

| | SRS.2 TDD | SRS.5 TDD | POS-SRS.2 | |
|---|---|---|---|---|
| **Field** | **Value** | **Value** | | **Comment** |
| c-SRS | 24 | 24 | Same as NRB,c in the test case | |
| b-SRS | 0 | 0 | n.a. | |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |

| | | | | |
|---|---|---|---|---|
| freqDomainShift | 0 | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | antennaSwitching | n.a. | |
| startPosition | 3 | 3 | 5 | resourceMapping setting |
| nrofSymbols | 1 | 1 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n2 | n4 | |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Aperiodic | Periodic | |
| periodicityAndOffset-p | sl80, 3 | N/A | Sl320, 40 | SRS transmission periodicity |

## A.15.3 SRS Configuration for SCS=30kHz

**Table A.15.3-1: Sounding Reference Symbol Configuration for SCS=120kHz**

| | **SRS.3 TDD** | **SRS.6 TDD** | **POS-SRS.3** | |
|---|---|---|---|---|
| **Field** | **Value** | **Value** | | **Comment** |
| c-SRS | 17 | 17 | Same as NRB,c in the test case | |
| b-SRS | 0 | 0 | n.a. | |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | antennaSwitching | n.a. | |
| startPosition | 1 | 1 | 5 | resourceMapping setting |
| nrofSymbols | 1 | 1 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n2 | n4 | |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Aperiodic | Periodic | |
| periodicityAndOffset-p | sl320, 3 | N/A | Sl1280, 160 | SRS transmission periodicity |

# A.16 CSI-RS configurations for RRM

## A.16.1 FDD

**Table A.16.1-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz**

| | CSI-RS.RRM.FR1.1 FDD |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 15 |
| **CSI-RS-CellMobility** | |
| cellId[note1] | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 [note2] | slot1 |
| associatedSSB | True |
| ssb-Index [note3] | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain [note4] | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise | |

## A.16.2 TDD

**Table A.16.2-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz**

| | CSI-RS.RRM.FR1.1 TDD |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 15 |
| **CSI-RS-CellMobility** | |
| cellId[note1] | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 [note2] | slot1 |
| associatedSSB | True |
| ssb-Index [note3] | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain [note4] | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise | |

| | |
|---|---|
| Note3: | assume the same SS/PBCH block index of the corresponding cell in the test case |
| Note4: | unless specified otherwise |

**Table A.16.2-2: CSI-RS RRM Reference Measurement Channels for SCS=30kHz**

| | CSI-RS.RRM.FR1.2 TDD |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 30 |
| **CSI-RS-CellMobility** | |
| cellId[note1] | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 [note2] | slot1 |
| associatedSSB | True |
| ssb-Index [note3] | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain [note4] | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |

| | |
|---|---|
| Note1: | unless specified otherwise |
| Note2: | unless specified otherwise |
| Note3: | assume the same SS/PBCH block index of the corresponding cell in the test case |
| Note4: | unless specified otherwise |

**Table A.16.2-3: CSI-RS RRM Reference Measurement Channels for SCS=120kHz**

| | CSI-RS.RRM.FR2.1 TDD |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 120 |
| **CSI-RS-CellMobility** | |
| cellId[note1] | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 [note2] | slot1 |
| associatedSSB | True |
| ssb-Index [note3] | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain [note4] | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |

| | |
|---|---|
| Note1: | unless specified otherwise |
| Note2: | unless specified otherwise |
| Note3: | assume the same SS/PBCH block index of the corresponding cell in the test case |
| Note4: | unless specified otherwise |

# A.17 Reference Cell DTX configurations

## A.17.1 Cell DTX Configuration 1: Cell DTX cycle = 160 ms and TAT = Infinity

**Table A.17.1-1: DTX.1: Cell DTX cycle = 160 ms and time alignment timer (TAT) = Infinity**

| Field | Value |
|---|---|
| cellDTXDRX-onDurationTimer | 1 ms |
| cellDTXDRX-CycleStartOffset | 160 ms |
| cellDTXDRXconfigType-r18 | dtx |
| cellDTXDRXactivationStatus | activated |
| Note: This Cell DTX configuration is applicable for NR serving cell. The Cell DTX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]. | |

# A.18 Spatial Relation Configuration

## A.18.1 Introduction

This clause provides the configurations for spatial relation towards either SSB or CSI-RS. The spatial relation defined in this clause are configured in each test when applicable to indicate spatial setting for certain UL signals with the referenceSignal configured in the spatial relation.

## A.18.2 Spatial Relation

**Table A.18.2-1: PUCCH Spatial Relation**

| Parameter | PUCCH.SRI.0 | PUCCH.SRI.1 |
|---|---|---|
| pucch-SpatialRelationInfoId | Id0 | Id1 |
| referenceSignal | SSB0 | SSB1 |
| PUCCH-PathlossReferenceRS | SSB0 | SSB1 |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. | | |

**Table A.18.2-2: SRS Spatial Relation**

| Parameter | SRS.SRI0 | SRS.SRI1 |
|---|---|---|
| srs-SpatialRelationInfoId | Id0 | Id1 |
| referenceSignal | SSB0 | SSB1 |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. | | |

# A.19 Test Cases involving E-UTRA/FR1 and FR2 carriers

## A.19.1 Introduction

The following applies to UE when undergoing tests with a mix of E-UTRA/NR FR1 and NR FR2 carriers in clauses 5, 7 and 8.

## A.19.2 Principle of Testing in EN-DC

For test cases in clause 5 listed in Table A.19.2-1, the following applies:

- UE does not have to pass the test case.

**Table A.19.2-1: Test cases with the E-UTRA/FR1 – FR2 testability issue (EN-DC)**

| Clause | Test case slogan |
|---|---|
| 5.5.2.7 | E-UTRAN - NR FR2 interruptions at E-UTRA SRS carrier based switching |
| 5.5.3.6 | Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 |
| 5.5.6.1.2 | EN-DC FR2 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC |
| 5.6.2.5 | EN-DC FR1-FR2 event-triggered reporting in non-DRX |
| 5.6.2.6 | EN-DC FR1-FR2 event-triggered reporting in DRX |
| 5.6.2.7 | EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection |
| 5.6.2.8 | EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection |
| 5.7.1.3 | EN-DC FR1-FR2 SS-RSRP measurement accuracy |
| Note 1: The list of the test case is based on TS 38.133 [6] Table A.3.13A.2-1 and updated based on the RAN5 testability analysis. | |

## A.19.3 Principle of Testing in SA

For test cases in clause 7 listed in Table A.19.3-1, the following applies:

- UE does not have to pass the test case.

**Table A.19.3-1: Test cases with the E-UTRA/FR1 – FR2 testability issue (SA)**

| Clause | Test case slogan |
|---|---|
| 7.3.1.1 | NR SA FR1-FR2 Inter-frequency handover; unknown target cell |
| 7.3.1.4 | NR SA FR1-FR2 synchronous DAPS handover |
| 7.3.1.5 | NR SA FR1-FR2 asynchronous DAPS handover |
| 7.5.3.2 | NR SA FR1-FR2 inter-band SCell activation and deactivation delay |
| 7.5.6.1.2 | NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX |
| 7.5.7.1 | NR SA FR2 addition and release delay of known PSCell |
| 7.5.7.2 | NR SA FR2 addition and release delay of unknown PSCell |
| 7.5.12.1 | NR SA FR2 Addition and Release Delay of PSCell |
| 7.5.14.1 | NR SA FR2 PSCell RACH-less based Activation and deactivation for FR1+FR2 inter-band with target PSCell in FR2 |
| 7.6.2.5 | NR SA FR1-FR2 event-triggered reporting in non-DRX |
| 7.6.2.6 | NR SA FR1-FR2 event-triggered reporting in DRX |
| 7.6.2.7 | NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection |
| 7.6.2.8 | NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used |
| 7.6.3.6 | NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used |
| 7.7.1.3 | NR SA FR1-FR2 SS-RSRP measurement accuracy |
| Note 1: The list of the test case is based on TS 38.133 [6] Table A.3.13A.3-1 and updated based on the RAN5 testability analysis. | |

## A.19.4 Principle of Testing in E-UTRA

For test cases in clause 8 listed in Table A.19.4-1, the following applies:

- UE does not have to pass the test case.

**Table A.19.4-1: Test cases with the E-UTRA/FR1 – FR2 testability issue (E-UTRA)**

| Clause | Test case slogan |
|---|---|
| 8.2.2.2 | E-UTRA – NR FR2 Early Measurement Reporting |
| 8.4.2.5 | E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX |

| | |
|---|---|
| 8.4.2.6 | E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX |
| 8.4.2.7 | E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX |
| 8.4.2.8 | E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX |
| 8.4.3.1 | E-UTRAN - NR SA FR2 event-triggered reporting without gap with interruption |
| Note 1: The list of the test case is based on TS 38.133 [6] Table A.3.13A.4-1 and updated based on the RAN5 testability analysis. | |

## A.19.5 Principle of Testing in NR-DC

For test cases in clause 7 listed in Table A.19.5-1, the following applies:

- UE does not have to pass the test case.

**Table A.19.5-1: Test cases with the E-UTRA/FR1 – FR2 testability issue (NR-DC)**

| Clause | Test case slogan |
|---|---|
| 7.3.3.5 | NR SA FR2 NR conditional handover including target MCG and target SCG from FR1-FR2 NR-DC to FR1-FR2 NR-DC |
| Note 1: The list of the test case is based on TS 38.133 [6] Table A.3.13A.5-1 and updated based on the RAN5 testability analysis. | |

# Annex B (normative): Conditions for RRM requirements applicability for operating bands

## B.1 Conditions for NR RRC_IDLE state mobility

### B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency idle state mobility test cases in clauses 6.1 and 7.1,
- UE conditions which shall apply for UE inter-frequency idle state mobility test cases in clauses 6.1 and 7.1.
- UE conditions which shall apply for RedCap UE intra-frequency idle state mobility test cases in clauses 16.1 and 17.1.
- UE conditions which shall apply for RedCap UE inter-frequency idle state mobility test cases in clauses 16.1 and 17.1.

### B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

Editor's notes for Table B.1.2-2 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4
- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

**Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A | -124 | -121 | ≥ -4 |
| | NR_FDD_FR1_B | -123.5 | -120.5 | |
| | NR_TDD_FR1_C | -123 | -120 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -122.5 | -119.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -122 | -119 | |
| | NR_FDD_FR1_F | -121.5 | -118.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -121 | -118 | |
| | NR_FDD_FR1_H | -120.5 | -117.5 | |
| | NR_FDD_FR1_N | -117.5 | -114.5 | |
| NOTE 1: NR operating band groups are defined in Clause 3A.4. | | | | |

**Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | SSB Ês/Iot |
|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | |
| | | | UE Power class | UE Power class | |

| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
|---|---|---|---|---|---|---|---|---|
| Conditions | Rx Beam Peak | n257 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | | n259 | | | -105.5 | | | |
| | | n260 | -104.3 | | -106.5 | -122.8+$Y_4$ | | |
| | | n261 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | | |
| | | n259 | | | -92.7 | | | |
| | | n260 | -96.3 | | -93.9 | -110.8+$Z_4$ | | |
| | | n261 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | | |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

## B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this clause.

## B.1.4 Conditions for measurements on NR intra-frequency cells for cell re-selection for RedCap

This clause defines the following conditions for RedCap NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.4-1 and Table B.1.4-2 for 1 Rx and 2 Rx RedCap respectively for FR1 NR cells.

The conditions are defined in Table B.1.4-3 for FR2 NR cells.

**Table B.1.4-1: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 2Rx**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dB |

| | | | | |
|---|---|---|---|---|
| **Conditions** | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -124 | -121 | ≥ -4 |
| | NR_FDD_RC_FR1_B | -123.5 | -120.5 | |
| | NR_FDD_RC_FR1_C, NR_TDD_RC_FR1_C | -123 | -120 | |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -122.5 | -119.5 | |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -122 | -119 | |
| | NR_FDD_RC_FR1_F | -121.5 | -118.5 | |
| | NR_FDD_RC_FR1_G | -121 | -118 | |
| | NR_FDD_RC_FR1_H | -120.5 | -117.5 | |
| NOTE 1: NR operating band groups are defined in TS.38.133 [6] clause 3.5.2. | | | | |

**Table B.1.4-2: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 1Rx**

| **Parameter** | **NR operating band groups** Note1 | **Minimum SSB_RP** | | **SSB Ês/Iot** |
|---|---|---|---|---|
| | | **dBm / $SCS_{SSB}$** | | **dB** |
| | | **$SCS_{SSB}$ = 15 kHz** | **$SCS_{SSB}$ = 30 kHz** | |
| **Conditions** | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -124 | -121 | ≥ -4 |
| | NR_FDD_RC_FR1_B | -123.5 | -120.5 | |
| | NR_FDD_RC_FR1_C, NR_TDD_RC_FR1_C | -123 | -120 | |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -122.5 | -119.5 | |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -122 | -119 | |
| | NR_FDD_RC_FR1_F | -121.5 | -118.5 | |
| | NR_FDD_RC_FR1_G | -121 | -118 | |
| | NR_FDD_RC_FR1_H | -120.5 | -117.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

**Table B.1.4-3: Conditions for intra-frequency cell re-selection in FR2 for RedCap**

| **Parameter** | **Angle of arrival** | **NR operating bands** | **Minimum SSB_RP** Note 2, Note 3 | | | | | | **SSB Ês/Iot** |
|---|---|---|---|---|---|---|---|---|---|
| | | | **dBm / $SCS_{SSB}$** | | | | | | **dB** |
| | | | **$SCS_{SSB}$ = 120 kHz** | | | | | **$SCS_{SSB}$ = 240 kHz** | |
| | | | **UE Power class** | | | | | | |
| | | | **1** | **2** | **3** | **4** | **5** | **7** | **1,2,3, 4,5,7** |
| Conditions | Rx Beam Peak | n257 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | -120.4+$Y_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB |
| | | n258 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | -120.6+$Y_5$ | TBD | |
| | | n261 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | | TBD | |
| | Spherical coverage Note 1 | n257 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | -112.4+$Z_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB |
| | | n258 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | -112.6+$Z_5$ | TBD | |
| | | n261 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | | TBD | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.<br>NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | | | |

Editor's notes for Table B.1.4-3 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where Y4is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where Z4 is the rough/fine beam gain difference in spherical coverage directions for power class 4

## B.1.5 Conditions for measurements on NR inter-frequency cells for cell re-selection for RedCap

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.4-1 and Table B.1.4-2 for 1 Rx and 2 Rx RedCap respectively for FR1 RedCap NR intra-frequency cell re-selection shall also apply for FR1 RedCap NR inter-frequency cells in this clause.

The conditions defined in Table B.1.4-3 for FR2 RedCap NR intra-frequency cell re-selection shall also apply for FR2 RedCap NR inter-frequency cells in this clause.

## B.1.6 Conditions for measurements on NR intra-frequency cells for cell re-selection for satellite access

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.1.6-1 for FR1 NR cells.

**Table B.1.6-1: Conditions for intra-frequency cell re-selection in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dB |
| Conditions | NR_FDD_SAB_FR1_A | -124 | -121 | ≥ -4 |
| NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A. | | | | |

## B.1.7 Conditions for measurements on NR inter-frequency cells for cell re-selection for satellite access

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions defined in Table B.1.6-1 for FR1 NR intra-frequency cell re-selection for satellite access shall also apply for FR1 NR inter-frequency cells for satellite access in this clause.

## B.1.8 Conditions for measurements on NR intra-frequency cells for cell re-selection under CCA

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.8-1 for FR1 NR cells under CCA.

**Table B.1.8-1: Conditions for intra-frequency cell re-selection in FR1 under CCA**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dB |
| Conditions | NR_CCA_FR1_I | -120 | -117 | ≥ -4 |
| | NR_CCA_FR1_J | -119.5 | -116.5 | |

NOTE 1: NR operating band groups are as defined in clause 3A.4.1.

### B.1.9 Conditions for measurements on NR inter-frequency cells for cell re-selection under CCA

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.8-1 for FR1 NR intra-frequency cells under CCA shall also apply to FR1 NR inter-frequency cells under CCA in this clause.

## B.2 Conditions for NR RRC_CONNECTED state

### B.2.1 Introduction

In Annex B.2, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurement procedures and measurement performance tests in clauses 4.6, 4.7, 5.6, 5.7, 6.6, 6.7, 7.6 and 7.7,

  UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in Clause 9,

- UE conditions which shall apply for UE intra-frequency measurements performance requirements in Clause 10,

- UE conditions which shall apply for UE inter-frequency measurements performance requirements in Clause 10.

### B.2.2 Conditions for NR intra-frequency measurements

Editor's notes for Table B.2.2-2 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

**Table B.2.2-1: Conditions for intra-frequency measurements in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A | -127 | -124 | ≥ -6 |
| | NR_FDD_FR1_B | -126.5 | -123.5 | |
| | NR_TDD_FR1_C | -126 | -123 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -125.5 | -122.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -125 | -122 | |
| | NR_FDD_FR1_F | -124.5 | -121.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -124 | -121 | |
| | NR_FDD_FR1_H | -123.5 | -120.5 | |
| | NR_FDD_FR1_N | -120.5 | -117.5 | |
| NOTE 1: NR operating band groups are defined in Clause 3A.4. | | | | |

**Table B.2.2-2: Conditions for intra-frequency measurements in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | | | SSB Ês/Iot |
|---|---|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | | | $SCS_{SSB}$ = 240 kHz | |
| | | | UE power class | | | UE power class | |
| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak | n257 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-6 |
| | | n258 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | | |
| | | n259 | | | -108.5 | | | |
| | | n260 | -107.3 | | -109.5 | -125.8+$Y_4$ | | |
| | | n261 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-6 |
| | | n258 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | | |
| | | n259 | | | -95.7 | | | |
| | | n260 | -99.3 | | -96.9 | -113.8+$Z_4$ | | |
| | | n261 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | | |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and spherical coverage values are increased by $\Delta MB_{S,n}$ the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

## B.2.3 Conditions for NR inter-frequency measurements

Editor's notes for Table B.2.3-2 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

**Table B.2.3-1: Conditions for inter-frequency measurements in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A | -125 | -122 | ≥ -4 |
| | NR_FDD_FR1_B | -124.5 | -121.5 | |
| | NR_TDD_FR1_C | -124 | -121 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -124.5 | -120.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -123 | -120 | |
| | NR_FDD_FR1_F | -122.5 | -119.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -122 | -119 | |
| | NR_FDD_FR1_H | -121.5 | -118.5 | |
| | NR_FDD_FR1_N | -118.5 | -115.5 | |

NOTE 1: NR operating band groups are defined in Clause 3A.4.

**Table B.2.3-2: Conditions for inter-frequency measurements in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | SSB Ês/Iot |
|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | dB |

| | | | $SCS_{SSB}$ = 120 kHz | | | | $SCS_{SSB}$ = 240 kHz | |
|---|---|---|---|---|---|---|---|---|
| | | | UE power class | | | | UE power class | |
| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
| Conditions | Rx Beam Peak | n257 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | | |
| | | n259 | | | -106.5 | | | |
| | | n260 | -105.3 | | -107.5 | -123.8+$Y_4$ | | |
| | | n261 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | | |
| | | n259 | | | -93.7 | | | |
| | | n260 | -97.3 | | -94.9 | -111.8+$Z_4$ | | |
| | | n261 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | | |

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

## B.2.4 Conditions for NR L1-RSRP reporting

### B.2.4.1 Conditions for SSB based L1-RSRP reporting

Editor's notes for Table B.2.4.1-2 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.1-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.1-2 for FR2 NR cells.

**Table B.2.4.1-1: Conditions for SSB based L1-RSRP measurements in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -124 | -121 | ≥ -3 |
| | NR_FDD_FR1_B | -123.5 | -120.5 | |
| | NR_TDD_FR1_C | -123 | -120 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -122.5 | -119.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -122 | -119 | |
| | NR_FDD_FR1_F | -121.5 | -118.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -121 | -118 | |
| | NR_FDD_FR1_H | -120.5 | -117.5 | |
| | NR_FDD_FR1_N | -117.5 | -114.5 | |

NOTE 1: NR operating band groups are defined in clause 3A.4

**Table B.2.4.1-2: Conditions for SSB based L1-RSRP measurements in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | SSB Ês/Iot |
|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | |
| | | | $SCS_{SSB}$ = 120 kHz | $SCS_{SSB}$ = 240 kHz | dB |
| | | | UE power class | UE power class | |

| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | Rx Beam Peak | n257 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-3 |
| | | n258 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | | n259 | | | -105 | | | |
| | | n260 | -104.3 | | -106.5 | -122.8+$Y_4$ | | |
| | | n261 | -107.3 | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-3 |
| | | n258 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | | |
| | | n259 | | | -92.3 | | | |
| | | n260 | -96.3 | | -93.9 | -110.8+$Z_4$ | | |
| | | n261 | -99.3 | -99.8 | -98.2 | -115.8+$Z_4$ | | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.<br>NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | |

## B.2.4.2 Conditions for CSI-RS based L1-RSRP reporting

Editor's notes for Table B.2.4.2-2 (RAN4 dependant):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.2-2 for FR2 NR cells.

**Table B.2.4.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1**

| Parameter | NR operating band groups Note1 | Minimum CSI-RS_RP dBm / $SCS_{CSI-RS}$ | | | CSI-RS Ês/Iot dB |
|---|---|---|---|---|---|
| | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | |
| **Conditions** | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -124 | -121 | -118 | ≥ -3 |
| | NR_FDD_FR1_B | -123.5 | -120.5 | -117.5 | |
| | NR_TDD_FR1_C | -123 | -120 | -117 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -122.5 | -119.5 | -116.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -122 | -119 | -116 | |
| | NR_FDD_FR1_F | -121.5 | -118.5 | -115.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -121 | -118 | -115 | |
| | NR_FDD_FR1_H | -120.5 | -117.5 | -114.5 | |
| | NR_FDD_FR1_N | -117.5 | -114.5 | -111.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | | |

**Table B.2.4.2-2: Conditions for CSI-RS based L1-RSRP measurements in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum CSI-RS_RP Note 2, Note 3 | | CSI-RS Ês/Iot |
|---|---|---|---|---|---|
| | | | dBm / $SCS_{CSI-RS}$ | | |
| | | | $SCS_{CSI-RS}$ = 60 kHz | $SCS_{CSI-RS}$ = 120 kHz | dB |
| | | | UE power class | UE power class | |

| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
|---|---|---|---|---|---|---|---|---|
| **Conditions** | Rx Beam Peak | n257 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | (Value for $SCS_{CSI-RS}$ = 60 kHz) +3dB | ≥-3 |
| | | n258 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | | |
| | | n259 | | | -108.5 | | | |
| | | n260 | -107.3 | | -109.5 | -125.8+$Y_4$ | | |
| | | n261 | -110.3 | -113.8 | -112.1 | -127.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | (Value for $SCS_{CSI-RS}$ = 60 kHz) +3dB | ≥-3 |
| | | n258 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | | |
| | | n259 | | | -95.7 | | | |
| | | n260 | -99.3 | | -96.9 | -113.8+$Z_4$ | | |
| | | n261 | -102.3 | -102.8 | -101.2 | -118.8+$Z_4$ | | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum CSI-RS Ês/Iot, with no applied noise.<br>NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | |

## B.2.5 Conditions for RRC connection release with redirection to NR

Editor's notes for Table B.2.5.2-2:

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for RRC connection release with redirection to NR: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.5-1 for FR1 NR cells.

The conditions are defined in Table B.2.5-2 for FR2 NR cells.

**Table B.2.5-1: Conditions for RRC connection release with redirection to NR in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| **Conditions** | NR_FDD_FR1_A, NR_TDD_FR1_A | -125 | -122 | ≥ -4 |
| | NR_FDD_FR1_B | -124.5 | -121.5 | |
| | NR_TDD_FR1_C | -124 | -121 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -124.5 | -120.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -123 | -120 | |
| | NR_FDD_FR1_F | -122.5 | -119.5 | |
| | NR_FDD_FR1_G, NR_TDD_FR1_G | -122 | -119 | |
| | NR_FDD_FR1_H | -121.5 | -118.5 | |
| | NR_FDD_FR1_N | -118.5 | -115.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

**Table B.2.5-2: Conditions for RRC connection release with redirection to NR in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | | | | SSB Ês/Iot |
|---|---|---|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | | | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | | | | $SCS_{SSB}$ = 240 kHz | |
| | | | UE power class | | | | UE power class | |
| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
| **Conditions** | | n257 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | | ≥-4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rx Beam Peak | n258 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | |
| | | n259 | | | -106.5 | | | |
| | | n260 | -105.3 | | -107.5 | -123.8+$Y_4$ | | |
| | | n261 | -108.3 | -111.8 | -110.1 | -125.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | | |
| | | n259 | | | -93.7 | | | |
| | | n260 | -97.3 | | -94.9 | -111.8+$Z_4$ | | |
| | | n261 | -100.3 | -100.8 | -99.2 | -116.8+$Z_4$ | | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.<br>NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | |

# B.2.6 Conditions for UE transmit timing

## B.2.6.1 Conditions for SSB based UE transmit timing

Editor's notes for Table B.2.6.1-2:

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

This clause defines the following conditions for UE transmit timing adjustment performed based on SSBs: SSB_RP and SSB Ês/Iot and applicable for a corresponding operating band.

The conditions are defined in Table B.2.6.1-1 for FR1 SSB.

**Table B.2.6.1-1: Conditions for SSB based UE transmit timing in FR1**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$=15 kHz | $SCS_{SSB}$=30 kHz | |
| Conditions | NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A | -124 | -121 | ≥ -3 |
| | NR_FDD_FR1_B | -123.5 | -120.5 | |
| | NR_TDD_FR1_C | -123 | -120 | |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | -122.5 | -119.5 | |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | -122 | -119 | |
| | NR_FDD_FR1_G | -121 | -118 | |
| | NR_FDD_FR1_H | -120.5 | -117.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

The conditions are defined in Table B.2.6.1-2 for FR2 SSB.

**Table B.2.6.1-2: Conditions for SSB based UE transmit timing in FR2**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | | | | SSB Ês/Iot |
|---|---|---|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | | | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | | | | $SCS_{SSB}$ = 240 kHz | |
| | | | UE power class | | | | UE power class | |
| | | | 1 | 2 | 3 | 4 | 1, 2, 3, 4 | |
| Conditions | Rx Beam Peak | n257 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-3 |
| | | n258 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | | n259 | | | -105.5 | | | |
| | | n260 | -122.3+$Y_1$ | | -106.5 | -122.8+$Y_4$ | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | n261 | -125.3+$Y_1$ | -110.8 | -109.1 | -124.8+$Y_4$ | | |
| | Spherical coverage Note 1 | n257 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-3 |
| | | n258 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | | |
| | | n259 | | | -92.7 | | | |
| | | n260 | -114.3+$Z_1$ | | -93.9 | -110.8+$Z_4$ | | |
| | | n261 | -117.3+$Z_1$ | -99.8 | -98.2 | -115.8+$Z_4$ | | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.<br>NOET 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | |

## B.2.7 Conditions for NR intra-frequency measurements for RedCap

This clause defines the following conditions for RedCap NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.7-1 and Table B.2.7-2 for 1 Rx and 2 Rx RedCap respectively for FR1 NR cells.

The conditions are defined in Table B.2.7-3 for FR2 NR cells.

**Table B.2.7-1: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 1 Rx**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -127 | -124 | ≥ -6 |
| | NR_FDD_RC_FR1_B | -126.5 | -123.5 | |
| | NR_TDD_RC_FR1_C | -126 | -123 | |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -125.5 | -122.5 | |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -125 | -122 | |
| | NR_FDD_RC_FR1_F | -124.5 | -121.5 | |
| | NR_FDD_RC_FR1_G | -124 | -121 | |
| | NR_FDD_RC_FR1_H | -123.5 | -120.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

**Table B.2.7-2: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 2Rx**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -127 | -124 | ≥ -6 |
| | NR_FDD_RC_FR1_B | -126.5 | -123.5 | |
| | NR_TDD_RC_FR1_C | -126 | -123 | |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -125.5 | -122.5 | |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -125 | -122 | |
| | NR_FDD_RC_FR1_F | -124.5 | -121.5 | |
| | NR_FDD_RC_FR1_G | -124 | -121 | |
| | NR_FDD_RC_FR1_H | -123.5 | -120.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

**Table B.2.7-3: Conditions for intra-frequency measurements in FR2 for RedCap**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | | | | | | SSB Ês/Iot |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | | | | | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | | | | | | $SCS_{SSB}$ = 240 kHz | |
| | | | UE Power class | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 7 | 1, 2, 3, 4, 5 | |
| Conditions | Rx Beam Peak | n257 | -128.3+$Y_1$ | -113.8 | -112.1 | -127.8+$Y_4$ | -123.4+$Y_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-6 |
| | | n258 | -128.3+$Y_1$ | -113.8 | -112.1 | -127.8+$Y_4$ | -123.6+$Y_5$ | TBD | | |
| | | n261 | -128.3+$Y_1$ | -113.8 | -112.1 | -127.8+$Y_4$ | | TBD | | |
| | Spherical coverage Note 1 | n257 | -120.3+$Z_1$ | -102.8 | -101.2 | -118.8+$Z_4$ | -115.4+$Z_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-6 |
| | | n258 | -120.3+$Z_1$ | -102.8 | -101.2 | -118.8+$Z_4$ | -115.6+$Z_5$ | TBD | | |
| | | n261 | -120.3+$Z_1$ | -102.8 | -101.2 | -118.8+$Z_4$ | | TBD | | |

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.7-2 (RAN4 dependent):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

## B.2.8 Conditions for NR inter-frequency measurements for RedCap

This clause defines the following conditions for RedCap NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.8-1 and Table B.2.8-2 for 1 Rx and 2 Rx RedCap for FR1 NR cells.

The conditions are defined in Table B.2.8-3 for FR2 NR cells.

**Table B.2.8-1: Conditions for inter-frequency measurements in FR1 for 1 Rx RedCap**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -125 | -122 | ≥ -4 |

| | | | |
|---|---|---|---|
| | NR_FDD_RC_FR1_B | -124.5 | -121.5 |
| | NR_TDD_RC_FR1_C | -124 | -121 |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -124.5 | -120.5 |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -123 | -120 |
| | NR_FDD_RC_FR1_F | -122.5 | -119.5 |
| | NR_FDD_RC_FR1_G | -122 | -119 |
| | NR_FDD_RC_FR1_H | -121.5 | -118.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | |

**Table B.2.8-2: Conditions for inter-frequency measurements in FR1 for 2 Rx RedCap**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A | -125 | -122 | ≥ -4 |
| | NR_FDD_RC_FR1_B | -124.5 | -121.5 | |
| | NR_TDD_RC_FR1_C | -124 | -121 | |
| | NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D | -124.5 | -120.5 | |
| | NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E | -123 | -120 | |
| | NR_FDD_RC_FR1_F | -122.5 | -119.5 | |
| | NR_FDD_RC_FR1_G | -122 | -119 | |
| | NR_FDD_RC_FR1_H | -121.5 | -118.5 | |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

**Table B.2.8-3: Conditions for inter-frequency measurements in FR2 for RedCap**

| Parameter | Angle of arrival | NR operating bands | Minimum SSB_RP Note 2, Note 3 | | | | | | | SSB Ês/Iot |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBm / $SCS_{SSB}$ | | | | | | | dB |
| | | | $SCS_{SSB}$ = 120 kHz | | | | | | $SCS_{SSB}$ = 240 kHz | |
| | | | UE Power class | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 7 | 1, 2, 3, 4, 5 | |
| Conditions | Rx Beam Peak | n257 | -126.3+$Y_1$ | -111.8 | -110.1 | -125.8+$Y_4$ | -121.4+$Y_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -126.3+$Y_1$ | -111.8 | -110.1 | -125.8+$Y_4$ | -121.6+$Y_5$ | TBD | | |
| | | n261 | -126.3+$Y_1$ | -111.8 | -110.1 | -125.8+$Y_4$ | | TBD | | |
| | Spherical coverage Note 1 | n257 | -118.3+$Z_1$ | -100.8 | -99.2 | -116.8+$Z_4$ | -113.4+$Z_5$ | TBD | (Value for $SCS_{SSB}$ = 120 kHz) +3dB | ≥-4 |
| | | n258 | -118.3+$Z_1$ | -100.8 | -99.2 | -116.8+$Z_4$ | -113.6+$Z_5$ | TBD | | |
| | | n261 | -118.3+$Z_1$ | -100.8 | -99.2 | -116.8+$Z_4$ | | TBD | | |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.<br>NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. | | | | | | | | | | |

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.3-2 (RAN4 dependent):

- The value of Y for power class 4 is FFS, where $Y_4$ is the rough/fine beam gain difference in Rx beam peak direction for power class 4

- The value of Z for power class 4 is FFS, where $Z_4$ is the rough/fine beam gain difference in spherical coverage directions for power class 4

## B.2.9 Conditions for NR intra-frequency measurements under CCA

This clause defines the following conditions for NR intra-frequency measurements under CCA and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.9-1 for NR cells under CCA.

**Table B.2.9-1: Conditions for intra-frequency measurements under CCA**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dB |
| Conditions | NR_CCA_FR1_I | -123 | -120 | ≥ -6 |
| | NR_CCA_FR1_J | -122.5 | -119.5 | |
| NOTE 1: NR operating band groups are as defined in clause 3A.4.1. | | | | |

## B.2.10 Conditions for NR inter-frequency measurements under CCA

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.10-1 for NR cells under CCA.

**Table B.2.10-1: Conditions for inter-frequency measurements under CCA**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | dB |
| Conditions | NR_CCA_FR1_I | -121 | -118 | ≥ -4 |
| | NR_CCA_FR1_J | -120.5 | -117.5 | |
| NOTE 1: NR operating band groups are as defined in clause 3A.4.1. | | | | |

## B.2.11 Conditions for NR L1-RSRP reporting under CCA

### B.2.11.1 Conditions for SSB based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs under CCA: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.11.1-1 for NR cells under CCA.

**Table B.2.11.1-1: Conditions for SSB based L1-RSRP measurements under CCA**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | SSB Ês/Iot |
|---|---|---|---|

| | | dBm / $SCS_{SSB}$ | | dB |
|---|---|---|---|---|
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| **Conditions** | NR_CCA_FR1_I | -120 | -117 | ≥ -3 |
| | NR_CCA_FR1_J | -119.5 | -116.5 | |
| NOTE 1: NR operating band groups are defined in clause 3A.4.1. | | | | |

# B.2.12 to B.2.16

# B.2.17 Conditions for NR intra-frequency measurements for satellite access

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.2.17-1 for FR1 NR cells.

**Table B.2.17-1: Conditions for intra-frequency measurements in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| **Conditions** | NR_FDD_SAB_FR1_A | -127 | -124 | ≥ -6 |
| NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A. | | | | |

# B.2.18 Conditions for NR inter-frequency measurements for satellite access

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.2.18-1 for FR1 NR cells.

**Table B.2.18-1: Conditions for inter-frequency measurements in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_SAB_FR1_A | -125 | -122 | ≥ -4 |
| NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A. | | | | |

# B.2.19 Conditions for NR L1-RSRP reporting for satellite access

## B.2.19.1 Conditions for SSB based L1-RSRP reporting for satellite access

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.2.19.1-1 for FR1 NR cells.

**Table B.2.19.1-1: Conditions for SSB based L1-RSRP measurements in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_SAB_FR1_A | -124 | -121 | ≥ -3 |

NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A.

## B.2.19.2 Conditions for CSI-RS based L1-RSRP reporting for satellite access

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.2.19.2-1 for FR1 NR cells.

**Table B.2.19.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum CSI-RS_RP | | | CSI-RS Ês/Iot |
|---|---|---|---|---|---|
| | | dBm / $SCS_{CSI-RS}$ | | | dB |
| | | $SCS_{CSI-RS}$ = 15 kHz | $SCS_{CSI-RS}$ = 30 kHz | $SCS_{CSI-RS}$ = 60 kHz | |
| Conditions | NR_FDD_SAB_FR1_A | -124 | -121 | -118 | ≥ -3 |
| NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A. | | | | | |

## B.2.20 Conditions for RRC connection release with redirection to NR for satellite access

This clause defines the following conditions for RRC connection release with redirection to NR: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band for satellite access.

The conditions are defined in Table B.2.20-1 for FR1 NR cells.

**Table B.2.20-1: Conditions for RRC connection release with redirection to NR in FR1 for satellite access**

| Parameter | NR operating band groups Note1 | Minimum SSB_RP | | SSB Ês/Iot |
|---|---|---|---|---|
| | | dBm / $SCS_{SSB}$ | | dB |
| | | $SCS_{SSB}$ = 15 kHz | $SCS_{SSB}$ = 30 kHz | |
| Conditions | NR_FDD_SAB_FR1_A | -125 | -122 | ≥ -4 |
| NOTE 1: NR operating band groups for satellite access are defined in clause 3A.4.1A. | | | | |

# B.3 RRM requirement exceptions

## B.3.1 Introduction

Annex B.3 covers exceptions for the side conditions based on receiver sensitivity for CA, DC, and SUL.

## B.3.2 Receiver sensitivity relaxation for CA

### B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1 [18, Clause 7.3A.3], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this clause applies for both SC and CA operation.

## B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

### B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1, Clause 7.3A.3 [2], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

### B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this clause, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3A.4, when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Clause 7.3A.4, and
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3A.4 apply.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

### B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this clause, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3A.5, when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3A.5 apply.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

## B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

Editor's note: TBD

## B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

### B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity $\Delta R_{IB}$>0 dB as defined in TS 38.101-2 [3], Clause 7.3A.2.1 depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB}$ defined for the corresponding downlink NR bands.

### B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity $\Delta R_{IB}$>0 dB as defined in TS 38.101-2 [3], Clause 7.3A.2.1 depending on the aggregated channel

bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB}$ defined for the corresponding downlink NR bands.

### B.3.3 Receiver sensitivity relaxation for DC

Editor's note: TBD

### B.3.4 Receiver sensitivity relaxation for SUL

#### B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}>0$ dB as defined in TS 38.101-1 [2], Clause 7.3C.3, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this clause applies for both SC and SUL operation.

#### B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

##### B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this clause, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount $\Delta$=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3C.2, when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Clause 7.3C.2, and
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3C.2 apply.

If the relaxation $\Delta$ specified in this clause applies, then the relaxation specified in Clause B.3.4.1 should not be applied.

## B.4 Conditions for NR sidelink

### B.4.1 Test parameters for GNSS signals

This clause defines the reference signal power levels of generated satellites for a corresponding GNSS, which will be used in NR sidelink and satellite access test cases.

**Table B.4.1-1: GNSS Reference Signal Power Parameters**

| System | Parameters | Unit | Value |
|---|---|---|---|
| | Number of generated satellites per system | - | 6 |
| GPS[Note 1] | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| BDS | Reference signal power level for all satellites | dBm | -133 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities.<br>NOTE 2: The DUT UE does not need to support all systems. The DUT UE shall support at least one system and will be test for the supported systems. | | | |

### B.4.2 Conditions for PSBCH-RSRP Accuracy Requirements

This clause defines the following conditions for PSBCH-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.2-1 for FR1.

**Table B.4.2-1: Conditions for PSBCH-RSRP measurements in FR1**

| Parameter | NR sidelink operating band groups Note1 | Minimum S-SSB_RP | | | S-SSB Ês/Iot |
|---|---|---|---|---|---|
| | | dBm/SCS$_{S-SSB}$ | | | dB |
| | | SCS$_{S-SSB}$ = 15kHz | SCS$_{S-SSB}$ = 30kHz | SCS$_{S-SSB}$ = 60kHz | |
| | NR_TDD_FR1_B | -126.5 | -123.5 | -120.5 | ≥ -6 |
| | NR_TDD_FR1_J | -122.5 | -119.5 | -116.5 | |
| NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands. | | | | | |

## B.4.3 Conditions for Selection/Reselection to Intra-frequency SyncRef UE

This clause defines the S-SSB_RP and S-SSB Ês/Iot applicable for a corresponding operating band.

The conditions for selection/reselection to intra-frequency SyncRef UE are defined in Table B.4.3-1 for FR1.

**Table B.4.3-1: NR sidelink synchronization measurements in FR1**

| Parameter | NR sidelink operating band groups Note1 | Minimum S-SSB_RP | | | S-SSB Ês/Iot |
|---|---|---|---|---|---|
| | | dBm/SCS$_{S-SSB}$ | | | dB |
| | | SCS$_{S-SSB}$ = 15kHz | SCS$_{S-SSB}$ = 30kHz | SCS$_{S-SSB}$ = 60kHz | |
| | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | ≥ 0 |
| | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | ≥ 0 |
| NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands. | | | | | |

## B.4.4 Conditions for L1 SL-RSRP Accuracy Requirements

This clause defines the following conditions for L1 SL-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.4-1 for FR1.

**Table B.4.4-1: Conditions for L1 SL-RSRP measurements in FR1**

| Parameter | NR sidelink operating band groups Note1 | Minimum L1 SL-RSRP | | | Ês/Iot |
|---|---|---|---|---|---|
| | | dBm/SCS | | | dB |
| | | SCS= 15kHz | SCS= 30kHz | SCS = 60kHz | |
| | NR_TDD_FR1_B | -120.5 | -117.5 | -114.5 | ≥ 0 |
| | NR_TDD_FR1_J | -116.5 | -113.5 | -110.5 | |
| NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands.<br>NOTE 2: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS.<br>NOTE 3: The SCS is for PSCCH and/or PSSCH. | | | | | |

# B.5 High level test procedure for SAN RRM tests

The following high-level steps are conducted for test cases for SAN defined in clause 14.

- A set of ephemeris information are pre-defined for each satellite corresponding to different epoch times in TS 38.508-1 [14].

- The same ephemeris information will be maintained during the test (constant ephemerisInfo in all SIB19 updates) i.e., SAN RRM test cases are defined with fixed constant Delay and Doppler shift from satellite access node to UE unless otherwise stated.

- The range from which the selected constant Delay is selected is as follows:

  - For GSO an altitude of 35,786km is considered. The range of the one-way delay between UE and satellite is from 119.375ms to 128.79ms.

  - For NGSO an altitude of 600km and 1200km on a circular orbit are considered. The range of the one-way delay between UE and satellite is from 2ms (lowest value for LEO orbit 600km) to 6.67ms (highest value for LEO orbit 1200km).

- The constant Doppler shift (i.e. frequency offset) is derived from the same ephemeris (i.e., orbit emulation) as the Delay.

- UE location is determined for the test. The ephemeris and the UE location should be designed such that elevation angle relative to the UE position shall not be smaller than 30° during entire test time.

- Test equipment adjusts the time and frequency of transmission according to pre-defined ephemeris (constant in all SIB19 updates) and UE location.

# Annex C (normative): Downlink physical channels and propagation conditions

## C.1 Downlink physical channels

### C.1.1 General

The following clauses describe the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

### C.1.2 Default downlink signal levels

The downlink power settings in Table C.1.2-1 and Table C.1.2-2 are used unless otherwise specified in a test case for FR1 cell and FR2 cell, respectively. The downlink power settings in Table C.1.2-1 and Table C.1.2-2 are also used for the initial registration for NR /5GC test cases in clauses 6 and 7. For EN-DC test cases in clauses 4 and 5, the E-UTRA power settings used for initial registration are defined in Annex A.6.

For FR1, if the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

**Table C.1.2-1: Default Downlink power levels for NR (FR1)**

| SCS (kHz) | Parameter | Unit | Value | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Channel bandwidth | MHz | 3 | | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80 | 90 | 100 |
| 15 | Number of RBs | | 12 | 15 | 25 | 50 | 75 | 100 | 128 | 160 | 215 | 270 | N/A | N/A | N/A | N/A |
| | Channel BW power | dBm | -63 | -62 | -60 | -57 | -55 | -54 | -53 | -52 | -51 | -50 | N/A | N/A | N/A | N/A |
| 30 | Number of RBs | | N/A | N/A | 10 | 24 | 36 | 50 | 64 | 75 | 100 | 128 | 162 | 216 | 243 | 270 |
| | Channel BW power | dBm | N/A | N/A | -61 | -57 | -55 | -54 | -53 | -52 | -51 | -50 | -49 | -48 | -47 | -47 |
| 60 | Number of RBs | | N/A | N/A | N/A | 10 | 18 | 24 | 30 | 36 | 50 | 64 | 75 | 100 | 120 | 135 |
| | Channel BW power | dBm | N/A | N/A | N/A | -58 | -56 | -54 | -53 | -52 | -51 | -50 | -49 | -48 | -47 | -47 |
| | RS EPRE | dBm/ 15kHz | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 | -85 |

NOTE 1: The channel bandwidth powers are informative, based on -85dBm/15kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.
NOTE 2: The power level is specified at each UE Rx antenna.
NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration ( ) with the same power spectrum density of -85dBm/15kHz.

**Table C.1.2-2: Default Downlink power levels for NR (FR2)**

| SCS (kHz) | | Unit | Channel Bandwidth | | | |
|---|---|---|---|---|---|---|
| | | | 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| 60 | Number of RBs | | 66 | 132 | 264 | N/A |
| | Channel BW power | dBm | -70 | -67 | -64 | N/A |
| 120 | Number of RBs | | 32 | 66 | 132 | 264 |
| | Channel BW power | dBm | -70 | -67 | -64 | -61 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | SS/PBCH SSS EPRE | dBm/60kHz | -99 | -99 | -99 | -99 |
| NOTE 1: The channel bandwidth powers are informative, based on -99dBm/60kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.<br>NOTE 2: The power level is specified at the centre of quiet zone.<br>NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration ( $\mu$ ) with the same power spectrum density of –99dBm/60kHz. | | | | | | |

The default signal level uncertainty for FR1 is +/-3dB at each test port, for any level specified. The default signal level uncertainty for FR2 is +/-6dB at centre of quiet zone, for any level specified. If the uncertainty value is critical for the Test purpose, a tighter uncertainty is specified for the related test case in Annex F

## C.1.3 Default connection setup

Table C.1.3-1 describes the downlink physical channels that are required for NR connection setup. For EN-DC test cases in clauses 4 and 5, the required E-UTRA downlink physical channels are defined in TS 36.521-3 [26] Annex C.2.

**Table C.1.3-1: Downlink physical channels required for NR connection set-up**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| **PBCH** | PBCH_RA = 0 dB | |
| | PBCH_RB = 0 dB | |
| **PSS** | PSS_RA = 0 dB | |
| **SSS** | SSS_RA = 0 dB | |
| **PDCCH** | PDCCH_RA = 0 dB | |
| | PDCCH_RB = 0 dB | |
| | MPDCCH_RB = 0 dB | |
| **PDSCH** | PDSCH_RA = 0 dB | |
| | PDSCH_RB = 0 dB | |
| **DMRS** | TBD | |
| **CSI-RS** | TBD | |
| NOTE 1: No boosting is applied | | |

As common PDSCH and PDCCH configuration parameters the parameters in Table A.1 and C.1.3-2 shall be used to bring up the connection setup for FR1 and FR2 NR cell.

**Table C.1.3-2: PDSCH and PDCCH configuration**

| Parameter | Unit | Value |
|---|---|---|
| Number of HARQ processes | | 8 (TDD)<br>16 (FDD) |
| Maximum number of HARQ transmission | | 5 |

# C.2 Propagation conditions

## C.2.0 General

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

## C.2.1 No interference

The downlink connection between the SS and the UE is without AWGN, and has no fading or multipath effects.

## C.2.2 Static propagation conditions

### C.2.2.0 General

The downlink connection between the SS and the UE is an AWGN environment (unless otherwise stated) with no fading or multipath effects.

### C.2.2.1 UE receiver with 2Rx antenna connectors

For 1 port transmission to UE receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$$

For 4 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \end{bmatrix}$$

### C.2.2.2 UE receiver with 4Rx antenna connectors

For 1 port transmission to UE receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}.$$

For 2 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & j \\ 1 & -j \\ 1 & j \\ 1 & -j \end{bmatrix}.$$

For 4 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \\ 1 & -1 & j & -j \\ 1 & -1 & -j & j \end{bmatrix}.$$

## C.2.3 Multi-path fading propagation conditions

Same as defined in TS 38.521-4 [20] clause B.2.

# Annex D (normative): Deviations from standard test configuration

## D.1 Test cases with different numerologies

TBD

## D.2 EN-DC test cases with different EN-DC configurations

### D.2.0 General

In clauses 4 and 5, EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

### D.2.1 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, and this requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

*Editor's Note: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.*

## D.3 Carrier aggregation test cases with different CA configurations

### D.3.0 General

In clauses 6 and 7, carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

### D.3.1 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, and the test requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

Editor's Note: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.

## D.4 Antenna connection for 4Rx capable UEs

### D.4.0 General

All the tests in this test specification are defined for UEs supporting 2Rx. This clause explains how to apply the 2Rx tests in clauses 4 and 6 to UEs supporting 4Rx antenna ports. No tests are currently specified in clauses 4 or 6 which are

applicable only to 4Rx antenna ports, so 4Rx capable UEs are always tested by reusing tests which were originally specified for 2Rx UEs. Please notice that 4Rx is in general not supported for the test cases in clauses 5 and 7.

# D.4.1 Principle of testing

## D.4.1.1 Single carrier tests

For 4Rx capable UEs supporting at least one band where 2Rx is supported and 4Rx is not supported, all single carrier tests specified in clauses 4 and 6, except 4.7 and 6.7 shall be tested with 2Rx on any band where 2Rx is supported and 4Rx is not supported, with the antenna connection defined in D.4.2.1. Single carrier tests specified clauses 4.7 and 6.7 are band dependent and shall be tested in all bands supported by the UE, using 2Rx and the antenna connection defined in D.4.2.1 for the bands where 2Rx is supported and 4Rx is not supported, and the antenna connection defined in D.4.2.2 for the bands where 2Rx is not supported.

For 4Rx capable UEs that do not support any band where 2Rx is supported and 4Rx is not supported, all single carrier tests in clauses 4 and 6 shall be tested with 4Rx using the antenna configuration defined in D.4.2.2.For radio link monitoring tests, the SNR levels are modified according to table D.4.1.1-1 and table D.4.1.1-2

**Table D.4.1.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) | | | |
|---|---|---|---|---|
| | Test 1 | Test 2 | Test 3 | Test 4 |
| 4.5.1.1 | -18 | N/A | N/A | N/A |
| 4.5.1.3 | -18 | N/A | N/A | N/A |
| 4.5.1.5 | -18 | N/A | N/A | N/A |
| 4.5.1.7 | -18 | N/A | N/A | N/A |
| 5.5.1.1 | -18 | N/A | N/A | N/A |
| 5.5.1.3 | -18 | N/A | N/A | N/A |
| 5.5.1.5 | -18 | N/A | N/A | N/A |
| 5.5.1.7 | -18 | N/A | N/A | N/A |
| 6.5.1.1 | -18 | N/A | N/A | N/A |
| 6.5.1.3 | -18 | N/A | N/A | N/A |
| 6.5.1.5 | -18 | N/A | N/A | N/A |
| 6.5.1.7 | -18 | N/A | N/A | N/A |
| 7.5.1.1 | -18 | N/A | N/A | N/A |
| 7.5.1.3 | -18 | N/A | N/A | N/A |
| 7.5.1.5 | -18 | N/A | N/A | N/A |
| 7.5.1.7 | -18 | N/A | N/A | N/A |

**Table D.4.1.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) | | SNR during T4 (dB) | |
|---|---|---|---|---|
| | Test 1 | Test 2 | Test 1 | Test 2 |
| 4.5.1.2 | -18 | N/A | -8 | N/A |
| 4.5.1.4 | -18 | N/A | -8 | N/A |
| 4.5.1.6 | -18 | N/A | -8 | N/A |
| 4.5.1.8 | -18 | N/A | -8 | N/A |
| 5.5.1.2 | -18 | N/A | -8 | N/A |
| 5.5.1.4 | -18 | N/A | -8 | N/A |
| 5.5.1.6 | -18 | N/A | -8 | N/A |
| 5.5.1.8 | -18 | N/A | -8 | N/A |
| 6.5.1.2 | -18 | N/A | -8 | N/A |
| 6.5.1.4 | -18 | N/A | -8 | N/A |
| 6.5.1.6 | -18 | N/A | -8 | N/A |
| 6.5.1.8 | -18 | N/A | -8 | N/A |
| 7.5.1.2 | -18 | N/A | -8 | N/A |
| 7.5.1.4 | -18 | N/A | -8 | N/A |
| 7.5.1.6 | -18 | N/A | -8 | N/A |
| 7.5.1.8 | -18 | N/A | -8 | N/A |

**Table D.4.1.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection**

| Test case | SNR for RS in set $q_0$ during T3, T4 and T5.(dB) |
|---|---|
| | Test 1 |
| 4.5.5.1 | -15 |
| 4.5.5.2 | -15 |
| 4.5.5.3 | -15 |
| 4.5.5.4 | -15 |
| 5.5.5.1 | -15 |
| 5.5.5.2 | -15 |
| 5.5.5.3 | -15 |
| 5.5.5.4 | -15 |
| 6.5.5.1 | -15 |
| 6.5.5.2 | -15 |
| 6.5.5.3 | -15 |
| 6.5.5.4 | -15 |
| 7.5.5.1 | -15 |
| 7.5.5.2 | -15 |
| 7.5.5.3 | -15 |
| 7.5.5.4 | -15 |

### D.4.1.2 Carrier aggregation tests

For carrier aggregation tests, the antenna connection is selected independently for each cell, the PCell and the SCell(s). If a cell (either PCell or any of the SCell(s)) is on a band where 2Rx is supported and 4Rx is not supported, antenna connection in Clause D.4.2.1 shall be used for this cell. If the cell is on a band where 2Rx is not supported, antenna connection in clause D.4.2.2 shall be used for this cell.

### D.4.1.3 EN-DC tests

For all EN-DC tests, the antenna connection is selected independently for each cell. For the E-UTRA PCell, the antenna connection specified in D.4.2.3 shall be used if the PCell is on an E-UTRA band where 2Rx is supported and 4Rx is not supported, and the antenna connection specified in D.4.2.4 shall be used if the PCell is on an E-UTRA band not supporting 2Rx.

For the NR PSCell and SCell(s), the principle of testing is the same as in D.4.1.2.

## D.4.2 Antenna connection

### D.4.2.1 Antenna connection for NR bands where 2Rx is supported

For NR bands where 2Rx is supported and 4Rx is not supported, the UE shall decide via manufacturer declaration and antenna port configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2 antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

### D.4.2.2 Antenna connection for NR bands where only 4Rx is supported

For NR bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in D.4.1.1 and D.4.1.2, the parameters and test requirements remain unmodified.

### D.4.2.3 Antenna connection for E-UTRA bands where 2Rx is supported

For E-UTRAN bands where 2Rx is supported and 4Rx is not supported, the UE shall decide via manufacturer declaration and antenna port configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2Rx antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

### D.4.2.4 Antenna connection for E-UTRA bands where only 4Rx is supported

For E-UTRAN bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in TS 36.521-1 [26] clause 3A.4.1.2.1 and 3A.4.1.2.2, the parameters and test requirements remain unmodified.

## D.4A Antenna configurations with unlicensed bands for 4Rx capable UEs

### D.4A.1 Introduction

All tests in clauses 10, 11, 12 and 13 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clauses 10, 11, 12 or 13 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

### D.4A.2 Principle of Testing

#### D.4A.2.1 Single Carrier Tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in clauses 10, 11, 12 and 13 except those in 10.5, 11.6, 12.5 and 13.4, shall be tested on any band where 2RX is supported with the antenna connection specified in D.4A.2.4. For single carrier tests specified in clauses 10.5, 11.6, 12.5 or 13.4, all tests shall be tested with the antenna connection specified in D.4A.2.4 for bands where 2RX is supported, and the antenna connection specified in D.4A.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in clauses 10, 11, 12 and 13 shall be tested using the antenna connection specified in clause D.4A.2.5. For radio link monitoring tests, the SNR levels are modified according to table D.4A.2.1-1 and table D.4A.2.1-2.

**Table D.4A.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) | | | |
|---|---|---|---|---|
| | Test 1 | Test 2 | Test 3 | Test 4 |
| 10.3.1.2 | -18 | N/A | N/A | N/A |
| 10.3.1.4 | TBD | N/A | N/A | N/A |
| 11.4.1.2 | -18 | N/A | N/A | N/A |
| 11.4.1.4 | TBD | N/A | N/A | N/A |

**Table D.4A.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection**

| Test case | SNR during T3 (dB) | | SNR during T4 (dB) | |
|---|---|---|---|---|
| | Test 1 | Test 2 | Test 1 | Test 2 |
| 10.3.1.3 | -18 | N/A | -8 | N/A |
| 10.3.1.5 | TBD | N/A | TBD | N/A |
| 11.4.1.3 | -18 | N/A | -8 | N/A |
| 11.4.1.5 | TBD | N/A | TBD | N/A |

**Table D.4A.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection**

| Test case | SNR for RS in set $q_0$ during T3, T4 and T5 (dB) | |
|---|---|---|
| | Test 1 | Test 2 |
| 10.3.4.1 | -15 | N/A |
| 10.3.4.2 | -15 | N/A |
| 11.4.4.1 | -15 | N/A |
| 11.4.4.2 | -15 | N/A |

### D.4A.2.2 Carrier Aggregation Tests

All carrier aggregation tests are performed using the antenna connection in clause D.4A.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in D.4A.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause D.4A.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in D.4A.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

### D.4A.2.3 EN-DC Tests

All EN-DC tests are performed using the antenna connection in clause D.4A.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in D.4A.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All EN-DC tests are performed using the antenna connection in clause D.4A.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in D.4A.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

### D.4A.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input**.** No test parameters or requirements are modified.

### D.4A.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses D.4A.2.1 and D.4A.2.2, no test parameters or requirements are modified.

### D.4A.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input**.** No test parameters or requirements are modified.

### D.4A.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [23], no test parameters or requirements are modified.

## D.4B Antenna connection for 8Rx capable UEs

### D.4B.1 Introduction

All tests in clause 4 and 6 are specified for UEs supporting 2Rx. In this clause, the antenna connection method for applying 2Rx tests or 4Rx tests to UEs supporting 8Rx antenna ports is specified. No tests are currently specified in clause 4 or 6 which are applicable only to 8Rx antenna ports, so 8Rx capable UEs are always tested by reusing tests which were originally specified for 2Rx UEs or 4Rx UEs.

# D.4B.1 Principle of testing

## D.4B.1.1 Single carrier tests

For 8Rx capable UEs supporting at least one band where 2Rx is supported and either 4Rx or 8Rx is not supported, all single carrier tests specified in clause 4 and 6 except those in clause 4.7 and 6.7 shall be tested on any band where 2Rx is supported and 8Rx is not supported with the antenna connection specified in clause D.4B.2.1. For single carrier tests specified in clause 4.7 or 6.7, all tests shall be tested with the antenna connection specified in clause D.4B.2.1 for bands where 2Rx is supported and 8Rx is not supported, and the antenna connection specified in clause D.4B.2.3 for bands where 8Rx is supported.

For 8Rx capable UEs supporting at least one band where 4Rx is supported and 8Rx is not supported but without supporting any band where only 2Rx is supported, all single carrier tests specified in clause 4 and 6 except those in clause 4.7 and 6.7 shall be tested on any band where 4Rx is supported and 8Rx is not supported with the antenna connection specified in clause D.4B.2.2. For single carrier tests specified in clause 4.7 or 6.7, all tests shall be tested with the antenna connection specified in clause D.4B.2.2 for bands where 4Rx is supported and 8Rx is not supported, and the antenna connection specified in D.4B.2.3 for bands where 8Rx is supported. For radio link monitoring tests, the SNR levels are modified according to Table D.4.1.1-1 and Table D.4.1.1-2. For beam failure detection and link recovery tests, the SNR levels are modified according to Table D.4.1.1-3.

For 8Rx capable UEs which do not support any band where 8Rx is not supported, all tests specified in clauses A.4 and A.6 shall be tested using the antenna connection specified in clause D.4B.2.3. For radio link monitoring tests, the SNR levels are modified according to Table D.4.1.1-1 and Table D.4.1.1-2. For beam failure detection and link recovery tests, the SNR levels are modified according to Table D.4.1.1-3.

## D.4B.1.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in clause D.4B.2.1 for the PCell antenna connection if the PCell is on a band where 2Rx is supported and either 4Rx or 8Rx is not supported, or using the antenna connection in clause D.4B.2.2 for the PCell antenna connection if the PCell is on a band where 4Rx is supported and 8Rx is not supported, or using the antenna connection in D.4B.2.3 for the PCell antenna connection if the PCell is on a band where 8Rx is supported.

All carrier aggregation tests are performed using the antenna connection in clause D.4B.2.1 for the SCell antenna connection if an SCell is on band where 2Rx is supported and either 4Rx or 8Rx is not supported, or using the antenna connection in clause D.4B.2.2 for the SCell antenna connection if an SCell is on a band where 4Rx is supported and 8Rx is not supported, or using the antenna connection in clause D.4B.2.3 for the SCell antenna connection if an SCell is on a band where 8Rx is supported.

## D.4B.1.3 EN-DC tests

All EN-DC tests are performed using the antenna connection in clause D.4B.2.4 for the PCell antenna connection if the PCell is on a band where 2Rx is supported and either 4Rx or 8Rx is not supported, or using the antenna connection in clause D.4B.2.5 for the PCell antenna connection if the PCell is on a band where 4Rx is supported and 8Rx is not supported, or using the antenna connection in clause D.4B.2.6 for the PCell antenna connection if the PCell is on a band where 8Rx is supported.

All EN-DC tests are performed using the antenna connection in clause D.4B.2.1 for the PSCell or SCell antenna connection if an SCell or PSCell is on band where 2Rx is supported and either 4Rx or 8Rx is not supported, or using antenna connection in clause D.4B.2.2 for the PSCell or SCell antenna connection if an SCell or PSCell is on a band where 4Rx is supported and 8Rx is not supported, or using antenna connection in D.4B.2.3 for the PSCell or SCell antenna connection if an SCell or PSCell is on a band where 8Rx is supported.

# D.4B.2 Antenna connection

## D.4B.2.1 Antenna connection for NR bands where 2Rx is supported

For bands where 2Rx is supported and either 4Rx or 8Rx is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 8 Rx ports are connected with data source from system simulator. The remaining 6 Rx ports shall be connected with zero input**.** No test parameters or requirements are modified.

### D.4B.2.2 Antenna connection for NR bands where 4Rx is supported

For bands where 4Rx is supported and 8Rx is not supported, it is left to the UE declaration and antenna port configuration to decide which 4 of the 8 Rx ports are connected with data source from system simulator. The remaining 4 Rx ports shall be connected with zero input. Except for the modifications to radio link monitoring thresholds and beam failure detection thresholds described in clause D.4A.2.1, no test parameters or requirements are modified.

### D.4B.2.3 Antenna connection for bands where 8Rx is supported

For bands where 8Rx is supported, all 8 Rx antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clause D.4A.2.1, no test parameters or requirements are modified.

### D.4B.2.4 Antenna connection for E-UTRA bands where 2Rx is supported

For E-UTRAN bands where 2Rx is supported and 4Rx or 8Rx is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 8 Rx ports are connected with data source from system simulator. The remaining 6 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

### D.4B.2.5 Antenna connection for E-UTRA bands where 4Rx is supported

For bands E-UTRAN where 4Rx is supported and 8Rx is not supported, it is left to the UE declaration and antenna port configuration to decide which 4 of the 8 Rx ports are connected with data source from system simulator. The remaining 4 Rx ports shall be connected with zero input. Except for the modifications to radio link monitoring thresholds described in TS 36.133 [23] clause A.3.8.1.2.1 and A.3.8.1.2.2, no test parameters or requirements are modified.

### D.4B.2.6 Antenna connection for E-UTRA bands where 8Rx is supported

For bands E-UTRAN where 8Rx is supported, all 8 Rx antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in TS 36.133 [23] clause A.3.8.1.2.1 and A.3.8.1.2.2, no test parameters or requirements are modified.

## D.5 Test Cases with Different Channel Bandwidths

### D.5.1 Test Cases with Different E-UTRA Channel Bandwidths

#### D.5.1.1 Introduction

Test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

#### D.5.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

# D.6 Test Cases for Synchronous and Asynchronous DC Operations

## D.6.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

### D.6.1.1 Introduction

This clause defines a principle, which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

Test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

### D.6.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

# D.7 CCA model

## D.7.1 Introduction

The CCA model is used in some RRM test cases with at least one cell on a carrier frequency with CCA. The intention with the CCA model is to emulate in the test equipment the behaviour of a gNB or UE which performs channel measurement to check that the channel is clear prior to performing one or more downlink or uplink transmissions.

## D.7.2 CCA model for operation on a carrier frequency with CCA in FR1

### D.7.2.1 DL CCA model

The same DL CCA model is applicable regardless of whether DRX cycle is used or not with the following differences:

- The counter, $l_{CCA,}$ is used to monitor the number of unavailable DBT samples withing an evaluation window, $W_{CCA_DL.}$ DBT samples outside of the evaluation window $W_{CCA_DL}$ are discarded.
- If DRX cycle is not used then prior to each DBT window, the test equipment shall determine whether the DL CCA attempt is successful (i.e., the corresponding signals have to be transmitted), based on probability $P_{CCA_DL}$ of successful DL CCA configured in the corresponding test case. If DRX cycle is not used, then the DL CCA model shall increment the counter $l_{CCA}$ for every unavailable DBT sample due to DL CCA failure.
- If DRX cycle is used, then the DL CCA model shall increment the counter, $l_{CCA}$, once per DRX cycle for a DRX cycle if the first DBT sample in that DRX cycle is unavailable due to DL CCA failure. DL CCA failures in a DRX cycle are determined as follows:
- The test system *in the first DBT window of each DRX cycle* determines whether the DL CCA attempt is successful or not using the principle as follows:
  - If the DL CCA is successful then the test system shall transmit in all DBT windows within that DRX cycle.
  - If the DL CCA is not successful then the test system shall not transmit in any of the DBT windows within that DRX cycle. In this case $l_{CCA}$ is increased by 1.
- The parameters, $L_{CCA_DL}$, $L_{CCA_UL}$, $W_{CCA_DL}$ and $W_{CCA_UL}$ can be used as in non-DRX tests.

If the CCA attempt is successful for a transmission, then the test equipment shall transmit also other remaining transmissions, according to the configuration, within the same DBT window.

If the CCA attempt is not successful for a transmission within the DBT window, the test equipment shall determine whether the CCA attempt is successful for the next configured transmission, based on probability $P_{CCA_DL}$.

The probability can be different in different time intervals $T_i$ during a test case. One probability value (per cell) applies at any time point during a test; one or more probability values can be configured in the entire test, one value $P_{CCA_DL}$ per time interval $T_i$ where $i \geq 1$, and the multiple time intervals (when $i>1$) do not overlap (e.g., $P_{CCA_DL}=1.0$ in $T_1$ and $P_{CCA_DL}=0.75$ in $T_2$).

For semi-static channel access configuration, a single value $P_{CCA_DL}$ is used to configure the probability of CCA success in different time intervals $T_i$ during a test realization. An additional limit $L_{CCA_DL}$ is used to determine the maximum number of unavailable DBT samples within an evaluation window $W_{CCA_DL}$. If the number of unavailable DBT samples on the last $W_{CCA_DL}$ DBT samples is larger or equal to $L_{CCA_DL}$, the CCA attempt is considered successful for transmission.

For dynamic channel access configuration, the parameters $P_{CCA_DL_1}$ and $P_{CCA_DL_2}$ are used to configure the probability of CCA success on the first and second SSB candidate positions, respectively, in different time intervals $T_i$ during a test realization. An additional limit $L_{CCA_DL}$ is used to determine the maximum number of unavailable DBT samples within an evaluation window $W_{CCA_DL}$. If the number of unavailable DBT samples on the last $W_{CCA_DL}$ DBT samples is larger or equal to $L_{CCA_DL}$, the CCA attempt is considered successful for transmission.

For semi-static channel access configuration or for dynamic channel access configuration where one candidate SSB position is modelled, prior to each discovery burst transmission window within a time interval Ti of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position. If $p1 \leq P_{CCA_DL}$, the discovery burst is transmitted at the first candidate SSB location; else if $l_{CCA}$ is larger than or equal to $L_{CCA_DL,}$ the discovery burst is transmitted at the first candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

For dynamic channel access configuration where two candidate SSB positions are modelled, prior to each discovery burst transmission window within a time interval $T_i$ of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position: if $p1 \leq P_{CCA_DL1}$, the discovery burst is transmitted at first candidate SSB location, else the test equipment shall:

a - Generate a uniform random variable *p2* from the range [0, 1] for the second candidate SSB position.

b - Transmit the discovery burst based on *p2* in the second candidate position. If $p2 \leq P_{CCA_DL2}$, the discovery burst is transmitted at the second candidate SSB location; else if $l_{CCA}$ is larger than or equal to $L_{CCA_DL}$, the discovery burst is transmitted at the second candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

The above steps are repeated for each discovery burst transmission window in each time interval $T_i$ of the test. The limit $L_{CCA_DL}$ and window $W_{CCA_DL}$ is a configuration parameter for each test case.

In many test cases, the requirement under a test depends on the number of configured SSB transmissions which are not available during the test due to CCA failure, so the test equipment shall track how many such signal occasions are not transmitted in DL during the test period.

## D.7.2.2 UL CCA model

For UL CCA, the modelling approach is based on probability $P_{CCA_UL}$ of successful CCA. Probability $P_{CCA_UL}$ is configured in the corresponding test case, based on a set $S_{CCA_UL}$ of possible values including 75 % and 87% as typical values for dynamic and semi-static channel access configurations, 0% to model consistent UL CCA failures, and 100% to model no UL CCA failures.

Consistent UL CCA failures are modelled by configuring a low value for $P_{CCA_UL}$, e.g., $P_{CCA_UL}$ = 0%.

In the same time interval $T_i$ during the same test case, $P_{CCA_UL}$ can be different from $P_{CCA_DL}$.

The probability can be different in different time intervals $T_i$ during a test case. One probability value applies at any time point during a test; one or more probability values can be configured in the entire test, one value $P_{CCA_UL}$ per time interval $T_i$ where $I \geq 1$, and the multiple time intervals (when $I > 1$) do not overlap (e.g., $P_{CCA_UL} = 1.0$ in $T_1$ and $P_{CCA_UL} = 0.75$ in $T_2$).

$T_{CCA}$ µs prior to each UL transmission burst in the test, the test equipment (TE) shall generate a uniform random variable p from the range [0, 1]. If $p<P_{CCA_UL}$, the TE transmits an OCNG noise pattern with an energy level X per LBT measurement BW, within the UE BW scheduled/configured for the UL transmission for at-least $T_{CCA}$ µs. Where $T_{CCA}$ µs is energy detection time for accessing the uplink channel as defined in section 5.1.1 of TS 37.106 [36]. Where:

- X is $10.5^{Note1}$ dB above the energy detection threshold defined in section 5.1.1 of TS 37.106 [36].
- $T_{CCA}$ is the channel sensing period depending on CCA category for the next UL transmission.

The TE shall count the number of UL CCA failures, and no further UL CCA failures are modelled if the number of failures exceeds the limit $L_{CCA_UL}$ within a window $W_{CCA_UL}$. For each UL CCA failure generated by the model, the TE shall monitor the corresponding UL resource for the desired UL signal and based on when and/or whether the TE received the desired UL signal, it deems the test case to pass or fail.

In many cases, the requirement under a test depends on the number of configured signal occasions which are not available during the test, so the test equipment shall track how many such signal occasions are not transmitted in UL during the test period.

Note1: Includes measurement uncertainty for OCNG noise as defined in Table F.1.1.2-1.

## D.7.3 Void

# D.8 Test Cases in SA and EN-DC Operations

## D.8.0 General

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations. RRM test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

The normative reference for this section is TS 38.133 [6] clause A.3.13.

*Editor's note: this clause may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.*

## D.8.1 Principle of testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and
- verifies at least all RRM requirements covered in the test case(s), which is not performed.

# Annex E (normative): Cell configuration mapping

## E.0 General

The cells used in TS 38.533 do not correspond to the cells defined in TS 38.508-1 [14] clause 4.4.2. This annex describes the mapping between the test cases in TS 38.533 and the cells defined in TS 38.508-1 [14]. The test case shall apply the RF parameters as defined in TS 38.533 according to the column heading.

NOTE: For example if the second cell in a test case is an inter-frequency cell then Cell3 from TS 38.508-1 [14] clause 4.4.2 is used with the radio parameters as defined for Cell2 in TS 38.533.

## E.1 Test frequency selection

### E.1.0 General

The requirements defined in this test specification comprise EN-DC and NR/5GC test cases. The test cases are defined with a single NR cell or with multiple NR cells. The multi-cell test cases can be either intra-frequency, i.e. the NR cells defined by the test are overlapping in the frequency domain, or inter-frequency, i.e. the NR cells defined by the test have different centre frequencies, separated from each other by a frequency value bigger than the respective cell bandwidths. This clause describes the general rule on how to select the test frequencies for the NR RRM test cases in this test specification.

### E.1.1 E-UTRA PCell for EN-DC test cases

Unless otherwise stated, the E-UTRA PCell for EN-DC test cases shall be configured using the test frequency “Mid” as defined in TS 36.508 [25] for the corresponding E-UTRA band.

In case that the “Mid” test frequency overlaps with any of the NR test frequencies required by the test case, the E-UTRA PCell shall be shifted to an additional frequency within the E-UTRA same band. If the E-UTRA band channel bandwidth is not sufficient to allocate a non-overlapping E-UTRA PCell, the auxiliary band as defined in TS 36.521-3 [26] clause 3 shall be used.

### E.1.2 Test cases with one NR cell

Unless otherwise stated, for NR test cases with one NR cell, this cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test.

### E.1.3 Test cases with more than one NR cell

#### E.1.3.1 Intra-frequency test cases

Unless otherwise stated, multi-cell intra-frequency test cases shall be tested using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding NR band under test.

#### E.1.3.2 Inter-frequency test cases

For NR/5GC and EN-DC multi-cell inter-frequency test cases in FR1, unless otherwise stated, the serving cell shall be configured using the test frequency “Low” as defined in TS 38.508-1 [14] for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using the test frequency “High” as defined in TS 38.508-1 [14] for the corresponding band under test. For the 2nd inter-frequency neighbour cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test.

For NR/5GC multi-cell inter-frequency test cases in FR2, unless otherwise stated, the serving cell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14], clause 7.2.3.2 for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the serving cell frequency, as defined in TS 38.508-1 [14], clause 7.2.3.2.

For EN-DC multi-cell inter-frequency test cases in FR2, unless otherwise stated, the PSCell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] , clause 7.2.3.2 for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the PSCell frequency, as defined in TS 38.508-1 [14] , clause 7.2.3.2.

# E.1.4 Carrier aggregation test cases

## E.1.4.1 Inter-band carrier aggregation

For inter-band carrier aggregation test cases, each of the component carriers and their respective neighbour cells shall be configured following the same principles defined in E.1.2 and E.1.3.

## E.1.4.2 Intra-band contiguous carrier aggregation

For intra-band contiguous carrier aggregation with 2 CCs in FR1, unless otherwise specified, the serving cells (and any other neighbour cell(s) in the same frequency carriers) shall be configured using the test frequency “Low” as defined in TS 38.508-1 [14], subclause 4.3.1.1.3 for the corresponding band under test (SpCC = CC1 and SCC = CC2).

For intra-band contiguous carrier aggregation with 2 CCs in FR2, unless otherwise specified, the serving cells (and any other neighbour cell(s) in the same frequency carriers) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14], subclause 4.3.1.2.3 for the corresponding band under test (SpCC = CC1 and SCC = CC2).

## E.1.4.3 Intra-band non-contiguous carrier aggregation

For intra-band non-contiguous carrier aggregation in FR1, unless otherwise specified, the test frequency selection shall be done following the maximum Wgap principle, i.e. selecting the test frequencies (of the test frequencies defined in TS 38.508-1 [14]) with the widest frequency separation within the band under test.

For intra-band non-contiguous carrier aggregation in FR2, the test frequency selection is TBD.

# E.1.5 E-UTRA – NR inter RAT test cases

Unless otherwise stated, the E-UTRA serving/neighbour cell for E-UTRA – NR inter-RAT test cases shall be configured using the test frequency “Mid” as defined in TS 36.508 [25] for the corresponding E-UTRA band.

In case that the “Mid” test frequency overlaps with any of the NR test frequencies required by the test case, the E-UTRA cell shall be shifted to an additional frequency within the E-UTRA same band. If the E-UTRA band channel bandwidth is not sufficient to allocate a non-overlapping E-UTRA cell, the auxiliary band as defined in TS 36.521-3 [26] clause 3 shall be used.

# E.1.6 Intra-band EN-DC test cases

## E.1.6.1 Intra-band non-contiguous EN-DC

For intra-band non-contiguous EN-DC in FR1, unless otherwise specified, the test frequency selection shall be done following the maximum Wgap principle, i.e. selecting the test frequencies (of the test frequencies defined in TS 38.508-1 [14]) with the widest frequency separation within the band under test.

### E.1.6.1.1 Inter-frequency neighbour cell

Unless otherwise stated, any inter-frequency neighbour cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding NR band under test. If the NR band channel bandwidth is not sufficient to allocate a non-overlapping the neighbour cell, the auxiliary band as defined in TBD shall be used.

## E.1.6.2 Intra-band contiguous EN-DC

### E.1.6.1.1 E-UTRA PCell

Unless otherwise stated, the E-UTRA PCell for intra-band contiguous EN-DC test cases shall be configured using same test frequency, e.g., “Mid” as for NR PSCell as defined in TS 38.508-1 [14].

### E.1.7 NR sidelink test cases

Unless otherwise stated, for NR sidelink test cases the NR sidelink carrier shall be configured using the test frequency "Mid" as defined in TS 38.508-1 [14] for the corresponding band under test.

For con-current operation, unless otherwise stated, each of the NR Uu carriers and their respective cells shall be configured following the sample principles defined in E.1.2 and E.1.3.

## E.2 Cell configuration mapping for EN-DC FR1 test cases in Chapter 4

Table E.2-1 defines the cell configuration mapping for EN-DC FR1 test cases in chapter 4 of this test specification.

**Table E.2-1: Cell configuration mapping for EN-DC FR1 RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| 4.3.2.2.1 | EN-DC FR1 contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| 4.3.2.2.2 | EN-DC FR1 non-contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| 4.3.2.2.3 | EN-DC FR1 2-step contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| 4.3.2.2.4 | EN-DC FR1 2-step non-contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| 4.4.1.1 | EN-DC FR1 UE transmit timing accuracy | LTE Cell 1 | NR Cell 1 | | | |
| 4.4.3.1 | EN-DC FR1 timing advance adjustment accuracy | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.1 | EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.2 | EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.3 | EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.4 | EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.5 | EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.6 | EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.7 | EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| 4.5.1.8 | EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.1.9** | EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.2.1** | EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.2.2** | EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.2.3** | | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| | EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | | | NR Cell 10 | | inter-band |
| **4.5.2.4** | EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.2.5** | EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC | LTE Cell 6 | NR Cell 1 | LTE Cell 3 | | |
| **4.5.2.6** | EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | LTE Cell 6 | NR Cell 1 | LTE Cell 3 | | |
| **4.5.2.8** | EN-DC FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.2.9** | EN-DC FR1 interruptions at E-UTRA SRS carrier based switching | LTE Cell 6 | NR Cell 1 | LTE Cell 3 | | |
| **4.5.2.10** | EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.3.1** | EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.3.2** | EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.3.3** | EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.3.5** | EN-DC FR1 direct SCell activation at SCell addition of known SCell | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.3.6** | EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **4.5.3.7** | EN-DC FR1 fast SCell Activation of known SCell for 640 ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| **4.5.3.11** | EN-DC FR1 TRS-based SCell Activation of SSB-less SCell in FR1 collocated inter-band in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 10 | | inter-band |
| **4.5.3.12** | EN-DC FR1 Inter-band SSB-less SCell activation using A-TRS | LTE Cell 1 | NR Cell 1 | NR Cell 10 | | inter-band |
| **4.5.4.1** | EN-DC FR1 UE UL carrier RRC reconfiguration delay | LTE Cell 1 | NR Cell 1 | NR Cell 33 | | |
| **4.5.5.1** | EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.2** | EN-DC FR1 SSB-based beam failure detection and link recovery in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.3** | EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.4** | EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.5** | EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.6** | EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.7** | EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.5.8** | EN-DC FR1 SCell TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **4.5.6.1.1** | EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **4.5.6.1.2** | EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.5.6.2.1** | EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.6.3.1** | Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **4.5.6.5.1** | E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **4.5.7.1** | EN-DC FR1 addition and release delay of known PSCell | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.8.1** | EN-DC FR1 interruptions at switching between two uplink carriers | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.9.1** | UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.10.1** | EN-DC FR1 PSCell activation and deactivation delay | LTE Cell 1 | NR Cell 1 | | | |
| **4.5.11.1** | EN-DC FR1 Addition and Release Delay of PSCell | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.1.1** | EN-DC FR1 event-triggered reporting without gap in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.2** | EN-DC FR1 event-triggered reporting without gap in DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.3** | EN-DC FR1 event-triggered reporting with gap in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.4** | EN-DC FR1 event-triggered reporting with gap in DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.5** | EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.6** | EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.7** | EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.6.1.8** | EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-SCell-r17 | LTE Cell 1 | NR Cell 1 | NR Cell 6 | NR Cell 13 | Intra-band |
| | | | | NR Cell 10 | NR Cell 30 | Inter-band |
| **4.6.2.1** | EN-DC FR1-FR1 event-triggered reporting in non-DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.6.2.2** | EN-DC FR1-FR1 event-triggered reporting in DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.6.2.5** | EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.6.2.6** | EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.6.2.9** | EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.6.4.1** | EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.4.2** | EN-DC FR1 SSB-based L1-RSRP measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.4.3** | EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.4.4** | EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.5.1** | EN-DC FR1 SRS-RSRP measurement with non-DRX | LTE Cell 1 | NR Cell 1 | | | |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **4.6.7.1** | EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.7.2** | EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.6.7.3** | EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.1.1.1** | EN-DC FR1 SS-RSRP absolute measurement accuracy | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **4.7.1.1.2** | EN-DC FR1 SS-RSRP relative measurement accuracy | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **4.7.1.2.1** | EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.1.2.2** | EN-DC FR1-FR1 SS-RSRP relative measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.2.1** | EN-DC FR1 SS-RSRQ measurement accuracy | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.7.2.2.1** | EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.2.2.2** | EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.3.1** | EN-DC FR1 SS-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **4.7.3.2.1** | EN-DC FR1-FR1 SS-SINR absolute measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.3.2.2** | EN-DC FR1-FR1 SS-SINR relative measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.4.1.1** | EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.4.1.2** | EN-DC FR1 SSB based L1-RSRP relative measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.4.2.1** | EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.4.2.2** | EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.5.1** | EN-DC FR1 SFTD measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.6.1** | EN-DC SRS-RSRP measurement accuracy with FR1 serving cell | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.7.1** | EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.7.2** | EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.7.3** | EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **4.7.8.1.1** | EN-DC intra-frequency absolute measurement accuracy with FR1 serving cell and FR1 target cell | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **4.7.8.1.2** | EN-DC intra-frequency relative measurement accuracy with FR1 serving cell and FR1 target cell | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **4.7.8.2.1** | EN-DC inter-frequency absolute measurement accuracy with FR1 serving cell and FR1 target cell | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **4.7.8.2.2** | EN-DC inter-frequency relative measurement accuracy with FR1 serving cell and FR1 target cell | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3 \neq 0$. | | | | | | |

# E.3 Cell configuration mapping for EN-DC FR2 test cases in Chapter 5

Table E.3-1 defines the cell configuration mapping for EN-DC FR2 test cases in chapter 5 of this test specification.

**Table E.3-1: Cell configuration mapping for EN-DC FR2 RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **5.3.2.2.1** | EN-DC FR2 contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| **5.3.2.2.2** | EN-DC FR2 non-contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| **5.3.2.2.3** | EN-DC FR2 2-step contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| **5.3.2.2.4** | EN-DC FR2 2-step non-contention based random access | LTE Cell 1 | NR Cell 1 | | | |
| **5.4.1.1** | EN-DC FR2 UE transmit timing accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **5.4.3.1** | EN-DC FR2 timing advance adjustment accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.1** | EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 6 | | | |
| **5.5.1.2** | EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 6 | | | |
| **5.5.1.3** | EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 6 | | | |
| **5.5.1.4** | EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 6 | | | |
| **5.5.1.5** | EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.6** | EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.7** | EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.8** | EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.9** | EN-DC FR2 radio link monitoring UE scheduling restrictions | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.1.10** | EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.2.1** | EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.2.2** | EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.2.3** | EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **5.5.2.4** | EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **5.5.2.5** | EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC | LTE Cell 6 | NR Cell 1 | LTE Cell 3 | | |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **5.5.2.6** | EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | LTE Cell 6 | NR Cell 1 | LTE Cell 3 | | |
| **5.5.2.7** | EN-DC FR2 interruptions at E-UTRA SRS carrier based switching | LTE Cell 1 | NR Cell 1 | LTE Cell 3 | | |
| **5.5.2.8** | EN-DC FR2 interruptions at NR SRS carrier based switching | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| | | | | NR Cell 10 | | inter-band |
| **5.5.3.1** | EN-DC FR2 SCell activation and deactivation intra-band in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| **5.5.3.7** | EN-DC FR2 direct SCell activation at SCell addition of known SCell | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| **5.5.3.8** | EN-DC FR2 fast SCell Activation of SCell in FR2 intra-band | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | intra-band |
| **5.5.5.1** | EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.2** | EN-DC FR2 SSB-based beam failure detection and link recovery in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.3** | EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.4** | EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.5** | EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.6** | EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **5.5.5.7** | EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **5.5.5.8** | EN-DC FR2 PSCell CSI-RS-based TRP specific Beam Failure Detection and Link Recovery in DRX mode | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.5.9** | EN-DC FR2 SSB-based beam failure detection and link recovery in DRX mode for UE fulfilling relaxed measurement criterion | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.6.2.1** | EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.6.3.1** | E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.5.6.4.1** | E-UTRAN – NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.5.7.1** | Addition and Release Delay of NR PSCell | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.8.1** | EN-DC FR2 MAC-CE based active TCI state switch | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.8.2** | EN-DC FR2 RRC based active TCI state switch | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.9.1.1** | EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.9.2.1** | EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.11.1** | EN-DC FR2 MAC-CE based active joint TCI state switch | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.11.2** | EN-DC FR2 MAC-CE based active uplink TCI state switch | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.11.3** | EN-DC FR2 MAC-CE based active downlink TCI state switch | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | |
| **5.5.12.1** | EN-DC FR2 PSCell activation and deactivation delay | LTE Cell 1 | NR Cell 1 | | | |
| **5.5.13.1** | EN-DC FR2 Addition and Release Delay of NR PSCell | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.1.1** | EN-DC FR2 event-triggered reporting without gap in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **5.6.1.2** | EN-DC FR2 event-triggered reporting without gap in DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.6.1.3** | EN-DC FR2 event-triggered reporting with gap in non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.6.1.4** | EN-DC FR2 event-triggered reporting with gap in DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.6.2.1** | EN-DC FR2-FR2 event-triggered reporting in non-DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.2** | EN-DC FR2-FR2 event-triggered reporting in DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.3** | EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.4** | EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.5** | EN-DC FR1-FR2 event-triggered reporting in non-DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.6** | EN-DC FR1-FR2 event-triggered reporting in DRX | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.7** | EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.2.8** | EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.6.3.1** | EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.3.2** | EN-DC FR2 SSB-based L1-RSRP measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.3.3** | EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.3.4** | EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.6.1** | EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.6.2** | EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.6.3** | EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **5.6.7.1** | EN-DC event triggered reporting test without gap under non-DRX | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.6.8.1** | EN-DC event triggered reporting tests for NR FR2 cell when DRX is used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.7.1.1** | EN-DC FR2 SS-RSRP measurement accuracy | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **5.7.1.2** | EN-DC FR2-FR2 SS-RSRP measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.7.1.3** | EN-DC FR1-FR2 SS-RSRP measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.7.2.1** | EN-DC FR2 SS-RSRQ measurement accuracy | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.7.2.2** | EN-DC FR2-FR2 SS-RSRQ measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.7.3.1** | EN-DC FR2 SS-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | |
| **5.7.3.2** | EN-DC FR2-FR2 SS-SINR measurement accuracy | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **5.7.6.1** | EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **5.7.6.2** | EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **5.7.6.3** | EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **5.7.7.1** | EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | LTE Cell 1 | NR Cell 489 | NR Cell 1 | | |
| **5.7.7.2** | EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | |

# E.4 Cell configuration mapping for SA FR1 test cases in Chapter 6

Table E.4-1 defines the cell configuration mapping for NR/5GC FR1 test cases in chapter 6 of this test specification.

**Table E.4-1: Cell configuration mapping for SA FR1 RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.1.1.1** | NR SA FR1 cell re-selection | NR Cell 1 | NR Cell 11 | | | |
| **6.1.1.2** | NR SA FR1-FR1 cell re-selection | NR Cell 6 | NR Cell 23 | | | |
| **6.1.1.3** | NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | NR Cell 1 | NR Cell 11 | | | |
| **6.1.1.4** | NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | NR Cell 1 | NR Cell 11 | | | |
| **6.1.1.5** | NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | NR Cell 6 | NR Cell 23 | | | |
| **6.1.1.6** | NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | NR Cell 6 | NR Cell 23 | | | |
| **6.1.1.7** | NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16 | NR Cell 1 | NR Cell 11 | | | |
| **6.1.1.8** | NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17 | NR Cell 1 | NR Cell 11 | | | |
| **6.1.1.9** | NR SA FR1 cell re-selection for UE operating on a cell with less than 5MHz BW | NR Cell 1 | NR Cell 11 | | | |
| **6.2.1** | NR SA FR1 TA Validation for CG-SDT | NR Cell 1 | | | | |
| **6.3.1.1** | NR SA FR1 handover with known target cell | NR Cell 1 | NR Cell 2 | | | |
| **6.3.1.2** | NR SA FR1 handover with unknown target cell | NR Cell 1 | NR Cell 2 | | | |
| **6.3.1.3** | NR SA FR1-FR1 Handover with unknown Target Cell | NR Cell 6 | NR Cell 3 | | | |
| **6.3.1.7** | NR SA FR1 synchronous DAPS handover | NR Cell 1 | NR Cell 2 | | | |
| **6.3.1.8** | NR SA FR1 asynchronous DAPS handover | NR Cell 1 | NR Cell 2 | | | |
| **6.3.1.9** | NR SA FR1 Intra-band inter-frequency synchronous DAPS handover | NR Cell 6 | NR Cell 3 | | | |
| **6.3.1.10** | NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover | NR Cell 6 | NR Cell 3 | | | |
| **6.3.1.11** | NR SA FR1 Inter-band inter-frequency synchronous DAPS handover | NR Cell 1 | NR Cell 10 | | | |
| **6.3.1.12** | NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover | NR Cell 1 | NR Cell 10 | | | |
| **6.3.1.18** | NR SA FR1 handover with unknown target cell operating with 12 PRB SSB bandwidth | NR Cell 6 | NR Cell 23 | | | |
| **6.3.2.1.1** | NR SA FR1 RRC re-establishment | NR Cell 1 | NR Cell 2 | | | |
| **6.3.2.1.2** | NR SA FR1 - FR1 RRC re-establishment | NR Cell 6 | NR Cell 3 | | | |
| **6.3.2.1.3** | NR SA FR1 RRC re-establishment without serving cell timing | NR Cell 1 | NR Cell 2 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.3.2.2.1** | NR SA FR1 contention based random access | NR Cell 1 | | | | |
| **6.3.2.2.2** | NR SA FR1 non-contention based random access | NR Cell 1 | | | | |
| **6.3.2.2.3** | NR SA FR1 2-step contention based random access | NR Cell 1 | | | | |
| **6.3.2.2.4** | NR SA FR1 2-step non-contention based random access | NR Cell 1 | | | | |
| **6.3.2.3.1** | NR SA FR1 RRC connection release with redirection | NR Cell 6 | NR Cell 23 | | | |
| **6.3.2.4.1** | PDCCH-order RACH on neighbor cell in FR1 when RACH BW is within active UL BWP | NR Cell 1 | NR Cell 2 | | | |
| **6.3.2.4.2** | PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM | NR Cell 6 | NR Cell 3 | | | |
| **6.3.2.4.3** | PDCCH-order RACH on neighbor cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP | NR Cell 1 | NR Cell 2 | | | |
| **6.3.3.1** | NR SA FR1 conditional handover | NR Cell 1 | NR Cell 2 | | | |
| **6.3.3.2** | NR SA FR1-FR1 conditional handover | NR Cell 1 | NR Cell 6 | | | |
| **6.3.3.3** | SA FR1 conditional handover including target MCG and target SCG | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 12 | |
| **6.3.3.4** | NR-SA FR1 conditional handover including target MCG and candidate SCG | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 12 | |
| **6.3.3.6** | NR SA FR1 Intra-frequency NES triggering conditional handover | NR Cell 1 | NR Cell 2 | | | |
| **6.3.3.7** | NR SA FR1 Inter-frequency NES-based conditional handover | NR Cell 1 | NR Cell 6 | | | |
| **6.3.4.1** | RACH-based Intra-frequency PCell switch from FR1 to FR1 | NR Cell 1 | NR Cell 2 | | | |
| **6.3.4.2** | RACH based Inter-frequency LTM PCell switch from FR1 to FR1 | NR Cell 6 | NR Cell 3 | | | |
| **6.3.4.3** | RACH-less Intra-frequency PCell switch from FR1 to FR1 | NR Cell 1 | NR Cell 2 | | | |
| **6.3.4.4** | NR SA FR1 RACH-less Intra-frequency PCell switch from FR1 to FR1 without L1-RSRP measurement | NR Cell 1 | NR Cell 2 | | | |
| **6.3.5.1** | NR SA FR1 RACH-based intra-frequency LTM PSCell switch from FR1 to FR1 | NR Cell 1 | NR Cell 6 | NR Cell 2 | | |
| **6.4.3.1** | NR SA FR1 timing advance adjustment accuracy | NR Cell 1 | | | | |
| **6.5.1.1** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **6.5.1.2** | NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **6.5.1.3** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **6.5.1.4** | NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **6.5.1.5** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **6.5.1.6** | NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **6.5.1.7** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **6.5.1.8** | NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | NR Cell 1 | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.5.1.9** | SA FR1 radio link monitoring out-of-sync Test for PSCell configured with CSI-RS-based RLM for UE fulfilling relaxed measurement criterion | NR Cell 1 | | | | |
| **6.5.1.13** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode for UE operating on a cell with less than 5MHz BW | NR Cell 1 | | | | |
| **6.5.1.14** | NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode for UE operating on a cell with less than 5MHz BW | NR Cell 1 | | | | |
| **6.5.1.15** | NR SA FR1 radio link monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **6.5.1.16** | NR SA FR1 Radio Link Monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **6.5.2.1** | NR SA FR1 interruptions during measurements on deactivated NR SCC | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.2.2** | SA FR1 interruptions at NR SRS carrier based switching | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.1** | NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.2** | NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.3** | NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.4** | NR SA FR1 direct SCell activation at SCell addition of known SCell | NR Cell 1 | NR Cell 6 | | | intra-band |
| **6.5.3.5** | NR SA FR1 direct SCell activation at handover with known SCell | NR Cell 1 | NR Cell 6 | NR Cell 2 | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.10** | NR SA FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.11** | NR SA FR1 fast SCell Activation of known SCell in non-DRX for 640ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.3.15** | NR SA FR1 TRS based SCell Activation of SSB-less SCell in inter-band CA in non-DRX | NR Cell 1 | NR Cell 10 | | | Inter-band |
| **6.5.3.16** | NR SA FR1 Inter-band SSB-less SCell Activation based on A-TRS in non-DRX | NR Cell 1 | NR Cell 10 | | | Inter-band |
| **6.5.4.1** | NR SA FR1 UE UL carrier RRC reconfiguration delay | NR Cell 1 | NR Cell 33 | | | |
| **6.5.5.1** | NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX | NR Cell 1 | | | | |
| **6.5.5.2** | NR SA FR1 SSB-based beam failure detection and link recovery in DRX | NR Cell 1 | | | | |
| **6.5.5.3** | NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | NR Cell 1 | | | | |
| **6.5.5.4** | NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX | NR Cell 1 | | | | |
| **6.5.5.5** | NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | NR Cell 1 | NR Cell 10 | | | |
| **6.5.5.6** | NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | NR Cell 1 | NR Cell 10 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.5.5.7** | NR SA FR1 PCell TRP Specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | NR Cell 1 | | | | |
| **6.5.6.1.1** | NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.5.6.1.2** | NR SA FR1 DCI-based DL active BWP switch in non-DRX | NR Cell 1 | | | | |
| **6.5.6.2.1** | NR SA FR1 RRC-based DL active BWP switch in non-DRX | NR Cell 1 | | | | |
| **6.5.6.3.1** | NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA | NR Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **6.5.6.5.1** | RRC based BWP switch on multiple CCs | NR Cell 1 | NR Cell 6 | | | |
| **6.5.7.1** | NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA | NR Cell 1 | NR Cell 10 | | | inter-band |
| **6.5.7.2** | NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA | NR Cell 1 | NR Cell 10 | | | inter-band |
| **6.5.7A.1** | NR SA FR1 DL interruptions at switching between two uplink carriers in FDD-TDD CA | NR Cell 1 | NR Cell 10 | | | inter-band |
| **6.5.7A.2** | NR SA FR1 DL interruptions at switching between two uplink carriers in TDD-TDD CA | NR Cell 1 | NR Cell 10 | | | inter-band |
| **6.5.7B.1** | NR SA FR1 DL Interruptions at switching between two uplink bands in FDD-TDD CA | NR Cell 1 | NR Cell 10 | NR Cell 31 | | inter-band |
| **6.5.7B.2** | NR SA FR1 DL Interruptions at switching between two uplink bands in TDD-TDD CA | NR Cell 1 | NR Cell 10 | NR Cell 31 | | inter-band |
| **6.5.7C.1** | DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA | NR Cell 1 | NR Cell 10 | NR Cell 31 | | Inter-band |
| **6.5.7C.2** | DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA | NR Cell 1 | NR Cell 10 | NR Cell 31 | | Inter-band |
| **6.5.7D.1** | NR SA FR1 DL interruptions at switching across three uplink bands in TDD-TDD CA for single TAG | NR Cell 1 | NR Cell 10 | NR Cell 500 | | Inter-band |
| **6.5.7D.2** | NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG | NR Cell 1 | NR Cell 10 | NR Cell 28 | NR Cell 500 | Inter-band |
| **6.5.7D.3** | NR SA FR1 DL interruptions at switching across three uplink bands in FDD-TDD CA for two TAGs | NR Cell 1 | NR Cell 10 | NR Cell 500 | | Inter-band |
| **6.5.7D.4** | NR SA FR1 DL interruptions at switching across four uplink bands in TDD-TDD CA for two TAGs | NR Cell 1 | NR Cell 10 | NR Cell 28 | NR Cell 500 | Inter-band |
| **6.5.8.1** | UE specific CBW change on PCell in FR1 in non-DRX | NR Cell 1 | | | | |
| **6.6.1.1** | SA event triggered reporting tests without gap under non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.2** | SA event triggered reporting tests without gap under DRX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.3** | SA event triggered reporting tests with per-UE gaps under non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.4** | SA event triggered reporting tests with per-UE gaps under DRX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.5** | SA event triggered reporting tests without gap under non-DRX with SSB index reading | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.6** | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.7** | NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.8** | NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-SCell-r17 | NR Cell 1 | NR Cell 6 | NR Cell 13 | | intra-band |
| | | | NR Cell 10 | NR Cell 30 | | inter-band |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.6.1.12** | NR SA FR1 event triggered reporting with SSB index detection without measurement gap in non-DRX mode for UE operating with 12 PRB SSB bandwidth | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.9** | NR SA FR1 event triggered reporting with MUSIM gap configured | NR Cell 1 | NR Cell 2 | | | |
| **6.6.1.13** | NR SA FR1 event triggered reporting tests without gap in DRX under Cell DTX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.2.1** | NR SA FR1-FR1 event-triggered reporting in non-DRX | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.2** | NR SA FR1-FR1 event-triggered reporting in DRX | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.5** | NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.6** | NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.9** | NR SA FR1-FR1 event triggered reporting tests with additional mandatory gap pattern | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.10** | NR SA FR1-FR1 event triggered reporting tests for FR1 without gap when DRX is used | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.11** | NR SA FR1-FR1 event triggered reporting tests for FR1 without gap when DRX is not used | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.12** | NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.13** | NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.14** | NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP | NR Cell 6 | NR Cell 3 | | | |
| **6.6.2.15** | NR SA FR1 event triggered reporting without SSB index detection in DRX mode for UE operating on a cell with less than 5MHz BW | NR Cell 6 | NR Cell 3 | | | |
| **6.6.4.1** | NR SA FR1 SSB-based L1-RSRP measurement in non-DRX | NR Cell 1 | | | | |
| **6.6.4.2** | NR SA FR1 SSB-based L1-RSRP measurement in DRX | NR Cell 1 | | | | |
| **6.6.4.3** | NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX | NR Cell 1 | | | | |
| **6.6.4.4** | NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX | NR Cell 1 | | | | |
| **6.6.4.5** | NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16 | NR Cell 1 | | | | |
| **6.6.4.6** | NR SA FR1 Inter-cell SSB based L1-RSRP measurements on PCell in DRX | NR Cell 1 | NR Cell 2 | | | |
| **6.6.6.1** | NR SA FR1 SRS-RSRP measurement in non-DRX | NR Cell 1 | | | | |
| **6.6.8.1** | NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | NR Cell 1 | | | | |
| **6.6.8.2** | NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | NR Cell 1 | | | | |
| **6.6.8.3** | NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | NR Cell 1 | | | | |
| **6.7.8.1** | NR SA FR1 SRS-RSRP measurement accuracy | NR Cell 1 | | | | |
| **6.6.9.1** | NR SA FR1 Idle mode CA/DC measurement for FR1 | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.6.9.2** | NR SA FR1 Idle mode fast CA/DC eEMR measurement | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.6.9.3** | NR SA FR1 Idle mode fast CA/DC cell reselection measurement without valid reporting | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.6.9.4** | NR SA FR1 Idle mode fast CA/DC cell reselection measurement with valid reporting | NR Cell 1 | NR Cell 6 | | | intra-band |
| | | | NR Cell 10 | | | inter-band |
| **6.6.17.1** | NR SA FR1 event triggered reporting tests with autonomous activation/deactivation Pre-MG | NR Cell 1 | NR Cell 2 | | | |
| **6.6.17.2** | NR SA FR1 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | NR Cell 1 | NR Cell 2 | | | |
| **6.6.18.1** | NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers | NR Cell 6 | NR Cell 3 | NR Cell 1 | | |
| **6.6.18.2** | NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers | NR Cell 6 | NR Cell 3 | NR Cell 1 | | |
| **6.6.18.4** | NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used | NR Cell 6 | NR Cell 3 | NR Cell 13 | | |
| **6.6.19.1** | NR SA FR1 event-triggered reporting tests with NCSG under non-DRX in FR1 | NR Cell 1 | NR Cell 2 | | | |
| **6.6.19.2** | NR SA FR1 event-triggered reporting tests for FR1 with NCSG for inter-frequency measurement | NR Cell 6 | NR Cell 3 | | | |
| **6.6.19.4** | NR SA FR1 Event triggered reporting on SCC with deactivated SCell test with per-UE NCSG under non-DRX | NR Cell 1 | NR Cell 6 | NR Cell 13 | | intra-band |
| | | | NR Cell 10 | NR Cell 30 | | inter-band |
| **6.6.20.1** | UE Rx-Tx time difference measurement with PRS for RTT-based PDC | NR Cell 1 | | | | |
| **6.6.21.1** | UE Rx-Tx time difference measurement with TRS for RTT-based PDC | NR Cell 1 | | | | |
| **6.6.22.1** | NR SA FR1 and FR1-FR1 event-triggered reporting with concurrent Type-2 measurement gap and Pre-MG | NR Cell 6 | NR Cell 13 | NR Cell 3 | | |
| **6.6.22.2** | NR SA FR1 event-triggered reporting with two concurrent Pre-MGs | NR Cell 6 | NR Cell 13 | NR Cell 3 | | |
| **6.6.23.1** | NR SA FR1-FR1 event-triggered reporting with concurrent Type-2 measurement gap and NCSG | NR Cell 6 | NR Cell 3 | NR Cell 1 | | |
| **6.6.23.2** | NR SA FR1-FR1 event-triggered reporting with two concurrent NCSGs | NR Cell 6 | NR Cell 3 | NR Cell 1 | | |
| **6.6.23.3** | NR SA FR1 and FR1-FR1 event triggered reporting with concurrent Type-2 measurement gap and NCSG | NR Cell 6 | NR Cell 3 | NR Cell 12 | | Intra-band |
| | | NR Cell 1 | NR Cell 10 | NR Cell 30 | | Inter-band |
| **6.6.24.1** | NR SA FR1 event-triggered reporting without gap with interruptions | NR Cell 1 | NR Cell 2 | | | |
| **6.6.24.2** | NR SA FR1-FR1 event-triggered reporting without gap with interruption with SSB index reading | NR Cell 6 | NR Cell 3 | | | |
| **6.6.24.3** | NR SA FR1-FR1 event-triggered reporting without gap with interruption | NR Cell 6 | NR Cell 3 | | | |
| **6.6.24.4** | NR SA FR1-FR1 event-triggered reporting without gap without interruption | NR Cell 6 | NR Cell 3 | | | |
| **6.6.24.5** | NR SA FR1 event-triggered reporting without gap without interruption | NR Cell 1 | NR Cell 2 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.6.26.1** | Intra-frequency SSB based L1-RSRP measurement | NR Cell 1 | NR Cell 2 | | | |
| **6.6.27.1** | Inter-frequency SSB based L1-RSRP measurement with measurement gap | NR Cell 6 | NR Cell 3 | | | |
| **6.6.28.1** | Inter-frequency SSB based L1-RSRP measurement without measurement gap | NR Cell 6 | NR Cell 3 | | | |
| **6.7.1.1.1** | NR SA FR1 SS-RSRP absolute measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **6.7.1.1.2** | NR SA FR1 SS-RSRP relative measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **6.7.1.2.1** | NR SA FR1-FR1 SS-RSRP absolute measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.1.2.2** | NR SA FR1-FR1 SS-RSRP relative measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.1.3.1** | NR SA FR1-FR2 SS-RSRP absolute measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **6.7.1.3.2** | NR SA FR1-FR2 SS-RSRP relative measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **6.7.2.1** | NR SA FR1 SS-RSRQ measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **6.7.2.2.1** | NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.2.2.2** | NR SA FR1-FR1 SS-RSRQ relative measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.3.1** | NR SA FR1 SS-SINR measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **6.7.3.2.1** | NR SA FR1-FR1 SS-SINR absolute measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.3.2.2** | NR SA FR1-FR1 SS-SINR relative measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.4.1.1** | NR SA FR1 SSB based L1-RSRP absolute measurement accuracy | NR Cell 1 | | | | |
| **6.7.4.1.2** | NR SA FR1 SSB based L1-RSRP relative measurement accuracy | NR Cell 1 | | | | |
| **6.7.4.2.1** | NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy | NR Cell 1 | | | | |
| **6.7.4.2.2** | NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy | NR Cell 1 | | | | |
| **6.7.9.1** | NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **6.7.9.2** | NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | NR Cell 1 | | | | |
| **6.7.9.3** | NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **6.7.10.1.1** | NR SA FR1 CSI-RSRP absolute measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **6.7.10.1.2** | NR SA FR1 CSI-RSRP relative measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **6.7.10.2.1** | NR SA FR1-FR1 CSI-RSRP absolute measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.10.2.2** | NR SA FR1-FR1 CSI-RSRP relative measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **6.7.17.1.1** | Inter-frequency L1-RSRP absolute accuracy requirements for neighbour cell | NR Cell 6 | NR Cell 3 | | | |
| **6.7.17.1.2** | Void | | | | | |

Table E.4-2 defines the cell configuration mapping for NR/5GC FR1 – E-UTRA Inter-RAT test cases (serving cell in NR) in chapter 6 of this test specification.

**Table E.4-2: Cell configuration mapping for SA FR1 – E-UTRA Inter-RAT RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 LTE Cell2 | 38.533 LTE Cell3 | 38.533 LTE Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.1.2.1** | NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA | NR Cell 1 | LTE Cell 1 | | | |
| **6.1.2.2** | NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA | NR Cell 1 | LTE Cell 1 | | | |
| **6.1.2.3** | NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion | NR Cell 1 | LTE Cell 1 | | | |
| **6.1.2.4** | NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion | NR Cell 1 | LTE Cell 1 | | | |
| **6.1.2.5** | NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 | NR Cell 1 | LTE Cell 11 | | | |
| **6.3.1.4** | NR SA FR1 – E-UTRA handover with known target cell | NR Cell 1 | LTE Cell 1 | | | |
| **6.3.1.5** | NR SA FR1 – E-UTRA handover with unknown target cell | NR Cell 1 | LTE Cell 1 | | | |
| **6.3.2.3.2** | NR SA FR1 – E-UTRA RRC connection release with redirection | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.3.1** | NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.3.2** | NR SA FR1 – E-UTRAN event-triggered reporting in DRX | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.3.3** | NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16 | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.15.1** | NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.19.3** | NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX in FR1 with NCSG | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.25.1** | NR SA FR1 - E-UTRAN event-triggered reporting without gap without interruption | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.25.2** | NR SA FR1 - E-UTRAN event-triggered reporting without interruption outside gap | NR Cell 1 | LTE Cell 1 | | | |
| **6.6.25.3** | NR SA FR1 - E-UTRAN event-triggered reporting without gap when CRS contained within active DL BWP | NR Cell 1 | LTE Cell 1 | | | |
| **6.7.5.1** | NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy | NR Cell 1 | LTE Cell 1 | | | |
| **6.7.6.1** | NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy | NR Cell 1 | LTE Cell 1 | | | |
| **6.7.7.1** | NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy | NR Cell 1 | LTE Cell 1 | | | |

**Table E.4-3: Cell configuration mapping for SA FR1 – UTRA FDD Inter-RAT RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 UTRA Cell2 | 38.533 UTRA Cell3 | 38.533 UTRA Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **6.3.1.6** | NR SA FR1 – UTRA cell re-selection to higher priority UTRA | NR Cell 1 | UTRA Cell 1 | | | |
| **6.6.5.1** | NR SA FR1 – UTRAN event-triggered reporting in non-DRX | NR Cell 1 | UTRA Cell 1 | | | |

Table E.4-4 defines the multi-cell configuration mapping for NR/5GC FR1 – E-UTRA Inter-RAT test cases (serving cell in NR) in chapter 6 of this test specification.

**Table E.4-4: Multi-cell configuration mapping for SA FR1 – E-UTRA Inter-RAT RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 LTE Cell3 | 38.533 LTE Cell 4 | CA Type |
|---|---|---|---|---|---|---|
| **6.6.18.3** | NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1 | NR Cell 6 | NR Cell 3 | LTE Cell 1 | | |

# E.5 Cell configuration mapping for SA FR2 test cases in Chapter 7

Table E.5-1 defines the cell configuration mapping for NR/5GC FR2 test cases in chapter 7 of this test specification.

**Table E.5-1: Cell configuration mapping for SA FR2 RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.1.1.1** | NR SA FR2 cell re-selection | NR Cell 1 | NR Cell 11 | | | |
| **7.1.1.2** | NR SA FR2-FR2 cell re-selection | NR Cell 1 | NR Cell 23 | | | |
| **7.1.1.3** | NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | NR Cell 1 | NR Cell 2 | | | |
| **7.1.1.4** | NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | NR Cell 1 | NR Cell 2 | | | |
| **7.1.1.5** | NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | NR Cell 1 | NR Cell 2 | | | |
| **7.1.1.6** | NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | NR Cell 1 | NR Cell 2 | | | |
| **7.1.1.7** | NR SA FR2 cell re-selection for power class 6 UE configured with *highSpeedMeasFlagFR2-r17* | NR Cell 1 | NR Cell 2 | | | |
| **7.1.1.8** | NR SA FR2 inter-frequency cell re-selection for power class 6 UE configured with *highSpeedMeasFlagFR2-r17* | NR Cell 1 | NR Cell 23 | | | |
| **7.2.1.1** | TA validation for CG-SDT in FR2 | NR Cell 1 | | | | |
| **7.3.1.1** | NR SA FR1-FR2 Inter-frequency handover; unknown target cell | NR Cell 1 | NR Cell 6 | | | |
| **7.3.1.2** | NR SA FR2 Intra-frequency handover; unknown target cell | NR Cell 1 | NR Cell 2 | | | |
| **7.3.1.3** | NR SA FR2-FR2 Inter-frequency handover; unknown target cell | NR Cell 1 | NR Cell 6 | | | |
| **7.3.1.4** | NR SA FR1-FR2 synchronous DAPS handover | NR Cell 1 | NR Cell 10 | | | |
| **7.3.1.5** | NR SA FR1-FR2 asynchronous DAPS handover | NR Cell 1 | NR Cell 10 | | | |
| **7.3.2.1.1** | NR SA FR2 RRC re-establishment | NR Cell 1 | | | | |
| **7.3.2.1.2** | NR SA FR2-FR2 re-establishment | NR Cell 1 | | | | |
| **7.3.2.1.3** | NR SA FR2 RRC re-establishment without serving cell timing | NR Cell 1 | NR Cell 2 | | | |
| **7.3.2.2.1** | NR SA FR2 contention based random access | NR Cell 1 | | | | |
| **7.3.2.2.2** | NR SA FR2 non-contention based random access | NR Cell 1 | | | | |
| **7.3.2.2.4** | NR SA FR2 2-step non-contention based random access | NR Cell 1 | | | | |
| **7.3.2.3.1** | NR SA FR2-FR2 RRC connection release with redirection | NR Cell 1 | NR Cell 6 | | | |
| **7.3.2.4.1** | NR SA FR2 PDCCH-order RACH on neighbor cell when RACH BW is within active BWP | NR Cell 1 | NR Cell 2 | | | |
| **7.3.2.4.2** | NR SA FR2 PDCCH-order RACH on inter-frequency neighbor cell | NR Cell 1 | NR Cell 6 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.3.3.1** | NR SA FR2 conditional handover | NR Cell 1 | NR Cell 2 | | | |
| **7.3.3.2** | NR SA FR2-FR2 conditional handover | NR Cell 1 | NR Cell 6 | | | |
| 7.3.4.1 | NR SA FR2 RACH based Intra-frequency PCell switch from FR2 to FR2 | NR Cell 1 | NR Cell 2 | | | |
| 7.3.4.2 | NR SA FR2 RACH-less Intra-frequency PCell switch from FR2 to FR2 | NR Cell 1 | NR Cell 2 | | | |
| 7.3.4.3 | NR SA FR2 RACH-based Inter-frequency LTM PCell switch from FR2 to FR2 | NR Cell 1 | NR Cell 6 | | | |
| **7.3.3.3** | NR SA FR2 intra-frequency NES triggering conditional handover | NR Cell 1 | NR Cell 2 | | | |
| **7.3.3.4** | NR SA FR2-FR1 inter-frequency NES triggering conditional handover | NR Cell 1 | NR Cell 6 | | | |
| **7.3.3.5** | NR SA FR2 NR conditional handover including target MCG and target SCG from FR1-FR2 NR-DC to FR1-FR2 NR-DC | NR Cell 1 | NR Cell 2 | NR Cell 3 | NR Cell 12 | |
| **7.3.3.6** | NR SA FR2 conditional handover including target MCG and candidate SCG from FR1-FR2 NR-DC to FR1-FR2 NR-DC | NR Cell 1 | NR Cell 6 | NR Cell 3 | NR Cell 13 | |
| **7.3.5.1** | NR SA FR2 RACH-based Intra-frequency LTM PSCell switch from FR2 to FR2 | NR Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **7.4.1.1** | NR SA FR2 UE transmit timing accuracy | NR Cell 1 | | | | |
| **7.4.1.3** | NR SA FR2 UE Transmit Timing Test with 2-TA for FR2 UE supporting *multiDCI-IntraCellMultiTRP-TwoTA-r18* | NR Cell 1 | | | | |
| **7.4.3.1** | NR SA FR2 timing advance adjustment accuracy | NR Cell 1 | | | | |
| **7.5.1.1** | Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **7.5.1.2** | Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **7.5.1.3** | Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **7.5.1.4** | Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | NR Cell 1 | | | | |
| **7.5.1.9** | NR SA FR2 radio link monitoring UE scheduling restrictions | NR Cell 1 | | | | |
| **7.5.3.3** | SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **7.5.3.4** | NR SA FR2 direct SCell activation at SCell addition of known SCell | NR Cell 1 | NR Cell 6 | | | |
| **7.5.3.5** | NR SA FR2 direct SCell activation at handover with known SCell | NR Cell 1 | NR Cell 6 | NR Cell 2 | | |
| **7.5.3.13** | NR SA FR2 SCell Activation for SCell in FR2 intra-band in non-DRX | NR Cell 1 | NR Cell 6 | | | intra-band |
| **7.5.3.14** | NR SA FR2 SCell Activation for known SCell in FR2 inter-band | NR Cell 1 | NR Cell 10 | | | |
| **7.5.5.1** | NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX | NR Cell 1 | | | | |
| **7.5.5.2** | NR SA FR2 SSB-based beam failure detection and link recovery in DRX | NR Cell 1 | | | | |
| **7.5.5.3** | NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | NR Cell 1 | | | | |
| **7.5.5.4** | NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX | NR Cell 1 | | | | |
| **7.5.5.6** | NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | NR Cell 1 | NR Cell 6 | | | |
| **7.5.5.7** | NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | NR Cell 1 | NR Cell 6 | | | |
| **7.5.5.8** | FFS | | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.5.5.9** | NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | NR Cell 1 | NR Cell 6 | | | |
| **7.5.5.10** | NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX | NR Cell 1 | | | | |
| **7.5.6.1** | NR SA FR2 DCI-based DL active BWP switch in non-DRX | NR Cell 1 | | | | |
| **7.5.8.1.1** | NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state | NR Cell 1 | | | | |
| **7.5.8.2.1** | NR SA PCell FR2 RRC based active TCI state switch for a known TCI state | NR Cell 1 | | | | |
| **7.5.8.3.1** | NR SA FR2 HST active TCI state switch for a known TCI state | NR Cell 1 | | | | |
| **7.5.8.3.2** | NR SA FR2 HST active TCI state switch for PC6 UE supporting *tci-StateSwitchInd-r18* a known TCI state | NR Cell 1 | | | | |
| **7.5.8.4** | NR SA FR2 DCI based active TCI state switch with m-DCI for simultaneous reception | NR Cell 1 | | | | |
| **7.5.8.5** | NR SA FR2 Single-DCI based active TCI state switch with known target TCI states for simultaneous reception | NR Cell 1 | | | | |
| **7.5.9.1.1** | NR PCell FR2 uplink spatial relation switch associated with known DL-RS (MAC-CE based) | NR Cell 1 | | | | |
| **7.5.9.2.1** | NR PCell FR2 uplink spatial relation switch associated with known DL-RS (RRC based) | NR Cell 1 | | | | |
| **7.5.11.1** | NR SA FR2 UE UL carrier RRC reconfiguration delay | NR Cell 1 | NR Cell 2 | | | |
| **7.5.12.1** | Addition and Release Delay of PSCell | NR Cell 1 | NR Cell 10 | | | |
| **7.5.13.1** | NR SA FR2 MAC-CE based active joint TCI state switch | NR Cell 1 | | | | |
| **7.5.13.2** | NR SA FR2 MAC-CE based active uplink TCI state switch | NR Cell 1 | | | | |
| **7.5.13.3** | NR SA FR2 MAC-CE based active downlink TCI state switch | NR Cell 1 | NR Cell 6 | | | |
| **7.5.13.6.1** | NR SA FR2 MAC-CE based active uplink TCI state switch for 2 known TCI states | NR Cell 1 | | | | |
| **7.5.14** | NR SA FR2 PSCell RACH-less based Activation and deactivation for FR1+FR2 inter-band with target PSCell in FR2 | NR Cell 1 | NR Cell 10 | | | |
| **7.6.1.1** | NR SA FR2 event-triggered reporting without gap in non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **7.6.1.2** | NR SA FR2 event-triggered reporting without gap in DRX | NR Cell 1 | NR Cell 2 | | | |
| **7.6.1.3** | NR SA FR2 event-triggered reporting with gap in non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **7.6.1.4** | NR SA FR2 event-triggered reporting with gap in DRX | NR Cell 1 | NR Cell 2 | | | |
| **7.6.1.5** | NR SA FR2 event triggered reporting test without gap in non-DRX for UE configured with *highSpeedMeasFlagFR2-r17* | NR Cell 1 | NR Cell 2 | | | |
| **7.6.2.1** | NR SA FR2-FR2 event-triggered reporting in non-DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.2** | NR SA FR2-FR2 event-triggered reporting in DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.3** | NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.4** | NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.5** | NR SA FR1-FR2 event-triggered reporting in non-DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.6** | NR SA FR1-FR2 event-triggered reporting in DRX | NR Cell 6 | NR Cell 3 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.6.2.7** | NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.8** | NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.10** | SA FR2-FR2 event triggered reporting test without gap under non-DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.11** | SA FR2-FR2 event triggered reporting test without gap under DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.20** | NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority | NR Cell 6 | NR Cell 3 | | | |
| **7.6.2.21** | NR SA FR2-FR2 event triggered reporting using MUSIM gap with shorter MGRP | NR Cell 6 | NR Cell 3 | | | |
| **7.6.3.1** | NR SA FR2 SSB-based L1-RSRP measurement in non-DRX | NR Cell 1 | | | | |
| **7.6.3.2** | NR SA FR2 SSB-based L1-RSRP measurement in DRX | NR Cell 1 | | | | |
| **7.6.3.3** | NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX | NR Cell 1 | | | | |
| **7.6.3.4** | NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX | NR Cell 1 | | | | |
| **7.6.3.5** | NR SA FR2 SSB based L1-RSRP measurement test when DRX is used for power class 6 UE configured with *highSpeedMeasFlagFR2-r17* | NR Cell 1 | | | | |
| **7.6.3.6** | NR SA FR*2* Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used | NR Cell 10 | NR Cell 1 | | | Inter-band |
| **7.6.6.1** | NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.6.6.2** | NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.6.6.3** | NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.6.13.1** | UE Rx-Tx time difference measurement for propagation delay compensation using PRS in FR2 | NR Cell 1 | | | | |
| **7.6.13.2** | NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using TRS | NR Cell 1 | | | | |
| **7.6.14.1** | NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and autonomous activation/deactivation | NR Cell 1 | NR Cell 2 | | | |
| **7.6.14.2** | NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | NR Cell 1 | NR Cell 2 | | | |
| **7.6.15.1** | NR SA FR2 event triggered reporting tests with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements | NR Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **7.6.15.2** | NR SA FR2 event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2) | NR Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **7.6.15.3** | NR SA FR2 event triggered reporting tests with concurrent measurement gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement | NR Cell 1 | NR Cell 6 | NR Cell 2 | | |
| **7.6.16.1** | NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX | NR Cell 1 | NR Cell 2 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.6.16.2** | NR SA FR2 event triggered reporting tests on inter-frequency measurement with NCSG when DRX is not used(PCell in FR2) | NR Cell 6 | NR Cell 3 | | | |
| **7.6.16.3** | NR SA FR2 event triggered reporting test on deactivated SCell measurement via NCSG in non-DRX | NR Cell 1 | NR Cell 6 | NR Cell 13 | | Intra-band |
| **7.6.17.1** | NR SA FR2 and FR2-FR2 event-triggered reporting with concurrent Type-2 measurement gap and Pre-MG | NR Cell 1 | NR Cell 2 | NR Cell 6 | | |
| **7.6.17.2** | NR SA FR2-FR2 event-triggered reporting with two concurrent Pre-MGs | NR Cell 6 | NR Cell 3 | | | |
| **7.6.18.1** | NR SA FR2 event-triggered reporting with concurrent Type-2 measurement gap and NCSG | NR Cell 1 | NR Cell 6 | NR Cell 3 | | |
| **7.6.19.1** | NR SA FR2 event-triggered reporting without interruption outside gap | NR Cell 1 | NR Cell 2 | | | |
| **7.6.19.2** | NR SA FR2-FR2 SA event triggered reporting test without gap without interruption | NR Cell 1 | NR Cell 2 | | | |
| **7.6.19.3** | NR SA FR2-event triggered reporting test without gap without interruption under non-DRX | NR Cell 6 | NR Cell 3 | | | |
| **7.6.20.1** | NR SA FR2 Intra-frequency SSB based L1-RSRP measurement | NR Cell 1 | NR Cell 2 | | | |
| **7.6.21.1** | NR SA FR2 Inter-frequency SSB-based L1-RSRP measurement with measurement gap for LTM | NR Cell 1 | NR Cell 6 | | | |
| **7.6.22.1** | NR SA FR2 Inter-frequency SSB based L1-RSRP measurement without measurement gap in FR2 | NR Cell 6 | NR Cell 3 | | | |
| **7.7.1.1** | NR SA FR2 SS-RSRP measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **7.7.1.2** | NR SA FR2-FR2 SS-RSRP measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **7.7.1.3.1** | NR SA FR1-FR2 SS-RSRP absolute measurement accuracy | NR Cell 1 | NR Cell 10 | | | |
| **7.7.1.3.2** | Void | | | | | |
| **7.7.2.1** | NR SA FR2 SS-RSRQ measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **7.7.2.2** | NR SA FR2-FR2 SS-RSRQ measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **7.7.3.1** | NR SA FR2 SS-SINR measurement accuracy | NR Cell 1 | NR Cell 2 | | | |
| **7.7.3.2** | NR SA FR2-FR2 SS-SINR measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **7.7.6.1** | NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.7.6.2** | NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.7.6.3** | NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | NR Cell 1 | | | | |
| **7.7.7.1.1** | NR SA FR2 CSI-RSRP measurement accuracy | NR Cell 489 | NR Cell 1 | | | |
| **7.7.7.2.1** | NR SA FR2-FR2 CSI-RSRP measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **7.7.14.1** | NR SA FR2 SSB based L1-RSRP measurement for group-based beam reporting | NR Cell 1 | | | | |
| **7.7.14.2** | NR SA FR2 CSI-RS based L1-RSRP measurement on resource set with repetition off | NR Cell 1 | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **7.7.15.1** | NR SA FR2 SSB based inter-frequency L1-RSRP measurement | NR Cell 1 | NR Cell 6 | | | |

# E.6 Cell configuration mapping for E-UTRAN – SA test cases in Chapter 8

Table E.6-1 defines the cell configuration mapping for E-UTRAN - NR/5GC FR1 Inter-RAT test cases (serving cell in LTE) in chapter 8 of this test specification.

**Table E.6-1: Cell configuration mapping for E-UTRA – SA FR1 Inter-RAT RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **8.2.1.1** | E-UTRA – NR FR1 cell re-selection to higher priority NR target cell | LTE Cell 1 | NR Cell 1 | | | |
| **8.2.1.2** | E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16 | LTE Cell 1 | NR Cell 1 | | | |
| **8.2.2.1** | E-UTRA – NR FR1 Early Measurement Reporting | LTE Cell 1 | NR Cell 1 | | | |
| **8.3.1.1** | E-UTRA – NR FR1 handover with unknown target cell | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.1.1** | E-UTRA – NR FR1 SFTD measurement delay in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.1.2** | E-UTRA – NR FR1 SFTD measurement delay in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.1** | E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.2** | E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.3** | E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.4** | E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.9** | E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16 | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.3.2** | E-UTRAN - NR SA FR1 event-triggered reporting without gap | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.1.1** | E-UTRA – NR FR1 SFTD measurement accuracy | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.1.1.1** | E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.2.1** | Void | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.3.1** | E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell | LTE Cell 1 | NR Cell 1 | | | |

Table E.6-2 defines the cell configuration mapping for E-UTRAN - NR/5GC FR2 Inter-RAT test cases (serving cell in LTE) in chapter 8 of this test specification.

**Table E.6-2: Cell configuration mapping for E-UTRA – SA FR2 Inter-RAT RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **8.2.2.2** | E-UTRA – NR FR2 Early Measurement Reporting | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.5** | E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.6** | E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.7** | E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.2.8** | E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **8.4.3.1** | E-UTRAN - NR SA FR2 event-triggered reporting without gap with interruption | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.1.2** | E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.2.2** | SS-RSRQ | LTE Cell 1 | NR Cell 1 | | | |
| **8.5.2.3.2** | E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell | LTE Cell 1 | NR Cell 1 | | | |

# E.7 Cell configuration mapping for NR sidelink test cases in Chapter 9

Table E.7-1 defines the cell configuration mapping for NR PC5 – NR SA FR1 Uu con-current test cases (serving cell in FR1) in chapter 9 of this test specification.

**Table E.7-1: Cell configuration mapping for NR PC5 – NR SA FR1 Uu con-current RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **9.1.1.3** | NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source | NR Cell 1 | | | | |
| **9.1.2.1** | NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source | NR Cell 1 | | | | |
| **9.1.5.1** | NR SA FR1 congestion control measurement for concurrent operation | NR Cell 1 | | | | |
| **9.1.6.1** | NR SA FR1 interruption to WAN due to NR sidelink communication | NR Cell 1 | | | | |

Table E.7-2 defines the cell configuration mapping for NR PC5 – NR SA FR2 Uu con-current test cases (serving cell in FR2) in chapter 9 of this test specification.

**Table E.7-2: Cell configuration mapping for NR PC5 – SA FR2 con-current RRM testing**

FFS

# E.8 Cell configuration mapping for EN-DC FR1 Shared Spectrum test cases in Chapter 10

Table E.8-1 defines the cell configuration mapping for EN-DC FR1 Shared Spectrum test cases in chapter 10 of this test specification.

**Table E.8-1: Cell configuration mapping for EN-DC FR1 Shared Spectrum RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | 38.533 LTE Cell5 | CA Type |
|---|---|---|---|---|---|---|---|
| **10.1.1.1.1** | EN-DC FR1 4-step RA type contention-based random access for NR PSCell with CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.1.1.1.2** | EN-DC FR1 4-step RA type non-contention based random access for NR PSCell with CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.1.1.1.3** | EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.1.1.1.4** | EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.1.2** | EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | LTE Cell 2 | |
| **10.2.1.1** | EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.2.2.1** | EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.1.2** | EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.1.3** | EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.3.1** | EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.3.3.2** | EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.3.3.3** | EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.3.4.1** | EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in non-DRX mode | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.4.2** | EN-DC FR1 Beam Failure Detection and Link Recovery Test for PSCell configured with SSB-based BFD and LR in DRX mode | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.5.1** | EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.5.2.1** | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.5.2.2** | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.3.5.3.1** | EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | LTE Cell 1 | NR Cell 1 | | | | |
| **10.3.6.1** | EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA | LTE Cell 1 | NR Cell 1 | | | | |
| **10.4.1.1** | EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.4.1.4** | EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **10.4.2.3** | EN-DC FR1 event triggered reporting tests for FR1 with CCA cell without SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.4** | EN-DC FR1 event triggered reporting tests for FR1 cell with CCA without SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.5** | EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.6** | EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.7** | EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.8** | EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.9** | EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.2.10** | EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.4.3.1** | EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used | LTE Cell 1 | NR Cell 1 | | | | |
| **10.4.3.2** | EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used | LTE Cell 1 | NR Cell 1 | | | | |
| **10.4.3.3** | EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | LTE Cell 1 | NR Cell 1 | | | | |
| **10.4.3.4** | EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | LTE Cell 1 | NR Cell 1 | | | | |
| **10.4.4.1** | EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.4.4.2** | EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.4.4.3** | EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.4.4.4** | EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.1.1** | EN-DC FR1 intra-frequency SS-RSRP measurement accuracy on a CCA serving cell | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.1.2** | EN-DC FR1-FR1 inter-frequency SS-RSRP measurement accuracy with CCA serving cell and CCA target cell | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.5.2.1** | EN-DC FR1 intra-frequency SS-RSRQ measurement accuracy with serving cell and target cell under CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.2.2** | EN-DC FR1-FR1 inter-frequency SS-RSRQ measurement accuracy with serving cell and target cell under CCA | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |
| **10.5.3.1** | EN-DC FR1 intra-frequency SS-SINR measurement accuracy on PSCC under CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.3.2** | EN-DC FR1-FR1 inter-frequency SS-SINR measurement accuracy on PSCC under CCA | LTE Cell 1 | NR Cell 6 | NR Cell 3 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **10.5.3.3** | EN-DC FR1 intra-frequency SS-SINR measurement accuracy on SCC under CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.4.1** | EN-DC FR1 SSB based L1-RSRP measurement | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.5.1** | EN-DC FR1 RSSI measurement accuracy on PSCC with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.5.2** | EN-DC FR1 RSSI measurement accuracy on SCC with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.5.5.3** | EN-DC FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.6.1** | EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| **10.5.6.2** | EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | | NR Cell 10 | | | Inter-band |
| **10.5.6.3** | EN-DC FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | LTE Cell 1 | NR Cell 1 | NR Cell 2 | | | |
| NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3\ \neq 0$. | | | | | | | |

# E.9 Cell configuration mapping for SA FR1 Shared Spectrum test cases in Chapter 11

Table E.9-1 defines the cell configuration mapping for SA FR1 Shared Spectrum test cases in chapter 11 of this test specification.

**Table E.9-1: Cell configuration mapping for SA FR1 Shared Spectrum RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 LTE Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **11.1.1.1** | NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell | NR Cell 1 | NR Cell 11 | | | |
| **11.1.1.2** | NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell | NR Cell 1 | NR Cell 23 | | | |
| **11.1.2.1** | NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA | NR Cell 1 | NR Cell 23 | | | |
| **11.1.3.1** | NR SA FR1 Cell re-selection from NR carrier with target NR carrier frequency under CCA | NR Cell 1 | NR Cell 23 | | | |
| **11.1.4.1** | NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA | NR Cell 1 | | | LTE Cell 1 | |
| **11.1.4.2** | NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA | NR Cell 1 | | | LTE Cell 1 | |
| **11.2.1.1** | NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell | NR Cell 1 | NR Cell 2 | | | |
| **11.2.1.2** | NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | NR Cell 1 | NR Cell 2 | | | |
| **11.2.1.3** | NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | NR Cell 6 | NR Cell 3 | | | |
| **11.2.1.4** | NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell | NR Cell 6 | NR Cell 3 | | | |
| **11.2.1.5** | NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell | NR Cell 6 | NR Cell 3 | | | |
| **11.2.1.6** | NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell | NR Cell 6 | NR Cell 3 | | | |
| **11.2.1.7** | NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell | NR Cell 1 | | | LTE Cell 1 | |
| **11.2.1.8** | NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell | NR Cell 1 | | | LTE Cell 1 | |
| **11.2.2.1.1** | NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1 | NR Cell 1 | NR Cell 2 | | | |
| **11.2.2.1.2** | NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1 | NR Cell 6 | NR Cell 3 | | | |
| **11.2.2.1.3** | NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing | NR Cell 1 | NR Cell 2 | | | |
| **11.2.2.1.4** | NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA | NR Cell 6 | NR Cell 3 | | | |
| **11.2.2.2.1** | NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA | NR Cell 1 | | | | |
| **11.2.2.2.2** | NR SA FR1 4-step RA type non-contention based random access for NR PSCell with CCA | NR Cell 1 | | | | |
| **11.2.2.2.3** | NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA | NR Cell 1 | | | | |
| **11.2.2.2.4** | NR SA FR1 2-step RA type non-contention-based random access for NR PCell with CCA | NR Cell 1 | | | | |
| **11.2.2.3.1** | NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA | NR Cell 6 | NR Cell 3 | | | |
| **11.2.2.3.2** | NR SA FR1 Redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA | NR Cell 6 | NR Cell 3 | | | |

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|---|---|---|---|---|---|---|
| **11.3.1.1** | NR SA FR1 UE Transmit Timing Test with PCell under DL CCA | NR Cell 1 | | | | |
| **11.3.2.1** | NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA | NR Cell 1 | | | | |
| **11.4.1.2** | NA SA FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA | NR Cell 1 | | | | |
| **11.4.1.3** | NR SA FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode under CCA | NR Cell 1 | | | | |
| **11.4.3.1** | NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.4.3.2** | NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.4.3.3** | NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.4.4.1** | NR SA FR1 E-UTRAN – NR interruptions during SCell operations with CCA | NR Cell 1 | | | | |
| **11.4.4.2** | NR SA FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle | NR Cell 1 | | | | |
| **11.4.5.1** | NR SA FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle | NR Cell 1 | | | | |
| **11.4.5.2.1** | NR SA FR1 DCI-based DL active BWP switch of PCell with non-DRX under CCA | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.4.5.2.2** | NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA | NR Cell 1 | | | | |
| **11.4.5.3.1** | NR SA FR1 DL active BWP switch of Cell with non-DRX | NR Cell 1 | | | | |
| **11.5.1.1** | NR SA FR1 Event-triggered reporting tests on PCC under CCA without gaps under non-DRX | NR Cell 1 | NR Cell 2 | | | |
| **11.5.1.2** | NR SA FR1 Event-triggered reporting tests on PCC under CCA without gaps under DRX | NR Cell 1 | NR Cell 2 | | | |
| **11.5.2.3** | NR SA FR1 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is not used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.4** | NR SA FR1 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.5** | NR SA FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.6** | NR SA FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.7** | NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.8** | NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.9** | NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | NR Cell 6 | NR Cell 3 | | | |
| **11.5.2.10** | NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used | NR Cell 6 | NR Cell 3 | | | |

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| **11.5.3.1** | NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX | NR Cell 1 | | | LTE Cell 1 | |
| **11.5.3.2** | NR SA FR1 - E-UTRAN event-triggered reporting in DRX | NR Cell 1 | | | LTE Cell 1 | |
| **11.5.4.1** | NR SA FR1 SSB based L1-RSRP measurement when DRX is not used | NR Cell 1 | | | | |
| **11.5.4.2** | NR SA FR1 SSB based L1-RSRP measurement when DRX is used | NR Cell 1 | | | | |
| **11.5.4.3** | NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | NR Cell 1 | | | | |
| **11.5.4.4** | NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | NR Cell 1 | | | | |
| **11.6.1.1** | NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA | NR Cell 489 | NR Cell 1 | | | |
| **11.6.1.2** | NR SA FR1 Intra-frequency measurement accuracy on SCC on a carrier frequency with CCA | NR Cell 489 | NR Cell 6 | NR Cell 3 | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.6.2.1** | NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | NR Cell 1 | NR Cell 2 | | | |
| **11.6.2.2** | NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | NR Cell 6 | NR Cell 3 | | | |
| **11.6.2.3** | NR SA FR1 Intra-frequency measurement accuracy on SCC | NR Cell 1 | NR Cell 2 | | | |
| **11.6.2.4** | NR SA FR1 Inter-frequency measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **11.6.3.1** | NR SA FR1 Intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | NR Cell 1 | NR Cell 2 | | | |
| **11.6.3.2** | NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | NR Cell 6 | NR Cell 3 | | | |
| **11.6.3.3** | NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.6.3.4** | NR SA FR1 Inter-frequency measurement accuracy | NR Cell 6 | NR Cell 3 | | | |
| **11.6.4.1** | NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA | NR Cell 1 | | | | |
| **11.6.5.1** | NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA | NR Cell 1 | NR Cell 2 | | | |
| **11.6.5.2** | NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.6.5.3** | NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 2 | | | |
| **11.6.6.1** | NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA | NR Cell 1 | NR Cell 2 | | | |
| **11.6.6.2** | NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA | NR Cell 1 | NR Cell 6 | | | Intra-band |
| | | | NR Cell 10 | | | Inter-band |
| **11.6.6.3** | NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 2 | | | |

NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3 \neq 0$.

# E.10 Cell configuration mapping for E-UTRAN – SA FR1 Shared Spectrum test cases in Chapter 12

Table E.10-1 defines the cell configuration mapping for E-UTRAN – SA FR1 Shared Spectrum test cases in Chapter 12 of this test specification.

**Table E.10-1: Cell configuration mapping for E-UTRAN – SA FR1 Shared Spectrum RRM testing**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **12.1.1.1** | E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA | LTE Cell 1 | NR Cell 1 | | | |
| **12.2.1.1** | E-UTRAN - NR with CCA handover with known target cell | LTE Cell 1 | NR Cell 1 | | | |
| **12.4.1.1** | E-UTRA – NR Inter-RAT SFTD Measurement Delay with NR under CCA in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **12.4.2.1** | E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA | LTE Cell 1 | NR Cell 1 | | | |
| **12.4.2.2** | E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA | LTE Cell 1 | NR Cell 1 | | | |
| **12.4.2.3** | E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA | LTE Cell 1 | NR Cell 1 | | | |
| **12.4.2.4** | E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA | LTE Cell 1 | NR Cell 1 | | | |
| **12.5.1.1** | E-UTRA - NR FR1 SFTD measurement accuracy under CCA | LTE Cell 1 | NR Cell 1 | | | |
| NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3 \neq 0$. | | | | | | |

# E.11 Cell configuration mapping for SA FR1 with SCell in Shared Spectrum test cases in Chapter 13

Table E.11-1 defines the cell configuration mapping for SA FR1 with SCell in Shared Spectrum test cases in Chapter 13 of this test specification.

**Table E.11-1: Cell configuration mapping for SA FR1 with SCell in Shared Spectrum RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **13.2.2.1** | NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle | NR Cell 1 | NR Cell 10 | | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.2.2.2** | NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle | NR Cell 1 | NR Cell 10 | | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.2.2.3** | NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA | NR Cell 1 | NR Cell 10 | | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.1.1** | NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.1.2** | NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.1.3** | NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.1.4** | NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.2.3** | NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.2.4** | NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.2.5** | NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.2.6** | NR SA FR1-FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used | NR Cell 1 | NR Cell 10 | NR Cell 2 | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.3.1** | NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used | NR Cell 1 | NR Cell 10 | | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.3.3.2** | NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used | NR Cell 1 | NR Cell 10 | | | Intra-band |
| | | | NR Cell 6 | | | Inter-band |
| **13.4.1.1** | NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 489 | NR Cell 6 | | |
| **13.4.2.1** | NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 489 | NR Cell 6 | | |
| **13.4.3.1** | NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 489 | NR Cell 6 | | |
| **13.4.4.1** | NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA | NR Cell 1 | NR Cell 6 | | | |
| **13.4.5.1** | NR SA FR1 RSSI measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 6 | | | |
| **13.4.5.2** | NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 6 | | | |
| **13.4.6.1** | NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 6 | | | |
| **13.4.6.2** | NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA | NR Cell 1 | NR Cell 6 | | | |
| NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3 \neq 0$. | | | | | | |

# E.12 Cell configuration mapping for SA Satellite Access test cases in Chapter 14

Table E.12-1 defines the cell configuration mapping for SA Satellite Access test cases in Chapter 14 of this test specification.

**Table E.12-1: Cell configuration mapping for SA Satellite Access RRM testing**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **14.1.1** | NR SA FR1 Cell reselection for Satellite Access | NR Cell 1 | NR Cell 11 | | | |
| **14.1.2** | NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access | NR Cell 1 | NR Cell 11 | | | |
| **14.1.3** | NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | NR Cell 1 | NR Cell 11 | | | |
| **14.1.4** | NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | NR Cell 1 | NR Cell 11 | | | |
| **14.1.5** | NR SA FR1-FR1 Cell reselection for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.1.6** | NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.1.7** | NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.1.8** | NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.1.9** | NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.1.10** | NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access | NR Cell 1 | NR Cell 23 | | | |
| **14.2.1.1** | NR SA FR1 Handover for Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.2.1.2** | NR SA FR1-FR1 Handover for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.2.1.3** | NR SA FR1 Time-based Conditional Handover for NR Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.2.1.4** | SA FR1-FR1 SAN time-based conditional Handover for NR satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.2.1.5** | SA FR1 SAN distance-based conditional Handover for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.2.1.6** | SA FR1-FR1 SAN distance-based conditional Handover for NR satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.2.1.8** | NR SA FR1-FR1 RACH-less Handover for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.2.2.1.1** | NR SA FR1 RRC Re-establishment for Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.2.2.1.2** | NR SA FR1-FR1 RRC Re-establishment for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.2.2.2.1** | NR SA FR1 4-step contention based random access for Satellite Access | NR Cell 1 | | | | |
| **14.2.2.2.2** | NR SA FR1 4-step non-contention based random access for Satellite Access | NR Cell 1 | | | | |
| **14.2.2.3.1** | NR SA FR1-FR1 RRC connection release with redirection for Satellite Access | NR Cell 6 | NR Cell 23 | | | |
| **14.2.2.4** | NR SA FR1 RACH-based Hard Satellite switching with re-synchronization for Satellite Access | NR Cell 1 | NR Cell 1 | | | |
| **14.2.2.5** | NR SA FR1 RACH-less Soft Satellite switching with re-synchronization for Satellite Access | NR Cell 1 | NR Cell 1 | | | |
| **14.3.1.1** | NR SA FR1 UE transmit timing accuracy for Satellite Access | NR Cell 1 | | | | |
| **14.3.2.1** | NR SA FR1 timing advance adjustment accuracy for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.1** | NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in non-DRX mode for Satellite Access | NR Cell 1 | | | | |

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|---|---|---|---|---|---|---|
| **14.4.1.2** | NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in non-DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.3** | NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.4** | NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.5** | NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.6** | NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.7** | NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.1.8** | NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.2.1** | NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.2.2** | NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.2.3** | NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.2.4** | NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access | NR Cell 1 | | | | |
| **14.4.3.1.1** | NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access | NR Cell 1 | | | | |
| **14.4.3.2.1** | NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access | NR Cell 1 | | | | |
| **14.4.4.1** | NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access | NR Cell 1 | | | | |
| **14.4.5.1** | NR SA FR1 MAC-CE based pathloss reference signal switch delay for Satellite Access | NR Cell 1 | | | | |
| **14.5.1.1** | SA FR1 event triggered reporting tests without gap under non-DRX for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.5.1.2** | SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.5.1.3** | SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.5.1.4** | SA FR1 event triggered reporting tests with single measurement gap under non-DRX for satellite access for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.5.1.5** | SA FR1 event triggered reporting tests with FNO concurrent gaps under DRX for satellite access for NR satellite access | NR Cell 1 | NR Cell 2 | | | |

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|---|---|---|---|---|---|---|
| **14.5.1.6** | SA FR1 event triggered reporting tests with PPO concurrent gaps under non-DRX with SSB index reading for satellite access for NR satellite access | NR Cell 1 | NR Cell 2 | | | |
| **14.5.2.1** | NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.2** | NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.3** | NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.4** | NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.6** | NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.7** | NR SA FR1-FR1 Event triggered reporting without gap under non-DRX for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.2.8** | NR SA FR1-FR1 Event triggered reporting without gap under DRX for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.5.3.1** | NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for Satellite Access | NR Cell 1 | | | | |
| **14.5.3.2** | NR SA FR1 SSB based L1-RSRP measurement when DRX is used for Satellite Access | NR Cell 1 | | | | |
| **14.5.3.3** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for Satellite Access | NR Cell 1 | | | | |
| **14.5.3.4** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for Satellite Access | NR Cell 1 | | | | |
| **14.6.1.1** | NR SA FR1 SS-RSRP measurement accuracy for Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.6.1.2** | NR SA FR1-FR1 SS-RSRP measurement accuracy for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.6.2.1** | NR SA FR1 SS-RSRQ measurement accuracy for Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.6.2.2** | NR SA FR1-FR1 SS-RSRQ measurement accuracy for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.6.3.1** | NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access | NR Cell 1 | NR Cell 2 | | | |
| **14.6.3.2** | NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access | NR Cell 6 | NR Cell 3 | | | |
| **14.6.4.1** | NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access | NR Cell 1 | | | | |
| **14.6.4.2** | NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access | NR Cell 1 | | | | |
| NOTE 1: Intra-frequency cells are selected such that serving and neighbour cells satisfy $(PCI_{neighbor} - PCI_{serving})\ mod\ 3 \neq 0$. | | | | | | |

# E.13

# E.14 Cell configuration mapping for SA FR1 test cases for RedCap in Chapter 16

Table E.14-1 defines the cell configuration mapping for NR/5GC FR1 test cases in chapter 16 of this test specification.

**Table E.14-1: Cell configuration mapping for SA FR1 RRM testing for RedCap**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.1.1.1** | NR SA FR1 Cell reselection for 1 Rx UE | NR Cell 1 | NR Cell 11 | | |
| **16.1.1.2** | NR SA FR1 Cell reselection for 2 Rx UE | NR Cell 1 | NR Cell 11 | | |
| **16.1.1.3** | NR SA FR1-FR1 Cell reselection for 1 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.1.1.4** | NR SA FR1-FR1 Cell reselection for 2 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.1.1.5** | NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | NR Cell 1 | NR Cell 11 | | |
| **16.1.1.6** | NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | NR Cell 1 | NR Cell 11 | | |
| **16.1.1.7** | NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.1.1.8** | NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.2.1.1** | NR SA FR1 CG-SDT for 1 Rx UE | NR Cell 1 | | | |
| **16.2.1.2** | NR SA FR1 CG-SDT for 2 Rx UE | NR Cell 1 | | | |
| **16.3.1.1** | NR SA FR1 handover with known target cell for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.1.2** | NR SA FR1 handover with known target cell for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.1.3** | NR SA FR1 handover with unknown target cell for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.1.4** | NR SA FR1 handover with unknown target cell for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.1.5** | NR SA FR1-FR1 handover with unknown target cell for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.3.1.6** | NR SA FR1-FR1 handover with unknown target cell for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.3.2.1.1** | NR SA FR1 RRC Re-establishment for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.2.1.2** | NR SA FR1 RRC Re-establishment for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.3.2.1.3** | NR SA FR1-FR1 RRC Re-establishment for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.3.2.1.4** | NR SA FR1-FR1 RRC Re-establishment for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.3.2.1.5** | NR SA FR1 RRC Re-establishment for 1 Rx UE without serving cell timing | NR Cell 1 | NR Cell 2 | | |
| **16.3.2.1.6** | NR SA FR1 RRC Re-establishment for 2 Rx UE without serving cell timing | NR Cell 1 | NR Cell 2 | | |
| **16.3.2.2.1** | NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE | Cell 1 | | | |
| **16.3.2.2.2** | NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Cell 1 | | | |
| **16.3.2.2.3** | NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE | Cell 1 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.3.2.2.4** | NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE | Cell 1 | | | |
| **16.3.2.2.5** | NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE | Cell 1 | | | |
| **16.3.2.2.6** | NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Cell 1 | | | |
| **16.3.2.2.7** | NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE | Cell 1 | | | |
| **16.3.2.2.8** | NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE | Cell 1 | | | |
| **16.3.2.3.1** | NR SA FR1-FR1 RRC connection release with redirection for 1 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.3.2.3.2** | NR SA FR1-FR1 RRC connection release with redirection for 2 Rx UE | NR Cell 6 | NR Cell 23 | | |
| **16.4.1.1** | NR SA FR1 NR UE Transmit Timing accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.4.1.2** | NR SA FR1 NR UE Transmit Timing accuracy for 2 Rx UE | NR Cell 1 | | | |
| **16.4.3.1** | NR SA FR1 timing advance adjustment accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.4.3.2** | NR SA FR1 timing advance adjustment accuracy for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.1** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.2** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.3** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.4** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.5** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.6** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.7** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.8** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.9** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.10** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.5.1.11** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.12** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.13** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.14** | NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.1.15** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.1.16** | NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.2.1** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.2.2** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.2.3** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.2.4** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.2.5** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.2.6** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.2.7** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE | NR Cell 1 | | | |
| **16.5.2.8** | NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | NR Cell 1 | | | |
| **16.5.3.1.1** | NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE | NR Cell 1 | | | |
| **16.5.3.1.2** | NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE | NR Cell 1 | | | |
| **16.5.3.2.1** | NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE | NR Cell 1 | | | |
| **16.5.3.2.2** | NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE | NR Cell 1 | | | |
| **16.5.4.1** | NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE | NR Cell 1 | | | |
| **16.5.4.2** | NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE | NR Cell 1 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.6.1.1** | NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.2** | NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.3** | NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.4** | NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.5** | NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.6** | NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.7** | NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.8** | NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.9** | NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.10** | NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.11** | NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.1.12** | NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.2.1** | NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.2** | NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.3** | NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.4** | NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.5** | NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.6** | NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.7** | NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.8** | NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.9** | NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.10** | NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.11** | NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.6.2.12** | NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.6.4.1** | NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE | NR Cell 1 | | | |
| **16.6.4.2** | NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE | NR Cell 1 | | | |
| **16.6.4.3** | NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE | NR Cell 1 | | | |
| **16.6.4.4** | NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE | NR Cell 1 | | | |
| **16.6.4.5** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE | NR Cell 1 | | | |
| **16.6.4.6** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE | NR Cell 1 | | | |
| **16.6.4.7** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 1 Rx UE | NR Cell 1 | | | |
| **16.6.4.8** | NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE | NR Cell 1 | | | |
| **16.6.5.1** | NR SA FR1 CGI identification of NR neighbour cell for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.6.5.2** | NR SA FR1 CGI identification of NR neighbour cell for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.7.1.1.1** | NR SA FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | NR Cell 489 | NR Cell 1 | | |
| **16.7.1.1.2** | NR SA FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | NR Cell 489 | NR Cell 1 | | |
| **16.7.1.2.1** | NR SA FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | NR Cell 489 | NR Cell 1 | | |
| **16.7.1.2.2** | NR SA FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | NR Cell 489 | NR Cell 1 | | |
| **16.7.1.3.1** | NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.1.3.2** | NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.1.4.1** | NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.1.4.2** | NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.2.1** | NR SA FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.7.2.2** | NR SA FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.7.2.3.1** | NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.2.3.2** | NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.2.4.1** | NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.2.4.2** | NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.3.1** | NR SA FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.7.3.2** | NR SA FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | NR Cell 1 | NR Cell 2 | | |
| **16.7.3.3.1** | NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.3.3.2** | NR SA FR1-FR1 SS-SINR relative measurement accuracy for 1 Rx UE | NR Cell 6 | NR Cell 3 | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 |
|---|---|---|---|---|---|
| **16.7.3.4.1** | NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.3.4.2** | NR SA FR1-FR1 SS-SINR relative measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | |
| **16.7.4.1.1** | NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.7.4.1.2** | NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.7.4.2.1** | NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 2 Rx UE | NR Cell 1 | | | |
| **16.7.4.2.2** | NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 2 Rx UE | NR Cell 1 | | | |
| **16.7.4.3.1** | NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.7.4.3.2** | NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 1 Rx UE | NR Cell 1 | | | |
| **16.7.4.4.1** | NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 2 Rx UE | NR Cell 1 | | | |
| **16.7.4.4.2** | NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 2 Rx UE | NR Cell 1 | | | |

Table E.14-2 defines the cell configuration mapping for NR/5GC FR1 – E-UTRA Inter-RAT test cases (serving cell in NR) for RedCap in chapter 16 of this test specification.

**Table E.14-2: Cell configuration mapping for SA FR1 – E-UTRA Inter-RAT RRM testing for RedCap**

| TC | Description | 38.533 NR Cell1 | 38.533 LTE Cell2 | 38.533 LTE Cell3 | 38.533 LTE Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **16.1.2.1** | NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 RX UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.1.2.2** | NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.1.2.3** | NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 RX UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.1.2.4** | NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 RX UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.1.2.5** | NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.1.2.6** | NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.1.7** | NR SA FR1 - E-UTRA handover with known target cell for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.1.8** | NR SA FR1 - E-UTRA handover with known target cell for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.1.9** | NR SA FR1 - E-UTRA handover with unknown target cell for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.1.10** | NR SA FR1 - E-UTRA handover with unknown target cell for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.2.3.3** | NR SA FR1 - E-UTRA RRC connection release with redirection for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.3.2.3.4** | NR SA FR1 - E-UTRA RRC connection release with redirection for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.6.3.1** | NR - E-UTRA event-triggered reporting in non-DRX for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.6.3.2** | NR - E-UTRA event-triggered reporting in non-DRX for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.6.3.3** | NR - E-UTRA event-triggered reporting in DRX for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 LTE Cell2 | 38.533 LTE Cell3 | 38.533 LTE Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **16.6.3.4** | NR - E-UTRA event-triggered reporting in DRX for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.6.5.3** | NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.6.5.4** | NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.7.5.1** | NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.7.5.2** | NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.7.6.1** | NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 1 Rx UE | NR Cell 1 | LTE Cell 1 | | | |
| **16.7.6.2** | NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 2 Rx UE | NR Cell 1 | LTE Cell 1 | | | |

# E.15 Cell configuration mapping for SA FR2 test cases for RedCap in Chapter 17

Table E.15-1 defines the cell configuration mapping for NR/5GC FR2 test cases in chapter 17 of this test specification.

**Table E.15-1: Cell configuration mapping for SA FR2 RRM testing for RedCap**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **17.1.1.1** | NR SA FR2 Cell reselection for 2 Rx UE | NR Cell 1 | NR Cell 11 | | | |
| **17.1.1.2** | NR SA FR2-FR2 Cell reselection for 2 Rx UE | NR Cell 6 | NR Cell 23 | | | |
| **17.1.1.3** | NR SA FR2 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | NR Cell 1 | NR Cell 11 | | | |
| **17.1.1.4** | NR SA FR2-FR2 Cell reselection for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE | NR Cell 6 | NR Cell 23 | | | |
| **17.2.1.1** | NR SA FR2 TA validation for CG-SDT for 2 Rx UE | NR Cell 1 | | | | |
| **17.3.1.1** | NR SA FR2 handover with unknown target cell for 2 Rx | NR Cell 1 | NR Cell 2 | | | |
| **17.3.1.2** | NR SA FR2-FR2 handover with unknown target cell for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.3.2.1.1** | NR SA FR2 Intra-frequency RRC Re-establishment in FR2 | NR Cell 1 | | | | |
| **17.3.2.1.2** | NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2 | NR Cell 1 | | | | |
| **17.3.2.1.3** | NR SA FR2 RRC re-establishment without serving cell timing | NR Cell 1 | NR Cell 2 | | | |
| **17.3.2.2.1** | NR SA FR2 4-step RA type contention based random access for 2 Rx UE | NR Cell 1 | | | | |
| **17.3.2.2.2** | NR SA FR2 4-step RA type non-contention based random access for 2 Rx UE | NR Cell 1 | | | | |
| **17.3.2.2.3** | NR SA FR2 2-step RA type contention based random access for 2 Rx UE | NR Cell 1 | | | | |
| **17.3.2.2.4** | NR SA FR2 2-step RA type non-contention based random access for 2 Rx UE | NR Cell 1 | | | | |
| **17.3.2.3.1** | NR SA FR2-FR2 RRC connection release with redirection for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.4.1.1** | NR SA FR2 NR UE Transmit Timing accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.4.3.1** | NR SA FR2 timing advance adjustment accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.1** | NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with | NR Cell 1 | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| | SSB-based RLM-RS in non-DRX mode for 2 Rx UE | | | | | |
| **17.5.1.2** | NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.3** | NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.4** | NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.5** | NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.6** | NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.7** | NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.8** | NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.1.9** | NR SA FR2 Radio Link Monitoring Scheduling Restrictions on FR2 for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.2.1** | NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.2.2** | NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.2.3** | NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.2.4** | NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.2.5** | NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.3.1.1** | NR SA FR2 DCI-based and Timer-based DL active BWP switch for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.3.2.1** | NR SA FR2 RRC-based DL active BWP switch for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.4.1.1** | NR SA FR2 MAC-CE based active TCI state switch for a known TCI state for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.4.2.1** | NR SA FR2 RRC-CE based active TCI state switch for a known TCI state for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.5.1.1** | NR SA FR2 MAC-CE based spatial relation switch associated with known DL-RS for 2 Rx UE | NR Cell 1 | | | | |
| **17.5.5.2.1** | NR SA FR2 RRC-based spatial relation switch associated with a known DL-RS for 2 Rx UE | NR Cell 1 | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **17.5.6.1** | NR SA FR2 UE specific CBW change on PCell for 2 Rx UE | NR Cell 1 | | | | |
| **17.6.1.1** | NR SA FR2 event triggered reporting without gap in non-DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | | |
| **17.6.1.2** | NR SA FR2 event triggered reporting without gap in DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | | |
| **17.6.1.3** | NR SA FR2 event triggered reporting with gap in non-DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | | |
| **17.6.1.4** | NR SA FR2 event triggered reporting with gap in DRX for 2 Rx UE | NR Cell 1 | NR Cell 2 | | | |
| **17.6.2.1** | NR SA FR2-FR2 event triggered reporting in non-DRX for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.6.2.2** | NR SA FR2-FR2 event triggered reporting in DRX for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.6.2.3** | NR SA FR2-FR2 event triggered reporting with SSB time index detection in non-DRX for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.6.2.4** | NR SA FR2-FR2 event triggered reporting with SSB time index detection in DRX for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.6.3.1** | NR SA FR2 SSB based L1-R SRP measurement in non-DRX for 2 Rx UE | NR Cell 1 | | | | |
| **17.6.3.2** | NR SA FR2 SSB based L1-RSRP measurement in DRX for 2 Rx UE | NR Cell 1 | | | | |
| **17.6.3.3** | NR SA FR2 CSI-RS based L1-RSRP measurement in non-DRX for 2 Rx UE | NR Cell 1 | | | | |
| **17.6.3.4** | NR SA FR2 CSI-RS based L1-RSRP measurement in DRX for 2 Rx UE | NR Cell 1 | | | | |
| **17.6.4.1** | NR SA FR2-FR2 CGI identification of NR neighbour cell for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.7.1.1** | NR SA FR2 SS-RSRP measurement accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.7.1.2** | NR SA FR2-FR2 SS-RSRP measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.7.2.1** | NR SA FR2 SS-RSRQ measurement accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.7.2.2** | NR SA FR2-FR2 SS-RSRQ measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |
| **17.7.3.1** | NR SA FR2 SSB based L1-RSRP measurement accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.7.3.2** | NR SA FR2 CSI-RS based L1-RSRP measurement accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.7.4.1** | NR SA FR2 SS-SINR measurement accuracy for 2 Rx UE | NR Cell 1 | | | | |
| **17.7.4.2** | NR SA FR2-FR2 SS-SINR measurement accuracy for 2 Rx UE | NR Cell 6 | NR Cell 3 | | | |

# E.16 Cell configuration mapping for E-UTRAN – SA test cases for RedCap in Chapter 18

Table E.16-1 defines the cell configuration mapping for E-UTRAN - NR/5GC FR1 Inter-RAT test cases for RedCap (serving cell in LTE) in chapter 18 of this test specification.

**Table E.16-1: Cell configuration mapping for E-UTRA – SA FR1 Inter-RAT RRM testing for RedCap**

| TC | Description | 38.533 LTE Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| 18.1.1.1 | E-UTRA - NR SA FR1 E-UTRA cell re-selection to higher priority NR target Cell for 2 Rx UE | LTE Cell 1 | NR Cell 1 | | | |
| **18.2.1.1** | E-UTRA - NR SA FR1 handover for 2 Rx UE | LTE Cell 1 | NR Cell 1 | | | |
| **18.2.2.1** | E-UTRA - NR SA FR1 RRC connection release with redirection for 2 Rx UE | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.1** | E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.2** | E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.3** | E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.4** | E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.5** | E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.6** | E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.7** | E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in non-DRX | LTE Cell 1 | NR Cell 1 | | | |
| **18.3.1.8** | E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in DRX | LTE Cell 1 | NR Cell 1 | | | |

# E.17 Cell configuration mapping for SA FR1 test cases for ATG in Chapter 19

Table E.17-1 defines the cell configuration mapping for NR/5GC FR1 test cases for ATG in chapter 19 of this test specification.

**Table E.17-1: Cell configuration mapping for SA FR1 RRM testing for ATG**

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **19.2.1.1** | Intra-frequency handover from FR1 to FR1; known target cell | NR Cell 1 | NR Cell 2 | | | |
| **19.2.1.2** | Inter-frequency handover from FR1 to FR1; unknown target cell | NR Cell 6 | NR Cell 3 | | | |
| **19.2.2.1** | Intra-frequency distance-based conditional Handover from FR1 to FR1 | NR Cell 1 | NR Cell 2 | | | |
| **19.2.2.2** | Inter-frequency distance-based conditional Handover from FR1 to FR1 | NR Cell 6 | NR Cell 3 | | | |
| **19.2.3.1.1** | Intra-frequency RRC Re-establishment in FR1 for ATG | NR Cell 1 | NR Cell 2 | | | |
| **19.2.3.1.2** | Inter-frequency RRC Re-establishment in FR1 with unknown target cell without serving cell timing for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.2.3.3.1** | NR SA FR1-FR1 RRC connection release with Redirection for ATG | NR Cell 6 | NR Cell 23 | | | |
| **19.4.1.1** | Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |

| TC | Description | 38.533 NR Cell1 | 38.533 NR Cell2 | 38.533 NR Cell3 | 38.533 NR Cell4 | CA Type |
|---|---|---|---|---|---|---|
| **19.4.1.2** | Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode | NR Cell 1 | | | | |
| **19.4.1.3** | Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode | NR Cell 1 | | | | |
| **19.4.1.4** | Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode | NR Cell 1 | | | | |
| **19.6.1.1.1** | NR SA FR1 SS-RSRP absolute measurement accuracy for ATG | NR Cell 489 | NR Cell 1 | | | |
| **19.6.1.1.2** | NR SA FR1 SS-RSRP relative measurement accuracy for ATG | NR Cell 489 | NR Cell 1 | | | |
| **19.6.1.2.1** | NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.1.2.2** | NR SA FR1-FR1 SS-RSRP relative measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.2.1** | NR SA FR1 SS-RSRQ absolute measurement accuracy for ATG | NR Cell 1 | NR Cell 2 | | | |
| **19.6.2.2.1** | NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.2.2.2** | NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.3.1** | NR SA FR1 SS-SINR absolute measurement accuracy for ATG | NR Cell 1 | NR Cell 2 | | | |
| **19.6.3.2.1** | NR SA FR1-FR1 SS-SINR absolute measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.3.2.2** | NR SA FR1-FR1 SS-SINR relative measurement accuracy for ATG | NR Cell 6 | NR Cell 3 | | | |
| **19.6.4.1.1** | NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for ATG | NR Cell 1 | | | | |
| **19.6.4.1.2** | NR SA FR1 SSB based L1-RSRP relative measurement accuracy for ATG | NR Cell 1 | | | | |
| **19.6.4.2.1** | NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for ATG | NR Cell 1 | | | | |
| **19.6.4.2.2** | NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for ATG | NR Cell 1 | | | | |
| **19.6.5.1.1** | NR SA FR1 L1-SINR absolute measurement accuracy with CSI-RS based CMR and no dedicated IMR for ATG | NR Cell 1 | | | | |
| **19.6.5.1.2** | NR SA FR1 L1-SINR relative measurement accuracy with CSI-RS based CMR and no dedicated IMR for ATG | NR Cell 1 | | | | |
| **19.6.5.2** | NR SA FR1 L1-SINR absolute measurement accuracy with SSB based CMR and dedicated IMR for ATG | NR Cell 1 | | | | |
| **19.6.5.3.1** | NR SA FR1 L1-SINR absolute measurement accuracy with CSI-RS based CMR and dedicated IMR for ATG | NR Cell 1 | | | | |
| **19.6.5.3.2** | NR SA FR1 L1-SINR relative measurement accuracy with CSI-RS based CMR and dedicated IMR for ATG | NR Cell 1 | | | | |
| **19.6.6.1.1** | NR SA FR1 CSI-RSRP absolute measurement accuracy for ATG | NR Cell 489 | NR Cell 1 | | | |
| **19.6.1.1.2** | NR SA FR1 CSI-RSRP relative measurement accuracy for ATG | NR Cell 489 | NR Cell 1 | | | |
| **19.6.7.1** | NR SA FR1 CSI-RSRQ absolute measurement accuracy for ATG | NR Cell 1 | NR Cell 2 | | | |
| **19.6.8.1** | NR SA FR1 CSI-SINR absolute measurement accuracy for ATG | NR Cell 1 | NR Cell 2 | | | |

# Annex F (normative): Measurement uncertainties and test tolerances

The requirements of this clause apply to all tests in the present document.

## F.1 Measurement uncertainties and test tolerances for FR1 and FR2

### F.1.1 Acceptable uncertainty of test system (normative)

See TS 38.521-1 [17] annex F.1.

#### F.1.1.1 Measurement of test environments

See TS 38.521-1 [17] Annex F1.1.

#### F.1.1.2 Measurement of RRM requirements

This clause defines the maximum test system uncertainty for the RRM requirements. The maximum uncertainty values allowed for the typical RRM measurement uncertainty contributors is defined in Table F.1.1.2-1 and Table F.1.1.2-2. Unless explicitly stated for a particular test case, these maximum uncertainty values should be used as starting point to perform the test tolerance analysis in TR 38.903 [22] for each of the test cases. Specific test cases might require a tighter measurement uncertainty value for some of the contributors. Exceptions to the general values in Table F.1.1.2-1 and Table F.1.1.2-2 shall be handled case by case.

**Table F.1.1.2-1: Maximum allowed measurement uncertainty values for the test system for FR1 (up to 6 GHz) and Cell BW ≤ 40 MHz**

| MU contributor | Unit | Value | Comment |
|---|---|---|---|
| AWGN absolute power, $N_{oc}$ averaged over $BW_{Config}$ | dB | ±1.5 | |
| AWGN absolute power, $N_{oc}$ for Measurement PRB | dB | ±1.5 | Measurement PRB may be for example #$RB_J$ to $RB_{J+19}$ for SSB-based, or selected RBs in the range #$RB_0$ to $RB_{105}$ for CSI-RS-based, or configured RBs in the SRS resource for CLI-based |
| Ratio of cell X signal / AWGN, $\hat{E}s_X$ / $N_{oc}$ averaged over $BW_{Config}$ | dB | ±0.3 | Same as in LTE |
| Ratio of cell X signal / AWGN, $\hat{E}s_X$ / $N_{oc}$ for Measurement PRB | dB | ±0.3 | Measurement PRB may be for example #$RB_J$ to $RB_{J+19}$ for SSB-based, or selected RBs in the range #$RB_0$ to $RB_{105}$ for CSI-RS-based, or configured RBs in the SRS resource for CLI-based |
| Fading profile uncertainty | dB | ±0.5 for 1 Tx ±0.7 for 2 Tx | Depends on fading profile, can be referenced from TS 38.101-4 [20] |
| AWGN and signal flatness* | dB | ±2.0 | Same as in LTE, can be referenced from TS 38.101-4 [20] |
| Uplink absolute power measurement | dB | ±1.5 | Same as in TS 38.521-1 [17] |
| Uplink relative power measurement | dB | ±0.7 | Same as in TS 38.521-1 [17] |
| Uplink signal transmit timing relative to downlink | Tc | ±112 | Calculated as 25% of tightest UE core requirement for FR1 (25% of 7*64*Tc) |
| Uplink signal transmit timing relative to downlink for satellite access | Tc | ±352 | Calculated as 25% of tightest UE core requirement for FR1 for satellite access (25% of 22*64*Tc) |
| Relative transmit timing accuracy during UE timing adjustment | Tc | ±88 | Calculated as 25% of tightest UE core requirement for FR1 (25% of 5.5*64*Tc) |

| MU contributor | Unit | Value | Comment |
|---|---|---|---|
| Timing Advance Adjustment accuracy | Tc | ±88 | Calculated as 25% of tightest UE core requirement for FR1 (25% of 5.5*64*Tc) |
| Note 1: The values in this table are specified per cell. Multi-cell test cases need to combined these values in the TT analysis in TR 38.903<br>Note 2: These values apply for cell BW ≤ 40 MHz. The maximum allowed measurement uncertainty for higher cell BW is FFS.<br>Note 3: Void | | | |

**Table F.1.1.2-2: Maximum allowed measurement uncertainty values for the test system for FR2 (up to 40GHz) and Cell BW ≤ 400 MHz**

| MU contributor | Unit | Value | Comment |
|---|---|---|---|
| AWGN absolute power, $N_{oc}$ averaged over $BW_{Config}$ | dB | PC3: ±5.65[4,5]<br>PC1: 5.65[4,5]<br>PC6: 5.65[4,5] | |
| AWGN absolute power, $N_{oc}$ for Measurement PRB | dB | PC3: ±5.65[4,5]<br>PC1: 5.65[4,5]<br>PC6: 5.65[4,5] | Measurement PRB may be for example #$RB_J$ to $RB_{J+19}$ for SSB-based, or selected RBs in the range #$RB_0$ to $RB_{274}$ for CSI-RS-based, or configured RBs in the SRS resource for CLI-based |
| Ratio of cell X signal / AWGN, $\hat{E}s_x$ / $N_{oc}$ averaged over $BW_{Config}$ | dB | ±0.3 | |
| Ratio of cell X signal / AWGN, $\hat{E}s_x$ / $N_{oc}$ for Measurement PRB | dB | ±0.3 | Measurement PRB may be for example #$RB_J$ to $RB_{J+19}$ for SSB-based, or selected RBs in the range #$RB_0$ to $RB_{274}$ for CSI-RS-based, or configured RBs in the SRS resource for CLI-based |
| $\hat{E}s_x$[Note 3] absolute power, $N_{oc}$ averaged over $BW_{Config}$ | dB | PC3: ±5.65[4,5]<br>PC1: 5.65[4,5]<br>PC6: 5.65[4,5] | |
| $\hat{E}s_x$[Note 3] absolute power, $N_{oc}$ for Measurement PRB | dB | PC3: ±5.65[4,5]<br>PC1: 5.65[4,5]<br>PC6: 5.65[4,5] | Measurement PRB may be for example #$RB_J$ to $RB_{J+19}$ for SSB-based, or selected RBs in the range #$RB_0$ to $RB_{274}$ for CSI-RS-based, or configured RBs in the SRS resource for CLI-based |
| Relative power between any two $\hat{E}s$ levels at the same frequency | dB | ±2.0 | |
| Fading profile uncertainty | dB | ±0.5 for 1 Tx ±0.7 for 2 Tx | |
| AWGN and signal flatness* | dB | ±3.6 | Same as in Demod Performance test cases, can be referenced from TS 38.521-4 [20] |
| Uplink absolute power measurement | dB | TBD | |
| Uplink relative power measurement | dB | TBD | |
| Uplink signal transmit timing relative to downlink | Tc | ±48 | |
| Relative transmit timing during UE timing adjustment | Tc | ±40 | |
| Timing Advance Adjustment | Tc | ±40 | |
| NOTE 1: The values in this table are specified per cell. Multi-cell test cases need to combine these values in the TT analysis in TR 38.903<br>NOTE 2: These values apply for cell BW ≤ 400 MHz. The maximum allowed measurement uncertainty for higher cell BW is FFS.<br>NOTE 3: Applies for test cases that use $\hat{E}s$ without AWGN<br>NOTE 4: Total Expanded MU for IFF for Max device size ≤ 30cm in TR 38.903 [22] Table E.3.1.3-2 for PC3 UEs, Table E.3.1.3-3 for PC1 UEs and Table E.3.1.3-4 for PC6 UEs.<br>NOTE 5: If the TT analysis for a specific test case based on this MU value results in an unsolvable conflict, making the test case untestable, even after the alternative solutions listed in TR 38.903 [22] clause A.4 have been considered for the test case in TS 38.133 [6] Annex A, the | | | |

| MU contributor | Unit | Value | Comment |
|---|---|---|---|
| | | | TT analysis shall be repeated using a lower MU value, taking into account the values defined in clause E.3.1 TR 38.903 [22]. The test case will be applicable for the subset of the test systems meeting this reduced MU Threshold. |

The maximum test system uncertainty for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.1.2-3.

The maximum test system uncertainty for the NE-DC FR1 test cases in chapter 4 is defined in Table F.1.1.2-3a.

The maximum test system uncertainty for the NR/5GC FR1 test cases in chapter 6 is defined in Table F.1.1.2-4.

The maximum test system uncertainty for the EN-DC FR2 test cases in chapter 5 is defined in Table F.1.1.2-5.

The maximum test system uncertainty for the NR/5GC FR2 test cases in chapter 7 is defined in Table F.1.1.2-6.

The maximum test system uncertainty for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases in chapter 8 is defined in Table F.1.1.2-7.

The maximum test system uncertainty for the FR1 NR sidelink test cases in chapter 9 is defined in Table F.1.1.2-8.

The maximum test system uncertainty for the EN-DC FR1 test cases for shared spectrum in chapter 10 is defined in Table F.1.1.2-12.

The maximum test system uncertainty for the NR/5GC FR1 test cases for shared spectrum in chapter 11 is defined in Table F.1.1.2-13.

The maximum test system uncertainty for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for shared spectrum in chapter 12 is defined in Table F.1.1.2-14.

The maximum test system uncertainty for the NR/5GC FR1 test cases with SCell in shared spectrum in chapter 13 is defined in Table F.1.1.2-15.

The maximum test system uncertainty for SA FR1 Satellite access test cases in chapter 14 is defined in Table F.1.1.2-16.

The maximum test system uncertainty for the NR/5GC FR1 test cases for RedCap in chapter 16 is defined in Table F.1.1.2-9.

The maximum test system uncertainty for the NR/5GC FR2 test cases for RedCap in chapter 17 is defined in Table F.1.1.2-10.

The maximum test system uncertainty for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for RedCap in chapter 18 is defined in Table F.1.1.2-11.

The maximum test system uncertainty for the NR/5GC FR1 test cases for ATG in chapter 19 is defined in Table F.1.1.2-17.

**Table F.1.1.2-3: Maximum test system uncertainty for RRM requirements for EN-DC FR1 test cases**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC | Noc ±1.5 dB<br>$\hat{E}_{s2}$ / Noc ±0.3 dB<br><br>Uplink absolute power measurement ±1.5 dB<br><br>Uplink relative power measurement ±0.7 dB<br><br>±112$T_c$ Uplink signal transmit timing relative to downlink | $\hat{E}_{s2}$ / $N_{oc}$ is the ratio of cell 2 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |

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| 4.3.2.2.3 EN-DC FR1 2-step contention based random access | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |
| 4.3.2.2.4 EN-DC FR1 2-step non-contention based random access | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |
| 4.4.1.1 EN-DC FR1 UE transmit timing accuracy | Noc ±1.5 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB<br><br>±112Tc Uplink signal transmit timing relative to downlink | $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy | Noc ±1.5 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB<br><br>±88$T_c$ Timing Advance Adjustment accuracy | $\hat{E}s_2$ / $N_{oc}$ is the ratio of cell 2 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the SNR<br><br>Meas PRB are the measurement PRB for SSB-based RLM #$RB_J$ to $RB_{J+19}$ |
| 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.9 EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | ± 0.6dB (AWGN conditions) | Overall system uncertainty for AWGN condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |

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| 4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | Same as 4.5.2.1 | Same as 4.5.2.1 |
| 4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | $Noc_2$ ±1.5 dB<br>$Noc_3$ ±1.5 dB<br>$\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>$\hat{E}s_3$ / $Noc_3$ ±0.3 dB | Note:<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN |
| 4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | Same as 4.5.2.3 | Same as 4.5.2.3 |
| 4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC | $Noc_1$ ±1.5 dB<br>$Noc_2$ ±1.5 dB<br>$Noc_3$ ±1.5 dB<br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>$\hat{E}s_3$ / Noc ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on E-UTRAN cell 1 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of E-UTRAN cell 1 signal / AWGN<br>$Noc_2$ is the AWGN on NR cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of NR cell 2 signal / AWGN<br>$Noc_3$ is the AWGN on E-UTRAN cell 3 frequency<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of E-UTRAN cell 3 signal / AWGN |
| 4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | Same as 4.5.2.5 | Same as 4.5.2.5 |
| 4.5.2.8 | Same as 4.5.2.1 | Same as 4.5.2.1 |
| 4.5.2.9 | Same as 4.5.2.1 | Same as 4.5.2.1 |
| 4.5.2.10 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | Noc ±1.5 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |
| 4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$Noc_3$ is the AWGN on cell 3 frequency<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 4.5.3.4 SCell Activation and deactivation of multiple unknown SCells in FR1 with single activation/deactivation command | Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $Noc_4$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Average $\hat{E}s_4$ / $Noc_4$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $Noc_4$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $\hat{E}s_4$ / $Noc_4$ ±0.3 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$Noc_3$ is the AWGN on cell 3 frequency<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br>$Noc_4$ is the AWGN on cell 4 frequency<br>$\hat{E}s_4$ / $Noc_4$ is the ratio of cell 4 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.5.3.5 EN-DC FR1 direct SCell activation at SCell addition of known SCell | Same as 4.5.3.1 | Same as 4.5.3.1 |

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| 4.5.3.6 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$Noc_3$ is the AWGN on cell 3 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ for CSI-RSRP Meas PRB are # $RB_0$ to # $RB_{105}$. |
| 4.5.3.7 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 640ms SCell measurement cycle | Same as 4.5.3.6 | Same as 4.5.3.6 |
| 4.5.3.11 EN-DC FR1 TRS-based SCell Activation of SSB-less SCell in FR1 collocated inter-band in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$Noc_3$ is the AWGN on cell 3 frequency<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.5.3.12 EN-DC FR1 Inter-band SSB-less SCell activation using A-TRS | Average Noc2 ±1.5 dB<br>Average Noc3 ±1.5 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Average Ês3 / Noc3 ±0.3 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB Noc3 ±1.5 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês3 / Noc3 ±0.3 dB | Note:<br>Noc2 is the AWGN on cell 2 frequency<br>Noc3 is the AWGN on cell 3 frequency<br>Ês2 / Noc3 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc3 is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #RBJ to RBJ+19. |
| 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay | Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB<br>Noc3 ±1.5 dB<br>Ês3 / Noc3 ±0.3 dB | Note:<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Noc3 is the AWGN on cell 3 frequency<br>Ês3 / Noc3 is the ratio of cell 3 signal / AWGN |
| 4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the SNR for the SSB<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX | Same as 4.5.5.1 | Same as 4.5.5.1 |
| 4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the SNR for the CSI-RS<br><br>Meas PRB is the measurement PRB for CSI-RSRP #$RB_0$ to $RB_{274}$ |
| 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX | Same as 4.5.5.3 | Same as 4.5.5.3 |
| 4.5.5.5 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the SNR for the SSB<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the SNR for the CSI-RS<br><br>Meas PRB is the measurement PRB for CSI-RSRP #$RB_0$ to $RB_{274}$ |

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| 4.5.5.6 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | Same as 4.5.5.5 | Same as 4.5.5.5 |
| 4.5.5.7 EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX | Same as 4.5.5.1 | Same as 4.5.5.1 |
| 4.5.5.8 EN-DC FR1 SCell TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | Same as 4.5.5.5 | Same as 4.5.5.5 |
| 4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC | ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC | Same as 4.5.6.1.1 | Same as 4.5.6.1.1 |
| 4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 4.5.6.3.1 Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs | ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 4.5.6.4.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs | Same as 4.5.6.3.1 | Same as 4.5.6.3.1 |

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| 4.5.7.1 EN-DC FR1 addition and release delay of known PSCell | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers | Average Noc ±1.5 dB<br>Average $\hat{E}s$ / Noc ±0.3 dB | Noc is the AWGN on cell 2 frequency<br>$\hat{E}s$ / Noc is the ratio of cell 2 signal / AWGN |
| 4.5.9.1 UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN-DC | ±1.0 dB | The following parameters are proposed to be controlled:<br>- AWGN flatness and signal flatness ±2 dB<br>- Signal-to-noise ratio uncertainty ±0.3 dB<br>Test System uncertainty on PSCell = SQRT $(0.3^2 + (0.25 * 2)^2)$ = 0.58 dB, rounded to 1.0 dB. |
| 4.5.10.1 EN-DC FR1 PSCell activation and deactivation delay | Same as 4.5.7.1 | Same as 4.5.7.1 |
| 4.5.11.1 EN-DC FR1 conditional PSCell addition delay | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX | Noc ±1.5 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>$\hat{E}s_3$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN |
| 4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.8 EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-SCell-r17 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 3 signal / AWGN<br>$\hat{E}s_3$ / $Noc_2$ is the ratio of cell 4 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | $Noc_2$ is the AWGN on NR freq2<br>$Noc_3$ is the AWGN on NR freq3<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection | Same as 4.6.2.1 | Same as 4.6.2.1 |

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| 4.6.2.9 EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_0$ / Noc is the SNR for the SSB#0<br>$\hat{E}s_1$ / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RSRP #$RB_0$ to $RB_{274}$ |
| 4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX | Same as 4.6.4.3 | Same as 4.6.4.3 |
| 4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 4.6.5.1 EN-DC FR1 SRS-RSRP measurement with non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s$ / Noc ±0.3 dB | Average Noc is the AWGN on virtual UE frequency (NR) on NR freq1<br>$\hat{E}s$ / Noc is the ratio of virtual UE signal / AWGN over the SRS resource RBs |
| 4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX | Noc2 ±1.5 dB<br>$\hat{E}s2$ / Noc2 ±0.3 dB | Note:<br>Noc2 is the AWGN on cell 2 (NR) frequency<br>$\hat{E}s2$ / Noc2 is the ratio of cell 2 signal / AWGN |
| 4.6.6.1 EN-DC intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC | Noc ±1.5 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>$\hat{E}s_3$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_2$ / Noc is the ratio of Cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of Cell 3 signal / AWGN |
| 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 2 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #$RB_0$ to $RB_{275}$ |
| 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 2 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the SSB#0<br>$\hat{E}s_1$ / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR #$RB_J$ to $RB_{J+19}$ |
| 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 2 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #$RB_0$ to $RB_{275}$ |
| 4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy | Average Noc ±1.5 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br>Average $\hat{E}s_3$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / Noc ±0.3 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_2$ / Noc is the cell 2 SNR<br>$\hat{E}s_3$ / Noc is the cell 3 SNR<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy | Same as 4.7.1.1.1 | Same as 4.7.1.1.1 |

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| 4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_2$ / $Noc_1$ is the cell 2 SNR<br>$\hat{E}s_3$ / $Noc_2$ is the cell 3 SNR<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy | Same as 4.7.1.1.1 | Same as 4.7.1.1.1 |
| 4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy | Same as 4.7.1.1.1 | Same as 4.7.1.1.1 |
| 4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 4.7.4.1.1 EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy | Average Noc ±1.5 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_2$ / Noc is the cell 2 SNR<br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 4.7.4.1.2 EN-DC FR1 SSB based L1-RSRP relative measurement accuracy | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 |
| 4.7.4.2.1 EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 |
| 4.7.4.2.2 EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 |
| 4.7.5.1 EN-DC FR1 SFTD measurement accuracy | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br><br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.8 dB | $Noc_1$ is the AWGN on NR freq1<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>$Noc_2$ is the AWGN on E-UTRA freq2<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_{22}$ to $RB_{27}$ |
| 4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell | Average Noc ±1.5 dB<br>Average $\hat{E}s$ / Noc ±0.3 dB | Average Noc is the AWGN on virtual UE frequency (NR) on NR freq1<br>$\hat{E}s$ / Noc is the ratio of virtual UE signal / AWGN over the SRS resource RBs |
| 4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy | Average Noc ±1.5 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_2$ / Noc is the SNR for the CSI-RS#0 & CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #$RB_0$ to $RB_{275}$ |
| 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy | Same as 4.7.7.1.1 | Same as 4.7.7.1.1 |
| 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Average Noc ±1.5 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_2$ / Noc is the SNR for the SSB#0 & SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR #$RB_J$ to $RB_{J+19}$ |
| 4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Same as 4.7.7.1.1 | Same as 4.7.7.1.1 |

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| 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy | Same as 4.7.7.1.1 | Same as 4.7.7.1.1 |
| 4.7.8.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell | Same as 4.7.1.1.1 | Same as 4.7.1.1.1 |
| 4.7.8.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |

**Table F.1.1.2-3a: Maximum test system uncertainty for RRM requirements for NE-DC FR1 test cases**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell | Noc ±1.5 dB<br>Ês / Noc ±0.3 dB | Note:<br>Ês / Noc is the ratio of E-UTRA cell signal / AWGN |
| 4A.2.1.1 NE-DC FR1 SFTD accuracy | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br><br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.8 dB | Note:<br>Ês / Noc is the ratio of NR cell signal / AWGN<br>Ês2 / Noc2 is the ratio of E-UTRA cell signal / AWGN |

**Table F.1.1.2-4: Maximum test system uncertainty for RRM requirements for SA FR1 test cases**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 6.1.1.1 NR SA FR1 cell re-selection | Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 6.1.1.2 NR SA FR1-FR1 cell re-selection | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16 | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 6.1.1.8 NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17 | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.1.1.9 NR SA FR1 cell reselection to intra-frequency NR case for UE operating on a cell with less than 5MHz BW | Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |

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| 6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 (NR) frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 (E-UTRAN) frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.2.1 NR SA FR1 TA Validation for CG-SDT | Average Noc ±1.5 dB<br>Average Ês / Noc ±0.3 dB<br>Meas PRB Ês / Noc ±0.3 dB | Note:<br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.1.1 NR SA FR1 handover with known target cell | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $Ês_1$ / Noc ±0.3 dB<br>Meas PRB $Ês_2$ / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.1.2 NR SA FR1 handover with unknown target cell | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 6.3.1.3 NR SA FR1-FR1 Handover with unknown Target Cell | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell | Noc ±1.5 dB<br>Ês / Noc ±0.3 dB<br>Ioc ±0.7 dB<br>Îor / Ioc ± 0.3dB<br>CPICH Ec / Ior ± 0.1dB<br>SCH Ec / Ior ± 0.1dB | Note:<br>Noc is the AWGN on cell 1 frequency<br>Ês / Noc is the ratio of cell 1 signal / AWGN<br>Ioc is the AWGN on cell 2 frequency<br>Îor / Ioc is the ratio of cell 2 signal / AWGN<br>CPICH Ec / Ior is the ratio of cell 2 CPICH code level / Ior<br>SCH Ec / Ior is the ratio of cell 2 SCH code level / Ior |
| 6.3.1.7 NR SA FR1 synchronous DAPS handover | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 6.3.1.8 NR SA FR1 asynchronous DAPS handover | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover | Same as 6.3.1.3 | Same as 6.3.1.3 |

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| 6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 6.3.1.18 NR SA FR1 Intra-frequency handover for unknown target cell operating with 12 PRB SSB bandwidth | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.2.1.1 NR SA FR1 RRC re-establishment | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 6.3.2.1.2 NR SA FR1 – FR1 RRC re-establishment | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing | Average Noc ±1.5 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br><br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.2.2.1 | $N_{oc}$ ±1.5 dB<br>Ês / $N_{oc}$ ±0.3 dB<br><br>Uplink absolute power measurement ±1.5 dB<br><br>Uplink relative power measurement ±0.7 dB<br><br>±112Tc Uplink signal transmit timing relative to downlink | $\hat{E}s_1$ / $N_{oc}$ is the ratio of cell 1 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 6.3.2.2.2 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.2.3 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.2.4 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.3.1 NR SA FR1 RRC connection release with redirection | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 6.3.2.4.1 PDCCH-order RACH on neighbor cell in FR1 when RACH BW is within active UL BWP | Average Noc ±1.5 dB<br>Average Ês0 / Noc ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB Ês0 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br><br>±112Tc Uplink signal transmit timing relative to downlink | Noc is the AWGN on NR freq1<br>Ês0 / Noc is the SNR for Cell 1<br>Ês1 / Noc is the SNR for Cell 2<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 6.3.2.4.2 PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br><br>±112Tc Uplink signal transmit timing relative to downlink | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 6.3.2.4.3 PDCCH-order RACH on neighbour cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP | Same as 6.3.2.4.1 | Same as 6.3.2.4.1 |
| 6.3.3.1 NR SA FR1 conditional handover | Same as 6.3.1.1 | Same as 6.3.1.1 |

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| 6.3.3.2 NR SA FR1-FR1 conditional handover | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 6.3.3.3 NR-DC SA FR1 conditional handover including target MCG and target SCG | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Average Ês3 / Noc1 ±0.3 dB<br>Average Ês4 / Noc2 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês3 / Noc1 ±0.3 dB<br>Meas PRB Ês4 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 and cell 3 frequency<br>Noc2 is the AWGN on cell 2 and cell 4 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc1 is the ratio of cell 3 signal / AWGN<br>Ês4 / Noc2 is the ratio of cell 4 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #RBJ to RBJ+19. |
| 6.3.3.4 NR-DC SA FR1 conditional handover including target MCG and candidate SCG | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Average Ês3 / Noc1 ±0.3 dB<br>Average Ês4 / Noc2 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês3 / Noc1 ±0.3 dB<br>Meas PRB Ês4 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 and cell 3 frequency<br>Noc2 is the AWGN on cell 2 and cell 4 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc1 is the ratio of cell 3 signal / AWGN<br>Ês4 / Noc2 is the ratio of cell 4 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #RBJ to RBJ+19. |
| 6.3.3.6 NR SA FR1 Intra-frequency NES triggering conditional handover | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 6.3.3.7 NR SA FR1-FR1 Inter-frequency NES-based conditional handover | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 6.3.4.1 RACH-based Intra-frequency PCell switch from FR1 to FR1 | Average Noc ±1.5 dB<br>Average $Ês_1$ / Noc ±0.3 dB<br>Average $Ês_2$ / Noc ±0.3 dB<br><br>Meas PRB Noc ±1.5 dB<br>Meas PRB $Ês_1$ / Noc ±0.3 dB<br>Meas PRB $Ês_2$ / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.4.2 RACH-based Inter-frequency PCell switch from FR1 to FR1 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $Ês_1$ / $Noc_1$ ±0.3 dB<br>Average $Ês_2$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Ês_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Ês_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq 1<br>$Noc_2$ is the AWGN on NR freq 2<br>$Ês_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$Ês_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.4.3 RACH-less Intra-frequency PCell switch from FR1 to FR1 | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br><br>Meas PRB Noc ±1.5 dB<br>Meas PRB $Ês_1$ / Noc ±0.3 dB<br>Meas PRB $Ês_2$ / Noc ±0.3 dB | Noc is the AWGN on NR freq1<br>Ês1 / Noc is the SNR for Cell 1<br>Ês2 / Noc is the SNR for Cell 2<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.3.4.4 NR SA FR1 RACH-less Intra-frequency PCell switch from FR1 to FR1 without L1-RSRP measurement | Same as 6.3.4.3 | Same as 6.3.4.3 |

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| 6.4.1.1 EN-DC FR1 UE transmit timing accuracy | Noc ±1.5 dB<br><br>$\hat{E}s_1 / N_{oc}$ ±0.3 dB<br><br>±112Tc Uplink signal transmit timing relative to downlink | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 6.4.3.1 NR SA FR1 timing advance adjustment accuracy | Noc ±1.5 dB<br><br>$\hat{E}s_1 / N_{oc}$ ±0.3 dB<br><br>±88$T_c$ Timing Advance Adjustment accuracy | $\hat{E}s_1 / N_{oc}$ is the ratio of cell 1 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | Average Noc ±1.5 dB<br>Average $\hat{E}s$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s$ / Noc ±0.3 dB<br>Fading profile ±0.7 dB | Noc is the AWGN on cell 1 frequency<br>$\hat{E}s$ / Noc is the SNR<br><br>Meas PRB are the measurement PRB for SSB-based RLM #$RB_J$ to $RB_{J+19}$ |
| 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.9 SA FR1 radio link monitoring out-of-sync Test for PSCell configured with CSI-RS-based RLM for UE fulfilling relaxed measurement criterion | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.13 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode for UE operating on a cell with less than 5MHz BW | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.14 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode for UE operating on a cell with less than 5MHz BW | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |

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| 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC | $Noc_1$ ±1.5 dB<br>$Noc_2$ ±1.5 dB<br>$\hat{E}s_1 / Noc_1$ ±0.3 dB<br>$\hat{E}s_2 / Noc_2$ ±0.3 dB | Note:<br>$\hat{E}s_1 / Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN |
| 6.5.2.2 | Same as 4.5.2.1 | Same as 4.5.2.1 |
| 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2 / Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2 / Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1 / Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 6.5.3.4 NR SA FR1 direct SCell activation at SCell addition of known SCell | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 6.5.3.5 NR SA FR1 direct SCell activation at handover with known SCell | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br><br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Average Ês3 / Noc1 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br><br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês3 / Noc1 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Noc2 is the AWGN on cell 2 frequency<br><br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc1 is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 6.5.3.10 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2 / Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2 / Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1 / Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ for CSI-RSRP Meas PRB are # $RB_0$ to # $RB_{105}$. |
| 6.5.3.11 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 640 ms SCell measurement cycle | Same as 6.5.3.10 | Same as 6.5.3.10 |
| 6.5.3.16 NR SA FR1 Inter-band SSB-less SCell Activation based on A-TRS in non-DRX | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Noc2 is the AWGN on cell 2 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #RBJ to RBJ+19. |

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| 6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$\hat{E}s_1 / Noc_1$ is the SNR for the SSB<br><br>Meas PRB is the measurement PRB for SS-RSRP $\#RB_J$ to $RB_{J+19}$ |
| 6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$\hat{E}s_1 / Noc_1$ is the SNR for the CSI-RS<br><br>Meas PRB is the measurement PRB for CSI-RSRP $\#RB_0$ to $RB_{274}$ |
| 6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 6.5.5.5 NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_2 / Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2 / Noc_2$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2 / Noc_2$ is the SNR for the SSB and CSI-RS<br><br>Meas PRB is the measurement PRB for SS-RSRP $\#RB_J$ to $RB_{J+19}$ |
| 6.5.5.6 NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | Same as 6.5.5.5 | Same as 6.5.5.5 |
| 6.5.5.7 NR SA FR1 PCell TRP Specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX | ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX | Same as 6.5.6.1.1 | Same as 6.5.6.1.1 |

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| 6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX | ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 6.5.6.3.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 6.5.6.5.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA | Noc1 ±1.5 dB<br>Noc2 ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA | Same as 6.5.7.1 | Same as 6.5.7.1 |
| 6.5.7A.1 NR SA FR1 DL interruptions at switching between two uplink carriers in FDD-TDD CA | Same as 6.5.7.1 | Same as 6.5.7.1 |
| 6.5.7A.2 NR SA FR1 DL interruptions at switching between two uplink carriers in TDD-TDD CA | Same as 6.5.7.1 | Same as 6.5.7.1 |
| 6.5.7B.1 NR SA FR1 DL interruptions at switching between two uplink bands in FDD-TDD CA | Noc1 ±1.5 dB<br>Noc2 ±1.5 dB<br>Noc3 ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Ês3 / Noc ±0.3 dB | Note:<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc3 is the ratio of cell 3 signal / AWGN |
| 6.5.7B.2 NR SA FR1 DL interruptions at switching between two uplink bands in TDD-TDD CA | Noc1 ±1.5 dB<br>Noc2 ±1.5 dB<br>Noc3 ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Ês3 / Noc ±0.3 dB | Note:<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc3 is the ratio of cell 3 signal / AWGN |
| 6.5.7C.1 NR SA FR1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA | Same as 6.5.7B.1 | Same as 6.5.7B.1 |
| 6.5.7D.1 NR SA FR1 DL interruptions at switching across three uplink bands in TDD-TDD CA for single TAG | Same as 6.5.7B.1 | Same as 6.5.7B.1 |
| 6.5.7D.2 NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG | Noc1 ±1.5 dB<br>Noc2 ±1.5 dB<br>Noc3 ±1.5 dB<br>Noc4 ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Ês3 / Noc ±0.3 dB<br>Ês4 / Noc ±0.3 dB | Note:<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc3 is the ratio of cell 3 signal / AWGN<br>Ês4 / Noc4 is the ratio of cell 4 signal / AWGN |

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| 6.5.7D.3 NR SA FR1 DL interruptions at switching across three uplink bands in FDD-TDD CA for two TAGs | Same as 6.5.7B.1 | Same as 6.5.7B.1 |
| 6.5.7D.4 NR SA FR1 DL interruptions at switching across four uplink bands in TDD-TDD CA for two TAGs | Same as 6.5.7D.2 | Same as 6.5.7D.2 |
| 6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX | Test System uncertainty on Cell1: ±0.6 dB | Overall system uncertainty for AWGN conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty: ±0.3 dB,<br>2. Effect of AWGN flatness and signal flatness: ±2.0 dB.<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) = 0.58dB, round up to 0.6dB. |
| 6.6.1.1 SA event triggered reporting tests without gap under non-DRX | Noc ±1.5 dB<br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |
| 6.6.1.2 SA event triggered reporting tests without gap under DRX | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.8 NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-SCell-r17 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_2$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.1.9 NR SA FR1 event triggered reporting with MUSIM gap configured | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.12 NR SA FR1 event triggered reporting with SSB index detection without measurement gap in non-DRX mode for UE operating with 12 PRB SSB bandwidth | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.13 NR SA FR1 event triggered reporting tests without gap in DRX under Cell DTX | Same as 6.6.1.1 | Same as 6.6.1.1 |

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| 6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.9 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.10 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.11 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.12 NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.13 NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.14 NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.15 NR SA FR1 event triggered reporting without SSB index detection in DRX mode for UE operating on a cell with less than 5MHz BW | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX | Freq 1 Noc ±1.5 dB<br>Freq 2 Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16 | Freq 1 Noc ±1.5 dB<br>Freq 2 Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_0$ / Noc is the SNR for the SSB#0<br>$\hat{E}s_1$ / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RSRP #$RB_0$ to $RB_{274}$ |
| 6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 6.6.4.1 | Same as 6.6.4.1 |

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| 6.6.4.6 NR SA FR1 Inter-cell SSB based L1-RSRP measurements on PCell in DRX | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX | Noc ±1.5 dB<br>Ês / Noc ±0.3 dB<br>Ioc ±0.7 dB<br>Îor / Ioc ± 0.3dB<br>CPICH Ec / Ior ± 0.1dB<br>SCH Ec / Ior ± 0.1dB | Note:<br>Noc is the AWGN on cell 1 frequency<br>Ês / Noc is the ratio of cell 1 signal / AWGN<br>Ioc is the AWGN on cell 2 frequency<br>Îor / Ioc is the ratio of cell 2 signal / AWGN<br>CPICH Ec / Ior is the ratio of cell 2 CPICH code level / Ior<br>SCH Ec / Ior is the ratio of cell 2 SCH code level / Ior |
| 6.6.6.1 NR SA FR1 SRS-RSRP measurement in non-DRX | Average Noc ±1.5 dB<br>Average Ês / Noc ±0.3 dB | Average Noc is the AWGN on virtual UE frequency (NR) on NR freq1<br>Ês / Noc is the ratio of virtual UE signal / AWGN over the SRS resource RBs |
| 6.6.7.1 SA intra-frequency CGI identification of NR neighbor cell in FR1 | Noc ±1.5 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>$\hat{E}s_3$ / Noc ±0.3 dB | $\hat{E}s_2$ / Noc is the ratio of Cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of Cell 3 signal / AWGN |
| 6.6.7.2 Identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA | Noc1 ±1.5 dB<br>Noc2 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on Cell 1 frequency.<br>Noc1 is the AWGN on Cell 2 frequency.<br>Ês1 / Noc1 is the ratio of Cell 1 signal / AWGN.<br>Ês2 / Noc2 is the ratio of Cell 2 signal / AWGN. |
| 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 1 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #$RB_0$ to $RB_{275}$ |
| 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 1 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the SSB#0<br>$\hat{E}s_1$ / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR #$RB_J$ to $RB_{J+19}$ |
| 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | Average Noc ±1.5 dB<br>Average $\hat{E}s_0$ / Noc ±0.3 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_0$ / $N_{oc}$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $N_{oc}$ ±0.3 dB | Noc is the AWGN on Cell 1 frequency<br>$\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #$RB_0$ to $RB_{275}$ |
| 6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on LTE freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.17.1 NR SA FR1 event triggered reporting tests with autonomous activation/deactivation Pre-MG | Noc ±1.5 dB<br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |

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| 6.6.17.2 NR SA FR1 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | Same as 6.6.17.1 | Same as 6.6.17.1 |
| 6.6.18.1 NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$Noc_3$ is the AWGN on NR freq3<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.18.2 NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers | Same as 6.6.18.1 | Same as 6.6.18.1 |
| 6.6.18.3 NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1 | Freq 1 Noc ±1.5 dB<br>Freq 2 Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 6.6.18.4 NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used | Freq 1 Noc ±1.5 dB<br>Freq 2 Noc ±1.5 dB<br>Freq 3 Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Ês3 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc is the ratio of cell 3 signal / AWGN |
| 6.6.19.1 NR SA FR1 event-triggered reporting tests with NCSG under non-DRX in FR1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.19.2 NR SA FR1 event-triggered reporting tests for FR1 with NCSG for inter-frequency measurement | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.19.3 NR SA FR1 NR - E-UTRAN event-triggered reporting in non-DRX in FR1 with NCSG | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.19.4 NR SA FR1 Event triggered reporting on SCC with deactivated SCell test with per-UE NCSG under non-DRX | Same as 6.6.1.8 | Same as 6.6.1.8 |
| 6.6.20.1 UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR1 SA | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.21.1 UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA | Average $Noc_1$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.24.1 NR SA FR1 event-triggered reporting without gap with interruptions | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.24.2 NR SA FR1-FR1 event-triggered reporting without gap with interruption with SSB index | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.24.3 NR SA FR1-FR1 event-triggered reporting without gap with interruption | Same as 6.6.2.1 | Same as 6.6.2.1 |

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| 6.6.24.4 NR SA FR1-FR1 event-triggered reporting without gap without interruption | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.24.5 NR SA FR1 event-triggered reporting without gap without interruption | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.26.1 Intra-frequency SSB based L1-RSRP measurement | Average Noc ±1.5 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br><br>Meas PRB Noc ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB | Noc is the AWGN on NR freq<br>$\hat{E}s_1$ / Noc is the SNR for the Cell 1<br>$\hat{E}s_2$ / Noc is the SNR for the Cell 2<br><br>Meas PRBs are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.27.1 Inter-frequency SSB based L1-RSRP measurement with measurement gap | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq 1<br>$Noc_2$ is the AWGN on NR freq 2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRBs are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 6.6.28.1 Inter-frequency SSB based L1-RSRP measurement without measurement gap | Same as 6.6.27.1 | Same as 6.6.27.1 |
| 6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br><br>meas PRB Ês1 / Noc ±0.3 dB<br>meas PRB Ês2 / Noc ±0.3 dB | Noc is the AWGN on NR freq1<br>Ês1 / Noc is the cell 1 SNR<br>Ês2 / Noc is the cell 2 SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br><br>meas PRB Ês1 / Noc1 ±0.3 dB<br>meas PRB Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2<br>Ês1 / Noc1 is the cell 2 SNR<br>Ês2 / Noc2 is the cell 3 SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 6.7.3.1 NR SA FR1 SS-SINR measurement accuracy | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>Ês2 / Noc is the cell 1 SNR<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |

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| 6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy | Average Noc ±1.5 dB<br>Average Ês / Noc ±0.3 dB<br><br>Meas PRB Noc ±1.5 dB<br>Meas PRB Ês / Noc ±0.8 dB | Noc is the AWGN on E-UTRA freq1<br>Ês / Noc is the ratio of cell 1 signal / AWGN<br><br>Meas PRB are the measurement PRB for RSRP #$RB_{22}$ to $RB_{27}$ |
| 6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 6.7.8.1 NR SA FR1 SRS-RSRP measurement accuracy | Averaqe Noc ±1.5 dB<br>Average Ês / Noc ±0.3 dB | Average Noc is the AWGN on virtual UE frequency (NR) on NR freq1<br>Ês / Noc is the ratio of virtual UE signal / AWGN over the SRS resource RBs |
| 6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy | Average Noc ±1.5 dB<br>Average Ês2 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>Ês2 / Noc is the SNR for the CSI-RS#0 & CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-SINR #RB0 to RB275 |
| 6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy | Same as 6.7.9.1.1 | Same as 6.7.9.1.1 |
| 6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Average Noc ±1.5 dB<br>Average Ês2 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>Ês2 / Noc is the SNR for the SSB#0 & SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR #RBJ to RBJ+19 |
| 6.7.9.3.1 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Same as 6.7.9.1.1 | Same as 6.7.9.1.1 |
| 6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy | Same as 6.7.9.1.1 | Same as 6.7.9.1.1 |
| 6.7.17.1.1 Inter-frequency L1-RSRP absolute accuracy requirements for neighbour cell in FR1 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $Ês_1$ / $Noc_1$ ±0.3 dB<br>Average $Ês_2$ / $Noc_2$ ±0.3 dB<br><br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Ês_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Ês_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq 1<br>$Noc_2$ is the AWGN on NR freq 2<br>$Ês_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$Ês_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRBs are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

**Table F.1.1.2-5: Maximum test system uncertainty for RRM requirements for EN-DC FR2 test cases**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 5.3.2.2.1 EN-DC FR2 contention based random access | Average Ês ±6.0 dB<br>Meas PRB Ês ±6.0 dB<br><br>Uplink absolute power measurement ±6.0 dB<br><br>Uplink relative power measurement ±FFS dB<br><br>±[48]$T_c$ Uplink signal transmit timing relative to downlink | Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |

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| 5.3.2.2.2 EN-DC FR2 non-contention based random access | Same as 5.3.2.2.1 | Same as 5.3.2.2.1 |
| 5.4.1.1 EN-DC FR2 UE transmit timing accuracy | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB<br><br>±48$T_c$ Uplink signal transmit timing relative to downlink<br>±40$T_c$ Relative during UE timing adjustment | <br><br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 5.4.1.2 NR UE Transmit Timing Test with 2-TA for FR2 UE supporting multiDCI-IntraCellMultiTRP-TwoTA-r18 | Same as 5.4.1.1 | Same as 5.4.1.1 |
| 5.4.3.1 EN-DC FR2 UE timing advance adjustment accuracy | Noc ±5.65 dB, f<=40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br><br>±40Tc timing advance adjustment | <br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | Average Noc ±5.65 dB, f<=40.8 GHz<br><br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br><br>Fading profile ±0.5 dB for 1Tx | Ês1 / Noc is the SNR of RLM-RS1<br>Ês2 / Noc is the SNR of RLM-RS2 |
| 5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Average Noc ±5.65 dB, f<=40.8 GHz<br><br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br><br>Fading profile ±0.5 dB for 1Tx | <br><br>Ês1 / Noc is the SNR of RLM-RS1<br>Ês2 / Noc is the SNR of RLM-RS2 |
| 5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 5.5.1.5 | Same as 5.5.1.5 |
| 5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 5.5.1.5 | Same as 5.5.1.5 |
| 5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 5.5.1.5 | Same as 5.5.1.5 |
| 5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions | Average Noc ±5.65 dB, f<=40.8 GHz<br><br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB | Ês1 / Noc is the SNR of SSB #0<br>Ês2 / Noc is the SNR of SSB #1 |
| 5.5.1.10 EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 5.5.2.1 EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB | <br><br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |

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| 5.5.2.2 EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | Same as 5.5.2.1 | Same as 5.5.2.1 |
| 5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | Noc ±5.65 dB, f<=40.8 GHz<br>$\hat{E}s_1 / N_{oc}$ ±0.3 dB<br>$\hat{E}s_2 / N_{oc}$ ±0.3 dB | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |
| 5.5.2.4 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | Same as 5.5.2.4 | Same as 5.5.2.4 |
| 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX | Average $Noc_2$ ±5.65 dB<br>Average $Noc_3$ ±5.65 dB<br>Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB<br>Average $\hat{E}s_3 / N_{oc}$ ±0.3 dB | $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN |
| 5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 |
| 5.5.3.7 EN-DC FR2 direct SCell activation at SCell addition of known SCell | Same as 5.5.3.1 | Same as 5.5.3.1 |
| 5.5.3.8 EN-DC FR2 fast SCell Activation of SCell in FR2 intra-band | Average $Noc_2$ ±5.65 dB<br>Average $Noc_3$ ±5.65 dB<br>Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB<br>Average $\hat{E}s_3 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $Noc_2$ ±5.65 dB<br>Meas PRB Average $Noc_3$ ±5.65 dB<br>Meas PRB Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $\hat{E}s_3 / N_{oc}$ ±0.3 dB | $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ for CSI-RSRP Meas PRB are # $RB_0$ to # $RB_{274}$. |
| 5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX | Noc averaged over $BW_{Config}$, ±5.65 dB, f<=40.8 GHz<br>Noc averaged over measured PRBs, ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s / N_{oc}$ averaged over $BW_{Config}$: ±0.3 dB<br>$\hat{E}s / N_{oc}$ averaged over measured PRBs: ±0.3 dB<br><br>Fading profile ±0.7 dB, 2Tx | Noc averaged over $BW_{Config}$ is the AWGN absolute power averaged over $BW_{Config}$<br>Noc averaged over measured PRBs is the AWGN absolute power averaged over measured PRBs<br><br>$\hat{E}s / N_{oc}$ averaged over $BW_{Config}$ is the Ratio of cell signal / AWGN averaged over $BW_{Config}$<br>$\hat{E}s / N_{oc}$ averaged over measured PRBs is the Ratio of cell signal / AWGN averaged over measured PRBs |
| 5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_2 / N_{oc}$ ±0.3 dB<br><br>Fading profile ±0.7 dB for 2Tx | Note:<br>Noc is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / Noc is the SNR for the CSI-RS |
| 5.5.5.4 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX | Same as 5.5.5.3 | Same as 5.5.5.3 |
| 5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 5.5.5.6 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_3 / N_{oc}$ ±0.3 dB<br><br>Fading profile ±0.7 dB for 2Tx | Note:<br>Noc is the AWGN on cell 3 frequency<br>$\hat{E}s_3$ / Noc is the SNR for the CSI-RS |
| 5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | Same as 5.5.5.6 | Same as 5.5.5.6 |

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| 5.5.5.8 EN-DC FR2 CSI-RS-based PSCell TRP specific Beam Failure Detection and Link Recovery in DRX mode | Same as 5.5.5.3 | Same as 5.5.5.3 |
| 5.5.5.9 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX mode for UE fulfilling relaxed measurement criterion | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | ±1.0 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. gNB emulator Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±3.6 dB |
| 5.5.6.3.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 |
| 5.5.6.4.1 E-UTRAN – NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 |
| 5.5.6.5.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 |
| 5.5.7.1 Addition and Release Delay of NR PSCell | Ês averaged over BW ±5.65 dB, f <= 40.8 GHz<br>Ês averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | Ês averaged over BW is the absolute power of cell 2 signal averaged over BW<br>Ês averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |
| 5.5.9.1.1 EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation | ±1.0 dB | The following parameters are proposed to be controlled:<br><br>- AWGN flatness and signal flatness ±3.6 dB<br>- Signal-to-noise ratio uncertainty ±0.3 dB<br>Test System uncertainty on PSCell = SQRT ($0.3^2$ + (0.25 * 3.6)$^2$) = 0.95 dB, rounded to 1.0 dB. |
| 5.5.9.2.1 EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS | Same as 5.5.9.1.1 | Same as 5.5.9.1.1 |
| 5.5.12.1 EN-DC FR2 PSCell activation and deactivation delay | Average Ês2 ±5.65 dB, f <= 40.8 GHz | Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.5.13.1 EN-DC FR2 Addition and Release Delay of NR PSCell | Ês averaged over BW ±5.65 dB, f <= 40.8 GHz<br>Ês averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | Ês averaged over BW is the absolute power of cell 2 signal averaged over BW<br>Ês averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |

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| 5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX | $\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$\hat{E}s_3$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_3$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB<br><br>$\hat{E}s_3$ averaged over BW is the absolute power of cell 3 signal averaged over BW<br>$\hat{E}s_3$ averaged over measured PRB is the absolute power of cell 3 signal averaged over measured PRB |
| 5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX | Noc ±5.65 dB<br><br>Ês2 / Noc ±0.3 dB<br>Ês3 / Noc ±0.3 dB | <br><br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br>Ês3 / Noc is the ratio of cell 3 signal / AWGN |
| 5.6.1.3 EN-DC FR2 event-triggered reporting without gap in non-DRX | Same as 5.6.1.1 | Same as 5.6.1.1 |
| 5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX | Same as 5.6.1.2 | Same as 5.6.1.2 |
| 5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX | Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz<br><br>Average Ês2 ±5.65 dB<br>Meas PRB Ês2 ±5.65 dB | Ês1 is NR cell 2 signal<br>Ês2 is NR cell 3 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Ês2 / Noc over meas PRBs ±0.3 dB | Ês1 is NR cell 2 signal<br>Ês2 is NR cell 3 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 5.6.2.1 | Same as 5.6.2.1 |
| 5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 5.6.2.2 | Same as 5.6.2.2 |
| 5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX | Average Ês2 ±5.65, f <= 40.8 GHz | Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX | Noc ±5.65 dB, f <= 40.8 GHz<br><br>Ês2 / Noc ±0.3 dB | Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 5.6.2.5 | Same as 5.6.2.5 |
| 5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 5.6.2.6 | Same as 5.6.2.6 |
| 5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the SSB#0<br>Ês1 / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |

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| 5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX | Same as 5.6.3.1 | Same as 5.6.3.1 |
| 5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the CSI-RS#0<br>Ês1 / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RS-RSRP #RBJ to RBJ+65 |
| 5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX | Same as 5.6.3.3 | Same as 5.6.3.3 |
| 5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell2 signal/AWGN |
| 5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the CSI-RS#0<br>Ês1 / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RS-SINR #RBJ to RBJ+275 |
| 5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the SSB#0<br>Ês1 / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR#RBJ to RBJ+19 |
| 5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | Same as 5.6.6.1 | Same as 5.6.6.1 |
| 5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used | Average $Noc_1$ ±5.65 dB<br>Average $Noc_2$ ±5.65 dB<br>Average $\hat{E}s_1 / N_{oc}$ ±0.3 dB<br>Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $Noc_1$ ±5.65 dB<br>Meas PRB Average $Noc_2$ ±5.65 dB<br>Meas PRB Average $\hat{E}s_1 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ for CSI-RSRP Meas PRB are # $RB_0$ to # $RB_{274}$. |

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| 5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz<br><br>Average Ês2 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês1 is NR cell 2 signal<br><br>Ês2 is NR cell 3 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy | Noc1 ±5.65 dB, f <= 40.8 GHz<br>Noc1 over measPRBs ±5.65 dB, f <= 40.8 GHz<br>Noc2 ±5.65 dB, f <= 40.8 GHz<br>Noc2 over measPRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc1 ±0.3 dB<br>Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on the NR freq 1<br><br>Noc2 is the AWGN on the NR freq 2<br><br>Ês1 / Noc1 is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês2 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês2 / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês2 is NR cell 3 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy | Same as 5.7.1.2 | Same as 5.7.1.2 |
| 5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy | Same as 5.7.2.1 | Same as 5.7.2.1 |
| 5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement accuracy | Same as 5.7.1.2 | Same as 5.7.1.2 |

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| 5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês1 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RS-RSRP<br><br>Test 2<br>Ês1 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for CSI-RS-RSRP |
| 5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell2 signal/AWGN |
| 5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RS-RSRP |
| 5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for SSB or CSI-RS |
| 5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RS-RSRP |

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| 5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz<br><br>Average Ês2 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 or CSI-RS #RB0 to RB274<br><br>Test 2<br>Ês1 is NR cell 2 signal<br><br>Ês2 is NR cell 3 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 or CSI-RS #RB0 to RB274 |
| 5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | Noc1 ±5.65 dB, f <= 40.8 GHz<br>Noc1 over measPRBs ±5.65 dB, f <= 40.8 GHz<br>Noc2 ±5.65 dB, f <= 40.8 GHz<br>Noc2 over measPRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc1 ±0.3 dB<br>Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on the NR freq 1<br><br>Noc2 is the AWGN on the NR freq 2<br><br>Ês1 / Noc1 is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 or CSI-RS #RB0 to RB274 |
| 5.7.8.1 EN-DC intra-frequency FR2 CSI-RSRQ measurement accuracy | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RSRP |
| 5.7.8.2 EN-DC inter-frequency FR2 CSI-RSRQ measurement accuracy | Noc1 ±5.65 dB, f <= 40.8 GHz<br>Noc1 over meas PRBs ±5.65 dB, f <= 40.8 GHz<br>Noc2 ±5.65 dB, f <= 40.8 GHz<br>Noc2 over meas PRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc1 ±0.3 dB<br>Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on the NR freq 1<br>Noc2 is the AWGN on the NR freq 2<br><br>Ês1 / Noc1 is the ratio of cell 2 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RSRP |
| 5.7.9.1 EN-DC intra-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.8.1 | Same as 5.7.8.1 |
| 5.7.9.2 EN-DC inter-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.8.2 | Same as 5.7.8.2 |

**Table F.1.1.2-6: Maximum test system uncertainty for RRM requirements for SA FR2 test cases**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
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| 7.1.1.1 NR SA FR2 cell re-selection | Noc, averaged over $BW_{Config}$, ±5.65 dB<br>Noc, averaged over Measurement PRB, ±5.65 dB<br><br>$Es_1$/Noc averaged over $BW_{Config}$ ±0.3 dB<br>$Es_1$/Noc averaged over Measurement PRB ±0.3 dB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ ±0.3 dB<br>$Es_2$/Noc averaged over Measurement PRB ±0.3 dB | Noc averaged over $BW_{Config}$ is the AWGN absolute power of RF channel 1 averaged over $BW_{Config}$<br>Noc averaged over Measurement PRB is the AWGN absolute power of RF channel 1 averaged over Measurement PRB<br><br>$Es_1$/Noc averaged over $BW_{Config}$ is Ratio of cell 1 signal / AWGN averaged over $BW_{Config}$<br>$Es_1$/Noc averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>$Es_2$/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |
| 7.1.1.2 NR SA FR2-FR2 cell re-selection | $Noc_1$, averaged over $BW_{Config}$, ±5.65 dB<br>$Noc_1$, averaged over Measurement PRB, ±5.65 dB<br><br>$Noc_2$, averaged over $BW_{Config}$, ±5.65 dB<br>$Noc_2$, averaged over Measurement PRB, ±5.65 dB<br><br>$Es_1/Noc_1$ averaged over $BW_{Config}$ ±0.3 dB<br>$Es_1/Noc_1$ averaged over Measurement PRB ±0.3 dB<br><br>$Es_2/Noc_2$ averaged over $BW_{Config}$ ±0.3 dB<br>$Es_2/Noc_2$ averaged over Measurement PRB ±0.3 dB | $Noc_1$ averaged over $BW_{Config}$ is the AWGN absolute power of RF channel 1 averaged over $BW_{Config}$<br>$Noc_1$ averaged over Measurement PRB is the AWGN absolute power of RF channel 1 averaged over Measurement PRB<br><br>$Noc_2$ averaged over $BW_{Config}$ is the AWGN absolute power of RF channel 2 averaged over $BW_{Config}$<br>$Noc_2$ averaged over Measurement PRB is the AWGN absolute power of RF channel 2 averaged over Measurement PRB<br><br>$Es_1/Noc_1$ averaged over $BW_{Config}$ is Ratio of cell 1 signal / AWGN averaged over $BW_{Config}$<br>$Es_1/Noc_1$ averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB<br><br>$Es_2/Noc_2$ averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>$Es_2/Noc_2$ averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |
| 7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | Same as 7.1.1.2 | Same as 7.1.1.2 |
| 7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | Same as 7.1.1.2 | Same as 7.1.1.2 |

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| 7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell | Average Noc over BW, ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / Noc over BW, ±0.3 dB, f <= 40.8 GHz<br>Average Ês1 / Noc over meas PRB, ±0.3 dB, f <= 40.8 GHz<br><br>Average Ês2 / Noc over BW, ±0.3 dB, f <= 40.8 GHz<br>Average Ês2 / Noc over meas PRB, ±0.3 dB, f <= 40.8 GHz | Average Noc over BW is AWGN absolute power averaged over BW.<br>Average Noc over meas PRB is AWGN absolute power averaged over measured PRB.<br><br>Average Ês1 / Noc over BW is the ratio of cell 1 signal / AWGN averaged over BW<br>Average Ês1 / Noc over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB<br><br>Average Ês2 / Noc over BW is the ratio of cell 2 signal / AWGN averaged over BW.<br>Average Ês2 / Noc over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB.<br><br>Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell | Average Noc1 over BW ±5.65 dB, f <= 40.8 GHz<br>Noc1 over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Noc2 over BW ±5.65 dB, f <= 40.8 GHz<br>Noc2 over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / Noc1 over BW, ±0.3 dB, f <= 40.8 GHz<br>Average Ês1 / Noc1 over meas PRB, ±0.3 dB, f <= 40.8 GHz<br><br>Average Ês2 / Noc2 over BW, ±0.3 dB, f <= 40.8 GHz<br>Average Ês2 / Noc2 over meas PRB, ±0.3 dB, f <= 40.8 GHz | Average Noc1 over BW is AWGN absolute power averaged over BW on freq 1.<br>Average Noc1 over meas PRB is AWGN absolute power averaged over measured PRB on freq 1.<br><br>Average Noc2 over BW is AWGN absolute power averaged over BW on freq 2.<br>Average Noc2 over meas PRB is AWGN absolute power averaged over measured PRB on freq 2.<br><br>Average Ês1 / Noc1 over BW is the ratio of cell 1 signal / AWGN averaged over BW on freq 1.<br>Average Ês1 / Noc1 over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB on freq 1.<br><br>Average Ês2 / Noc2 over BW is the ratio of cell 2 signal / AWGN averaged over BW on freq 2.<br>Average Ês2 / Noc2 over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB on freq 2.<br><br>Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover | Noc, averaged over $BW_{Config}$, ±5.65 dB<br>Noc, averaged over Measurement PRB, ±5.65 dB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ ±0.3 dB<br>$Es_2$/Noc averaged over Measurement PRB ±0.3 dB | Noc averaged over $BW_{Config}$ is the AWGN absolute power of RF channel 2 averaged over $BW_{Config}$<br>Noc averaged over Measurement PRB is the AWGN absolute power of RF channel 2 averaged over Measurement PRB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>$Es_2$/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |

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| 7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover | Same as 7.3.1.4 | Same as 7.3.1.4 |
| 7.3.2.1.1 NR SA FR2 RRC re-establishment | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Ês2 / Noc over meas PRBs ±0.3 dB | Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment | Average $Noc_1$ ±5.65 dB, f <= 40.8 GHz<br>$Noc_1$ over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average $Noc_2$ ±5.65 dB, f <= 40.8 GHz<br>$Noc_2$ over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / $Noc_1$ ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB<br>Average Ês2 / $Noc_2$ ±0.3 dB<br>Ês2 / Noc over meas PRBs ±0.3 dB | Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing | Same as 7.3.2.1.1 | Same as 7.3.2.1.1 |
| 7.3.2.2.1 NR SA FR2 contention based random access | Average Ês ±6.0 dB<br>Meas PRB Ês ±6.0 dB<br><br>Uplink absolute power measurement ±6.0 dB<br><br>Uplink relative power measurement ±FFS dB<br><br>±[48]$T_c$ Uplink signal transmit timing relative to downlink | Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 7.3.2.2.2 NR SA FR2 non-contention based random access | Same as 7.3.2.2.1 | Same as 7.3.2.2.1 |
| 7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection | Same as 7.3.1.3 | Same as 7.3.1.3 |
| 7.3.3.1 NR SA FR2 conditional handover | Noc averaged over $BW_{Config}$, ±5.65 dB<br>Noc, averaged over Measurement PRB, ±5.65 dB<br><br>$Es_1$/Noc averaged over $BW_{Config}$ ±0.3 dB<br>$Es_1$/Noc averaged over Measurement PRB ±0.3 dB<br><br>$Es_2$/Noc ±0.3 dB<br>Noc, averaged over $BW_{Config}$, ±5.65 dB<br>$Es_2$/Noc averaged over Measurement PRB ±0.3 dB | Noc averaged over $BW_{Config}$,is the AWGN absolute power of RF channel 1 averaged over $BW_{Config}$,<br>Noc averaged over Measurement PRB,is the AWGN absolute power of RF channel 1 averaged over Measurement PRB,<br><br>$Es_1$/Noc averaged over $BW_{Config}$ is Ratio of cell 1 signal / AWGN averaged over $BW_{Config}$<br>$Es_1$/Noc averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>$Es_2$/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |
| 7.3.3.3 | Same as 7.3.3.1 | Same as 7.3.3.1 |

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| 7.3.4.1 NR SA FR2 RACH based Intra-frequency PCell switch from FR2 to FR2 | Same as 7.3.1.2 | Same as 7.3.1.2 |
| 7.3.4.2 NR SA FR2 RACH-less Intra-frequency PCell switch from FR2 to FR2 | Same as 7.3.1.2 | Same as 7.3.1.2 |
| 7.3.4.3 NR SA FR2 RACH-based Inter-frequency LTM PCell switch from FR2 to FR2 | Same as 7.3.1.3 | Same as 7.3.1.3 |
| 7.4.1.1 SA FR2 UE transmit timing accuracy | Noc ±5.65 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ ±0.3 dB<br><br>±48$T_c$ Uplink signal transmit timing relative to downlink<br>±40$T_c$ Relative during UE timing adjustment | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 7.4.1.3 SA FR2 UE transmit timing accuracy | Noc ±5.65 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ ±0.3 dB<br><br>±48$T_c$ Uplink signal transmit timing relative to downlink<br>±40$T_c$ Relative during UE timing adjustment | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 7.4.3.1 NR SA FR2 UE timing advance adjustment accuracy | Noc ±5.65 dB<br><br>Ês1 / Noc ±0.3 dB<br><br>±40Tc timing advance adjustment | Ês1 / Noc is the ratio of cell 1 signal / AWGN<br><br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 7.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 7.5.3.4 NR SA FR2 direct SCell activation at SCell addition of known SCell | Average Noc1 ±5.65 dB<br><br>Average Noc2 ±5.65 dB<br><br>Average Ês1 / Noc1 ±0.3 dB<br><br>Average Ês2 / Noc2 ±0.3 dB | Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br><br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 7.5.3.5 NR SA FR2 direct SCell activation at handover with known SCell | Average Noc1 ±5.65 dB<br><br>Average Noc2 ±5.65 dB<br><br>Average Ês1 / Noc ±0.3 dB<br><br>Average Ês2 / Noc ±0.3 dB<br><br>Average Ês3 / Noc ±0.3 dB | Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br><br>Ês2 / Noc1 is the ratio of cell 2 signal / AWGN<br><br>Ês3 / Noc2 is the ratio of cell 3 signal / AWGN |

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| 7.5.3.13 NR SA FR2 SCell Activation of SCell in FR2 intra-band in non-DRX | Average $Noc_1$ ±5.65 dB<br>Average $Noc_2$ ±5.65 dB<br>Average $\hat{E}s_1 / N_{oc}$ ±0.3 dB<br>Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $Noc_1$ ±5.65 dB<br>Meas PRB Average $Noc_2$ ±5.65 dB<br>Meas PRB Average $\hat{E}s_1 / N_{oc}$ ±0.3 dB<br>Meas PRB Average $\hat{E}s_2 / N_{oc}$ ±0.3 dB | $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ for CSI-RSRP Meas PRB are # $RB_0$ to # $RB_{274}$. |
| 7.5.3.14 NR SA FR2 SCell Activation for known SCell in FR2 inter-band | Noc1 averaged over $BW_{Config}$, ±5.65 dB<br>Noc1, averaged over Measurement PRB, ±5.65 dB<br><br>Noc2 averaged over $BW_{Config}$, ±5.65 dB<br>Noc2, averaged over Measurement PRB, ±5.65 dB<br><br>$Es_1$/Noc1 averaged over $BW_{Config}$ ±0.3 dB<br>$Es_1$/Noc1 averaged over Measurement PRB ±0.3 dB<br><br>$Es_2$/Noc2 ±0.3 dB<br>Noc, averaged over $BW_{Config}$, ±5.65 dB<br>$Es_2$/Noc2 averaged over Measurement PRB ±0.3 dB | Noc1 averaged over $BW_{Config}$,is the AWGN absolute power of RF channel 1 averaged over $BW_{Config}$<br>Noc1 averaged over Measurement PRB,is the AWGN absolute power of RF channel 1 averaged over Measurement PRB<br><br>Noc2 averaged over $BW_{Config}$,is the AWGN absolute power of RF channel 2 averaged over $BW_{Config}$,<br>Noc2 averaged over Measurement PRB,is the AWGN absolute power of RF channel 2 averaged over Measurement PRB,<br><br>$Es_1$/Noc averaged over $BW_{Config}$ is Ratio of cell 1 signal / AWGN averaged over $BW_{Config}$<br>$Es_1$/Noc averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB<br><br>$Es_2$/Noc averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>$Es_2$/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |
| 7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_1 / N_{oc}$ ±0.3 dB<br><br>Fading profile ±0.7 dB for 2Tx | Note:<br>Noc is the AWGN on cell 1 frequency<br>$\hat{E}s_1$ / Noc is the SNR for the CSI-RS |
| 7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX | Same as 7.5.5.3 | Same as 7.5.5.3 |
| 7.5.5.5 NR SA FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 7.5.5.6 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_2 / N_{oc}$ ±0.3 dB<br><br>Fading profile ±0.7 dB for 2Tx | Note:<br>Noc is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / Noc is the SNR for the CSI-RS |
| 7.5.5.7 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | Same as 7.5.5.6 | Same as 7.5.5.6 |
| 7.5.5.9 NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | Same as 7.5.5.6 | Same as 7.5.5.6 |

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| 7.5.5.10 NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX | ±1.0 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. gNB emulator Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB<br><br>AWGN flatness and signal flatness ±3.6 dB |
| 7.5.6.3.1 Rel16 test requirements for BWP switching on multiple CCs | Same as 7.5.6.2.1 | Same as 7.5.6.2.1 |
| 7.5.6.5.1 Rel16 test requirements for active BWP switch | Same as 7.5.6.2.1 | Same as 7.5.6.2.1 |
| 7.5.8.1.1 NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_1$ / $N_{oc}$ ±0.3 dB<br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB<br><br>No fading | Noc is the AWGN on cell 1 and 2 frequency<br><br>$\hat{E}s_1$ / Noc is Ratio of cell 1 signal / AWGN averaged over BW<br>$\hat{E}s_2$ / Noc is Ratio of cell 2 signal / AWGN averaged over BW |
| 7.5.8.2.1 NR SA PCell FR2 RRC based active TCI state switch for a known TCI state | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 |
| 7.5.9.1.1 EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation | ±1.0 dB | The following parameters are proposed to be controlled:<br><br>- AWGN flatness and signal flatness ±3.6 dB<br>- Signal-to-noise ratio uncertainty ±0.3 dB<br>Test System uncertainty on PSCell = SQRT ($0.3^2$ + (0.25 * 3.6)$^2$) = 0.95 dB, rounded to 1.0 dB. |
| 7.5.9.2.1 EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS | Same as 7.5.9.1.1 | Same as 7.5.9.1.1 |
| 7.5.11.1 UE UL carrier RRC reconfiguration delay | Noc ±5.65 dB, f<=40.8 GHz<br><br>$\hat{E}s_1$ / $N_{oc}$ ±0.3 dB<br>$\hat{E}s_2$ / $N_{oc}$ ±0.3 dB<br><br>No fading | Note:<br>Noc is the AWGN on cell 1 and 2 frequencies<br><br>$\hat{E}s_1$ / Noc is Ratio of cell 1 signal / AWGN averaged over BW<br>$\hat{E}s_2$ / Noc is Ratio of cell 2 signal / AWGN averaged over BW |
| 7.5.12.1 Addition and Release Delay of PSCell | $\hat{E}s$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $\hat{E}s$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |

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| 7.5.13.6.1 NR SA FR2 MAC-CE based active uplink TCI state switch for 2 known TCI states | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Ês2 / Noc over meas PRBs ±0.3 dB<br>Average Ês3 / Noc ±0.3 dB<br>Ês3 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the SSB#0<br>Ês1 / Noc is the SNR for the SSB#1<br>Ês2 / Noc is the SNR for the SSB#2<br>Ês3 / Noc is the SNR for the SSB#3<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 for 120kHz $SCS_{SSB}$ |
| 7.5.14 NR SA FR2 PSCell RACH-less based Activation and deactivation for FR1+FR2 inter-band with target PSCell in FR2 | Noc averaged over $BW_{Config}$, ±5.65 dB<br>Noc, averaged over Measurement PRB, ±5.65 dB<br><br>Es/Noc averaged over $BW_{Config}$ ±0.3 dB<br>Es/Noc averaged over Measurement PRB ±0.3 dB | Noc averaged over $BW_{Config}$,is the AWGN absolute power of RF channel 2 averaged over $BW_{Config}$<br>Noc averaged over Measurement PRB,is the AWGN absolute power of RF channel 2 averaged over Measurement PRB<br><br>Es/Noc averaged over $BW_{Config}$ is Ratio of cell 2 signal / AWGN averaged over $BW_{Config}$<br>Es/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB |
| 7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX | $\hat{E}s_1$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_1$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_1$ averaged over BW is the absolute power of cell 1 signal averaged over BW<br>$\hat{E}s_1$ averaged over measured PRB is the absolute power of cell 1 signal averaged over measured PRB<br><br>$\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |
| 7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX | Noc averaged over BW, ±5.65 dB, f <= 40.8 GHz<br>Noc averaged over measured PRB, ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc averaged over BW, ±0.3 dB, f <= 40.8 GHz<br>Ês1 / Noc averaged over measured PRB, ±0.3 dB, f <= 40.8 GHz<br><br>Ês2 / Noc averaged over BW, ±0.3 dB, f <= 40.8 GHz<br>Ês2 / Noc averaged over measured PRB, ±0.3 dB, f <= 40.8 GHz | Noc averaged over BW is AWGN absolute power averaged over BW.<br>Noc averaged over measured PRB is AWGN absolute power averaged over measured PRB.<br><br>Ês1 / Noc averaged over BW is the ratio of cell 1 signal / AWGN averaged over BW<br>Ês1 / Noc averaged over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB<br><br>Ês2 / Noc averaged over BW is the ratio of cell 2 signal / AWGN averaged over BW.<br>Ês2 / Noc averaged over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB. |
| 7.6.1.3 NR SA FR2 event-triggered reporting without gap in non-DRX | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX | Same as 7.6.1.2 | Same as 7.6.1.2 |

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| 7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX | Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz<br><br>Average Ês2 ±5.65 dB<br>Meas PRB Ês2 ±5.65 dB | Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX | Average $Noc_1$ ±5.65 dB, f <= 40.8 GHz<br>$Noc_1$ over meas PRBs ±5.65 dB f <= 40.8 GHz<br>Average $Noc_2$ ±5.65 dB, f <= 40.8 GHz<br>$Noc_2$ over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês1 / $Noc_1$ ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB<br>Average Ês2 / $Noc_2$ ±0.3 dB<br>Ês2 / $Noc_2$ over meas PRBs ±0.3 dB | Ês1 is NR cell 1 signal<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX | Average Ês2 ±5.65 dB, f <= 40.8 GHz | Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX | Noc ±5.65 dB, f <= 40.8 GHz<br><br>Ês2 / Noc ±0.3 dB | Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 7.6.2.5 | Same as 7.6.2.5 |
| 7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 7.6.2.6 | Same as 7.6.2.6 |
| 7.6.2.10 | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 7.6.2.11 | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 7.6.2.20 NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the SSB#0<br>Ês1 / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX | Same as 7.6.3.1 | Same as 7.6.3.1 |

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| 7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the CSI-RS#0<br>Ês1 / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RS-RSRP |
| 7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 7.6.3.6 NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used | Same as 7.6.6.2 | Same as 7.6.6.2 |
| 7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX | Same as 5.6.4.1 | Same as 5.6.4.1 |
| 7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the CSI-RS#0<br>Ês1 / Noc is the SNR for the CSI-RS#1<br><br>Meas PRB is the measurement PRB for CSI-RS-SINR #RBJ to RBJ+275 |
| 7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | Average Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Average Ês0 / Noc ±0.3 dB<br>Ês0 / Noc over meas PRBs ±0.3 dB<br>Average Ês1 / Noc ±0.3 dB<br>Ês1 / Noc over meas PRBs ±0.3 dB | Ês0 / Noc is the SNR for the SSB#0<br>Ês1 / Noc is the SNR for the SSB#1<br><br>Meas PRB is the measurement PRB for SS-SINR #RBJ to RBJ+19 |
| 7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Same as 7.6.6.1 | Same as 7.6.6.1 |
| 7.6.13.1 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using PRS | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Meas PRB is the measurement PRB for PRS-RSRP #RBJ to RBJ+19 |
| 7.6.13.2 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using TRS | Same as 7.6.13.1 | Same as 7.6.13.1 |
| 7.6.14.1 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and autonomous activation/deactivation | $Ês_1$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$Ês_1$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$Ês_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$Ês_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $Ês_1$ averaged over BW is the absolute power of cell 1 signal averaged over BW<br>$Ês_1$ averaged over measured PRB is the absolute power of cell 1 signal averaged over measured PRB<br><br>$Ês_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$Ês_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |
| 7.6.14.2 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | Same as 7.6.14.1 | Same as 7.6.14.1 |

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| 7.6.15.1 NR SA FR2 SA event triggered reporting tests with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements | $\hat{E}s_1$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_1$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$\hat{E}s_3$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_3$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_1$ averaged over BW is the absolute power of cell 1 signal averaged over BW<br>$\hat{E}s_1$ averaged over measured PRB is the absolute power of cell 1 signal averaged over measured PRB<br><br>$\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB<br><br>$\hat{E}s_3$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s_3$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB |
| 7.6.15.2 NR SA FR2 event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2) | Same as 7.6.15.1 | Same as 7.6.15.1 |
| 7.6.15.3 NR SA FR2 event triggered reporting tests with concurrent measurement gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>$\hat{E}s_3$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / Noc ±0.3 dB | Noc is the AWGN on the NR freq 1 and 2<br><br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 7.6.16.1 NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 7.6.16.2 NR SA FR2 event triggered reporting tests on inter-frequency measurement with NCSG when DRX is not used(PCell in FR2) | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB | Noc is the AWGN on the NR freq 1 and 2<br><br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 7.6.16.3 NR SA FR2 event triggered reporting tests on deactivated SCell measurement via NCSG in non-DRX | $\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz<br><br>$\hat{E}s_3$ averaged over BW ±5.65 dB, f <= 40.8 GHz<br>$\hat{E}s_3$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW<br>$\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB<br><br>$\hat{E}s_3$ averaged over BW is the absolute power of cell 3 signal averaged over BW<br>$\hat{E}s_3$ averaged over measured PRB is the absolute power of cell 3 signal averaged over measured PRB |
| 7.6.20.1 NR SA FR2 Intra-frequency SSB based L1-RSRP measurement | Average $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Average $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz<br><br>Meas PRB $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Meas PRB $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_1$ is NR Cell 1 signal<br>$\hat{E}s_2$ is NR Cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

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| 7.6.21.1 NR SA FR2 Inter-frequency SSB-based L1-RSRP measurement with measurement gap for LTM | Average $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Average $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz<br><br>Meas PRB $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Meas PRB $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz | $\hat{E}s_1$ is NR Cell 1 signal<br>$\hat{E}s_2$ is NR Cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz<br><br>Average Ês2 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 1 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês1 is NR cell 1 signal<br><br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy | Noc1 ±5.65 dB, f <= 40.8 GHz<br>Noc1 over measPRBs ±5.65 dB, f <= 40.8 GHz<br>Noc2 ±5.65 dB, f <= 40.8 GHz<br>Noc2 over measPRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc1 ±0.3 dB<br>Ês2 / Noc2 ±0.3 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Meas PRB Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on the NR freq 1<br><br>Noc2 is the AWGN on the NR freq 2<br><br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.7.1.3 NR SA FR1-FR2 SS-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês2 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês2 / Noc is the ratio of cell 1 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês2 is NR cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy | Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB, f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br>Meas PRB Ês2 / Noc ±0.3 dB | Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy | Same as 7.7.1.2 | Same as 7.7.1.2 |
| 7.7.3.1 NR SA FR2 SS-SINR measurement accuracy | Same as 7.7.2.1 | Same as 7.7.2.1 |
| 7.7.3.3 NR SA FR2-FR2 SS-SINR measurement accuracy | Same as 7.7.1.2 | Same as 7.7.1.2 |

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| 7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19<br><br>Test 2<br>Ês1 is NR cell 1 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy | Test 1<br>Noc ±5.65 dB, f <= 40.8 GHz<br>Noc over meas PRBs ±5.65 dB f <= 40.8 GHz<br><br>Ês1 / Noc ±0.3 dB<br>Meas PRB Ês1 / Noc ±0.3 dB<br><br>Test 2<br>Average Ês1 ±5.65 dB, f <= 40.8 GHz<br>Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Meas PRB is the measurement PRB for CSI-RS-RSRP<br><br>Test 2<br>Ês1 is NR cell 1 signal<br><br>Meas PRB is the measurement PRB for CSI-RS-RSRP |
| 7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy | Same as 5.7.5.1 | Same as 5.7.5.1 |
| 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Same as 7.6.6.1 | Same as 7.6.6.1 |
| 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | Same as 7.6.6.2 | Same as 7.6.6.2 |
| 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Same as 7.6.6.1 | Same as 7.6.6.1 |
| 7.7.8.1 NR SA intra-frequency FR2 CSI-RSRQ measurement accuracy | Same as 5.7.8.1 | Same as 5.7.8.1 |
| 7.7.8.2 NR SA inter-frequency FR2 CSI-RSRQ measurement accuracy | Same as 5.7.8.2 | Same as 5.7.8.2 |
| 7.7.9.1 NR SA intra-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.9.1 | Same as 5.7.9.1 |
| 7.7.9.2 NR SA inter-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.9.2 | Same as 5.7.9.2 |

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|---|---|---|
| 7.7.15.1 NR SA FR2 SSB based inter-frequency L1-RSRP measurement | Test 1 :<br>Average $Noc_1$ ±5.65 dB, f <= 40.8 GHz<br>Average $Noc_2$ ±5.65 dB, f <= 40.8 GHz<br>Average $\hat{E}s_1/Noc_1$ ±0.3 dB, f<=40.8 GHz<br>Average $\hat{E}s_2/Noc_2$ ±0.3 dB, f<=40.8 GHz<br><br>Meas PRB $Noc_1$ ±5.65 dB, f <= 40.8 GHz<br>Meas PRB $Noc_2$ ±5.65 dB, f <= 40.8 GHz<br>Meas PRB $\hat{E}s_1/Noc_1$ ±0.3 dB, f<=40.8 GHz<br>Meas PRB $\hat{E}s_2/Noc_2$ ±0.3 dB, f<=40.8 GHz<br><br>Test 2 :<br>Average $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Average $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz<br><br>Meas PRB $\hat{E}s_1$ ±5.65 dB, f <= 40.8 GHz<br>Meas PRB $\hat{E}s_2$ ±5.65 dB, f <= 40.8 GHz | Test 1 :<br>$Noc_1$ is the AWGN on the NR freq 1<br>$Noc_2$ is the AWGN on the NR freq 2<br>$\hat{E}s_1/Noc_1$ is the ratio of Cell 1 signal/AWGN<br>$\hat{E}s_2/Noc_2$ is the ratio of Cell 2 signal/AWGN<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$<br><br>Test 2 :<br>$\hat{E}s_1$ is NR Cell 1 signal<br>$\hat{E}s_2$ is NR Cell 2 signal<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

**Table F.1.1.2-7: Maximum test system uncertainty for RRM requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 8.2.1.1 E-UTRA – NR FR1 cell re-selection to higher priority NR target cell | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.2.1.2 E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting | Average $Noc_1$ ±5.65 dB<br>Average $Noc_2$ ±5.65 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±5.65 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$ |

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| 8.3.1.1 E-UTRA – NR FR1 handover with known target cell | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.4.1.1 E-UTRA – NR FR1 SFTD measurement delay in non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.4.1.2 E-UTRA – NR FR1 SFTD measurement delay in DRX | Same as 8.4.1.1 | Same as 8.4.1.1 |
| 8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX | Average $Noc_2$ ±5.65 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±5.65 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$ |
| 8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX | Average $Noc_2$ ±5.65 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±5.65 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$ |
| 8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 8.4.2.9 E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16 | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB |
| 8.5.1.1 E-UTRA – NR FR1 SFTD measurement accuracy | Average $\hat{E}s_1$ / $Noc_1$ ±0.8 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.8 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

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| 8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell | Average Noc ±1.5 dB<br>Noc over meas PRBs #$RB_{J-J+19}$ ±1.5 dB<br>Average Ês / Noc ±0.3 dB<br><br>meas PRB Ês1 / Noc1 ±0.8 dB | Noc is the AWGN on the NR freq<br><br>Ês / Noc is the cell SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell | Test 1<br>Average Noc ±5.65 dB<br>Noc over meas PRBs ±5.65 dB<br>Average Ês / Noc ±0.3 dB<br><br>Ês / Noc over meas PRBs ±0.3 dB<br><br>Test 2<br>Average Es ±5.65 dB<br>Es over meas PRBs ±5.65 dB | Test 1<br>Noc is the AWGN on the NR freq<br><br>Ês / Noc is the cell SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$ |
| 8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell | Same as 8.5.2.1.1.1 | Same as 8.5.2.1.1.1 |
| 8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cell | Same as 8.5.2.1.2 | Same as 8.5.2.1.2 |
| 8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell | Same as 8.5.2.1.1.1 | Same as 8.5.2.1.1.1 |
| 8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell | Same as 8.5.2.1.2 | Same as 8.5.2.1.2 |

**Table F.1.1.2-8: Maximum test system uncertainty for RRM requirements for FR1 NR sidelink test cases**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source | Sidelink signal transmit timing relative to GNSS timing:<br>±192 Tc | Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds |
| 9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source | Sidelink signal transmit timing relative to SyncRef UE:<br>±128 Tc for SL SCS = 30kHz<br><br>Average Noc: ±1.5 dB<br>Average $Ês_1$ / Noc: ±0.3 dB<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $Ês_1$ / Noc: ±0.3 dB | Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds<br><br>Noc is the AWGN absolute power on PC5 carrier.<br><br>$Ês_1$ / Noc is the ratio of SyncRef UE 1 signal / AWGN<br><br>Meas PRB is the measurement PRB for PSBCH-RSRP #$RB_J$ to $RB_{J+10}$ |
| 9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source | Sidelink signal transmit timing relative to downlink timing:<br>±192 Tc for DL SCS = 15kHz and SL SCS = 30kHz<br>±160 Tc for DL SCS = 30kHz and SL SCS = 30kHz<br><br>Average Noc: ±1.5 dB<br>Average $Ês_1$ / Noc: ±0.3 dB<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $Ês_1$ / Noc: ±0.3 dB | Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds<br><br>Noc is the AWGN absolute power on Uu carrier.<br><br>$Ês_1$ / Noc is the ratio of Cell 1 signal / AWGN<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

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| 9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source | Average Noc: ±1.5 dB<br>Average $\hat{E}s_1$ / Noc: ±0.3 dB<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB | Noc is the AWGN absolute power on Uu carrier.<br><br>$\hat{E}s_1$ / Noc is the ratio of Cell 1 signal / AWGN<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source | Average Noc: ±1.5 dB<br>Average $\hat{E}s_1$ / Noc: ±0.3 dB<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_1$ / Noc is the ratio of SyncRef UE 1 signal / AWGN<br><br>Meas PRB is the measurement PRB for PSBCH-RSRP #$RB_J$ to $RB_{J+10}$ |
| 9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source | Average Noc: ±1.5 dB<br>Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2,3<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2,3 | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_i$ / Noc is the ratio of SyncRef UE i signal / AWGN, i = 1,2,3<br><br>Meas PRB is the measurement PRB for PSBCH-RSRP #$RB_J$ to $RB_{J+10}$ |
| 9.1.3.2 NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source | Average Noc: ±1.5 dB<br>Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2 | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_i$ / Noc is the ratio of SyncRef UE i signal / AWGN, i = 1,2<br><br>Meas PRB is the measurement PRB for PSBCH-RSRP #$RB_J$ to $RB_{J+10}$ |
| 9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection | Average Noc: ±1.5 dB<br>Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,49<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,49 | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,...,49<br><br>Meas PRB is the measurement PRB for SL-RSRP #$RB_J$ to $RB_{J+599}$ |
| 9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption | Average Noc: ±1.5 dB<br>Average $\hat{E}s_1$ / Noc: ±0.3 dB,<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB, | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_1$ / Noc is the ratio of active sidelink UE 1 signal / AWGN,<br><br>Meas PRB is the measurement PRB for SL-RSRP #$RB_J$ to $RB_{J+119}$ |
| 9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation | Average Noc: ±1.5 dB<br>Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,129<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,129 | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,...,129<br><br>Meas PRB is the measurement PRB for SL-RSRP #$RB_J$ to $RB_{J+119}$ |
| 9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation | Average Noc: ±1.5 dB<br>Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,2,3<br><br>Meas PRB Noc: ±1.5 dB<br>Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,2,3 | Noc is the AWGN absolute power on PC5 carrier.<br><br>$\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,2,3<br><br>Meas PRB is the measurement PRB for SL-RSSI #$RB_J$ to $RB_{J+119}$ |
| 9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation | Same as 9.1.5.1 | Same as 9.1.5.1 |

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| 9.1.6.1 NR SA FR1 interruption to WAN due to NR sidelink communication | ± 0.6dB (AWGN conditions) | Overall system uncertainty for AWGN condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |

**Table F.1.1.2-9: Maximum test system uncertainty for RRM requirements for SA FR1 test cases for RedCap**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | Same as 6.1.1.4 | Same as 6.1.1.4 |
| 16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.1.4 | Same as 6.1.1.4 |
| 16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | Same as 6.1.1.5 | Same as 6.1.1.5 |
| 16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.1.5 | Same as 6.1.1.5 |
| 16.1.2.1 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 RX UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.1.2.2 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.1.2.3 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 RX UE | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.1.2.4 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 RX UE | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.1.2.5 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.1.2.6 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.2.1.1 NR SA FR1 CG-SDT for 1 Rx UE | Same as 6.2.1 | Same as 6.2.1 |

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| 16.2.1.2 NR SA FR1 CG-SDT for 2 Rx UE | Same as 6.2.1 | Same as 6.2.1 |
| 16.3.1.1 NR SA FR1 handover with known target cell for 1 Rx UE | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 16.3.1.2 NR SA FR1 handover with known target cell for 2 Rx UE | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 16.3.1.3 NR SA FR1 handover with unknown target cell for 1 Rx UE | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 16.3.1.4 NR SA FR1 handover with unknown target cell for 2 Rx UE | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 16.3.1.5 NR SA FR1-FR1 handover with unknown target cell for 1 Rx UE | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 16.3.1.6 NR SA FR1-FR1 handover with unknown target cell for 2 Rx UE | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 16.3.1.7 NR SA FR1 - E-UTRA handover with known target cell for 1 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.3.1.8 NR SA FR1 - E-UTRA handover with known target cell for 2 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.3.1.9 NR SA FR1 - E-UTRA handover with unknown target cell for 1 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.3.1.10 NR SA FR1 - E-UTRA handover with unknown target cell for 2 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.3.2.1.1 NR SA FR1 RRC Re-establishment for 1 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.3.2.1.2 NR SA FR1 RRC Re-establishment for 2 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.3.2.1.3 NR SA FR1-FR1 RRC Re-establishment for 1 Rx UE | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 16.3.2.1.4 NR SA FR1-FR1 RRC Re-establishment for 2 Rx UE | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 16.3.2.1.5 NR SA FR1 RRC Re-establishment for 1 Rx UE without serving cell timing | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 |
| 16.3.2.1.6 NR SA FR1 RRC Re-establishment for 2 Rx UE without serving cell timing | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 |
| 16.3.2.2.1 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.3 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.4 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.5 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.7 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |

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| 16.3.2.3.1 NR SA FR1-FR1 RRC connection release with redirection for 1 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.3.2.3.2 NR SA FR1-FR1 RRC connection release with redirection for 2 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.3.2.3.3 NR SA FR1 - E-UTRA RRC connection release with redirection for 1 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.3.2.3.4 NR SA FR1 - E-UTRA RRC connection release with redirection for 2 Rx UE | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.4.1.1 NR SA FR1 NR UE Transmit Timing accuracy for 1 Rx UE | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 16.4.1.2 NR SA FR1 NR UE Transmit Timing accuracy for 2 Rx UE | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 16.4.3.1 NR SA FR1 timing advance adjustment accuracy for 1 Rx UE | Same as 6.4.3.1 | Same as 6.4.3.1 |
| 16.4.3.2 NR SA FR1 timing advance adjustment accuracy for 2 Rx UE | Same as 6.4.3.1 | Same as 6.4.3.1 |
| 16.5.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.3 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.6 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.7 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.9 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.11 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |

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| 16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.13 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.15 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 16.5.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 16.5.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 1 Rx UE | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 16.5.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 16.5.2.5 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 16.5.2.7 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 16.5.3.1.1 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 |
| 16.5.3.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 |
| 16.5.3.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |

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| 16.5.3.2.2 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE | Same as 6.5.8.1 | Same as 6.5.8.1 |
| 16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE | Same as 6.5.8.1 | Same as 6.5.8.1 |
| 16.6.1.1 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.3 NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.5 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.7 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.8 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.9 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.11 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.12 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.2.1 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.2 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.3 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |

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| 16.6.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.7 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.8 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.9 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.10 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.11 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 1 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.12 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.3.1 NR - E-UTRA event-triggered reporting in non-DRX for 1 Rx UE | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 16.6.3.2 NR - E-UTRA event-triggered reporting in non-DRX for 2 Rx UE | Same as 6.6.3.2 | Same as 6.6.3.2 |
| 16.6.3.3 NR - E-UTRA event-triggered reporting in DRX for 1 Rx UE | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 16.6.3.4 NR - E-UTRA event-triggered reporting in DRX for 2 Rx UE | Same as 6.6.3.2 | Same as 6.6.3.2 |
| 16.6.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 16.6.4.3 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 16.6.4.5 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 16.6.4.7 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 1 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 16.6.5.1 NR SA FR1 CGI identification of NR neighbour cell for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.5.2 NR SA FR1 CGI identification of NR neighbour cell for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 |

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| 16.6.5.3 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 1 Rx UE | Noc1 ±1.5 dB<br><br>Noc2 ±1.5 dB<br><br>Ês1 / Noc1 ±0.3 dB<br><br>Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on Cell 1 frequency.<br><br>Noc1 is the AWGN on Cell 2 frequency.<br><br>Ês1 / Noc1 is the ratio of Cell 1 signal / AWGN.<br><br>Ês2 / Noc2 is the ratio of Cell 2 signal / AWGN. |
| 16.6.5.4 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 2 Rx UE | Same as 16.6.5.3 | Same as 16.6.5.3 |
| 16.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 16.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | Same as 6.7.1.1.2 | Same as 6.7.1.1.2 |
| 16.7.1.2.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 16.7.1.2.2 NR SA FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.1.1.2 | Same as 6.7.1.1.2 |
| 16.7.1.3.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.1.3.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | Same as 6.7.1.2.2 | Same as 6.7.1.2.2 |
| 16.7.1.4.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.1.4.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.1.2.2 | Same as 6.7.1.2.2 |
| 16.7.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | Same as 6.7.2.1 | Same as 6.7.2.1 |
| 16.7.2.2 NR SA FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | Same as 6.7.2.1 | Same as 6.7.2.1 |
| 16.7.2.3.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.2.3.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 1 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.2.4.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.2.4.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 16.7.3.2 NR SA FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 16.7.3.3.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.3.3.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 1 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |

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| 16.7.3.4.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.3.4.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 16.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 1 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 1 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.2.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.2.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.3.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 1 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.3.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 1 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.4.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.4.4.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| 16.7.5.1 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 1 Rx UE | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 16.7.5.2 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 16.7.6.1 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 1 Rx UE | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 16.7.6.2 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 2 Rx UE | Same as 6.7.5.1 | Same as 6.7.5.1 |

**Table F.1.1.2-10: Maximum test system uncertainty for RRM requirements for SA FR2 test cases for RedCap**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 17.1.1.1 NR SA FR2 Cell reselection for 2 Rx UE | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 17.1.1.2 NR SA FR2-FR2 Cell reselection for 2 Rx UE | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 17.1.1.3 NR SA FR2 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 17.1.1.4 NR SA FR2-FR2 Cell reselection for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 17.3.1.1 NR SA FR2 handover with unknown target cell for 2 Rx | Same as 7.3.1.2 | Same as 7.3.1.2 |
| 17.3.1.2 NR SA FR2-FR2 handover with unknown target cell for 2 Rx UE | Same as 7.3.1.3 | Same as 7.3.1.3 |
| 17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2 | Same as 7.3.2.1.1 | Same as 7.3.2.1.1 |

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| 17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2 | Same as 7.3.2.1.2 | Same as 7.3.2.1.2 |
| 17.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing | Same as 7.3.2.1.3 | Same as 7.3.2.1.3 |
| 17.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection for 2 Rx UE | Same as 7.3.2.3 | Same as 7.3.2.3 |
| 17.4.1.1 NR SA FR2 NR UE Transmit Timing accuracy for 2 Rx UE | Same as 7.4.1.1 | Same as 7.4.1.1 |
| 17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.3 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.5 NR SA FR2 Radio Link Monitoring Out-of-sync Test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.6 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.7 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.8 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions on FR2 for 2 Rx UE | Same as 5.5.1.1 | Same as 5.5.1.1 |
| 17.5.2.1 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.1 | Same as 7.5.5.1 |
| 17.5.2.2 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE | Same as 7.5.5.2 | Same as 7.5.5.2 |
| 17.5.2.3 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.3 | Same as 7.5.5.3 |
| 17.5.2.4 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | Same as 7.5.5.4 | Same as 7.5.5.4 |

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| 17.5.2.5 NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.5 | Same as 7.5.5.5 |
| 17.5.3.1.1 NR SA FR2 DCI-based and Timer-based DL active BWP switch for 2 Rx UE | Noc ±5.65dB<br>Ês / Noc ±0.3 dB<br>AWGN and signal flatness: ±3.0 dB | Ês / Noc is the ratio of cell 1 signal / AWGN |
| 17.5.3.2.1 NR SA FR2 RRC-based DL active BWP switch for 2 Rx UE | Same as 17.5.3.1.1 | Same as 17.5.3.1.1 |
| 17.5.4.1.1 NR SA FR2 MAC-CE based active TCI state switch for a known TCI state for 2 Rx UE | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 |
| 17.5.4.2.1 NR SA FR2 RRC-CE based active TCI state switch for a known TCI state for 2 Rx UE | Same as 7.5.8.2.1 | Same as 7.5.8.2.1 |
| 17.5.5.1.1 NR SA FR2 MAC-CE based spatial relation switch associated with known DL-RS for 2 Rx UE | Same as 7.5.9.1.1 | Same as 7.5.9.1.1 |
| 17.5.5.2.1 NR SA FR2 RRC-based spatial relation switch associated with a known DL-RS for 2 Rx UE | Same as 7.5.9.2.1 | Same as 7.5.9.2.1 |
| 17.6.1.1 NR SA FR2 event triggered reporting without gap in non-DRX for 2 Rx UE | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 17.6.1.2 NR SA FR2 event triggered reporting without gap in DRX for 2 Rx UE | Same as 7.6.1.2 | Same as 7.6.1.2 |
| 17.6.1.3 NR SA FR2 event triggered reporting with gaps in non-DRX for 2 Rx UE | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 17.6.1.4 NR SA FR2 event triggered reporting with gaps in DRX for 2 Rx UE | Same as 7.6.1.2 | Same as 7.6.1.2 |
| 17.6.2.1 NR SA FR2-FR2 event triggered reporting in non-DRX for 2 Rx UE | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 17.6.2.2 NR SA FR2-FR2 event triggered reporting in DRX for 2 Rx UE | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 17.6.2.3 NR SA FR2-FR2 event triggered reporting with SSB time index detection in non-DRX for 2 Rx UE | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 17.6.2.4 NR SA FR2-FR2 event triggered reporting with SSB time index detection in DRX for 2 Rx UE | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 17.6.3.1 NR SA FR2 SSB based L1-RSRP measurement in non-DRX for 2 Rx UE | Same as 7.6.3.1 | Same as 7.6.3.1 |
| 17.6.3.2 NR SA FR2 SSB based L1-RSRP measurement in DRX for 2 Rx UE | Same as 7.6.3.1 | Same as 7.6.3.1 |
| 17.6.3.3 NR SA FR2 CSI-RS based L1-RSRP measurement in non-DRX for 2 Rx UE | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 17.6.3.4 NR SA FR2 CSI-RS based L1-RSRP measurement in DRX for 2 Rx UE | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 17.7.1.1 NR SA FR2 SS-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.1.1 | Same as 7.7.1.1 |
| 17.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.1.2 | Same as 7.7.1.2 |
| 17.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy for 2 Rx UE | Same as 7.7.2.1 | Same as 7.7.2.1 |
| 17.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy for 2 Rx UE | Same as 7.7.2.2 | Same as 7.7.2.2 |

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| 17.7.3.1 NR SA FR2 SSB based L1-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.4.1 | Same as 7.7.4.1 |
| 17.7.3.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.4.2 | Same as 7.7.4.2 |
| 17.7.4.1 NR SA FR2 SS-SINR measurement accuracy for 2 Rx UE | Same as 7.7.3.1 | Same as 7.7.3.1 |
| 17.7.4.2 NR SA FR2-FR2 SS-SINR measurement accuracy for 2 Rx UE | Same as 7.7.3.2 | Same as 7.7.3.2 |

**Table F.1.1.2-11: Maximum test system uncertainty for RRM requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell for RedCap**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 18.1.1.1 E-UTRA - NR SA FR1 E-UTRA cell re-selection to higher priority NR target Cell for 2 Rx UE | Same as 8.2.1.1 | Same as 8.2.1.1 |
| 18.2.1.1 E-UTRA - NR SA FR1 handover for 2 Rx UE | Same as 8.3.1.1 | Same as 8.3.1.1 |
| 18.2.2.1 E-UTRA - NR SA FR1 RRC connection release with redirection for 2 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 18.3.1.1 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.2 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.3 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.4 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 |

**Table F.1.1.2-12: Maximum test system uncertainty for RRM requirements for EN-DC FR1 test cases for shared spectrum**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 10.1.1.1.1 EN-DC FR1 4-step RA type contention-based random access for NR PSCell with CCA | Noc ±1.5 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB<br><br>Uplink absolute power measurement ±1.5 dB<br><br>Uplink relative power measurement ±0.7 dB<br><br>±112$T_c$ Uplink signal transmit timing relative to downlink | $\hat{E}s_2$ / $N_{oc}$ is the ratio of cell 2 signal / AWGN<br><br>$T_c$ = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 10.1.1.1.2 EN-DC FR1 4-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 10.1.1.1.3 EN-DC FR1 2-step RA type contention-based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 10.1.1.1.4 EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |

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| 10.1.2 EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Average Ês3 / Noc ±0.3 dB<br>Average Ês4 / Noc ±0.3 dB | Noc1 is the AWGN on E-UTRAN freq1<br>Noc2 is the AWGN on NR freq2<br>Ês1 / Noc is the cell 1 SNR<br>Ês2 / Noc is the cell 2 SNR<br>Ês3 / Noc is the cell 3 SNR<br>Ês4 / Noc is the cell 4 SNR |
| 10.2.1.1 EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA | Same as 4.4.1.1 | Same as 4.4.1.1 |
| 10.2.2.1 EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA | Same as 4.4.3.1 | Same as 4.4.3.1 |
| 10.3.1.2 EN-DC FR1 Radio link monitoring out-of-sync test for PSCell under CCA configured with SSB-based RLM-RS in non-DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 10.3.1.3 EN-DC FR1 Radio link monitoring in-sync test for PSCell under CCAconfigured with SSB-based RLM-RS in non-DRX mode | Same as 4.5.1.2 | Same as 4.5.1.2 |
| 10.3.3.1 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 10.3.3.2 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 10.3.3.3 EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 10.3.4.1 EN-DC FR1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell under CCA configured with SSB-based BFD and LR in non-DRX mode | Same as 4.5.5.1 | Same as 4.5.5.1 |
| 10.3.4.2 EN-DC FR1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell under CCA configured with SSB-based BFD and LR in DRX mode | Same as 4.5.5.1 | Same as 4.5.5.1 |
| 10.3.5.1 EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA | 1.5dB | Measurement uncertainty for OCNG noise as defined in Table F.1.1.2-1 |
| 10.3.5.2.1 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | Same as 4.5.6.1.1 | Same as 4.5.6.1.1 |
| 10.3.5.2.2 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC | Same as 4.5.6.1.1 | Same as 4.5.6.1.1 |
| 10.3.5.3.1 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | Same as 4.5.6.1.1 | Same as 4.5.6.1.1 |
| 10.3.6.1 EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA | Same as 4.5.7.1 | Same as 4.5.7.1 |
| 10.4.1.1 EN-DC FR1 Event-triggered reporting tests on PSCC under CCA without gaps under non-DRX | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 10.4.1.4 EN-DC FR1 Event-triggered reporting tests on PSCC under CCA with per-UE gaps under DRX | Same as 4.6.1.1 | Same as 4.6.1.1 |

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| 10.4.2.3 EN-DC FR1 event triggered reporting tests for FR1 with CCA cell without SSB time index detection when DRX is not used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.4 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA without SSB time index detection when DRX is used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.5 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is not used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.6 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.7 EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.8 EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.9 EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.2.10 EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 10.4.3.1 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 10.4.3.2 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 10.4.3.3 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 10.4.3.4 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 10.4.4.1 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.2 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.3 EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.4 EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.5.1.1 EN-DC FR1 Intra-frequency measurement accuracy on a CCA serving cell | Same as 4.7.1.1.1 | Same as 4.7.1.1.1 |
| 10.5.1.2 EN-DC FR1 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | Same as 4.7.1.2.1 | Same as 4.7.1.2.1 |
| 10.5.2.1 EN-DC FR1 Intra-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | Same as 4.7.2.1 | Same as 4.7.2.1 |

| | | |
|---|---|---|
| 10.5.2.2 EN-DC FR1 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | Same as 4.7.2.2.1 | Same as 4.7.2.2.1 |
| 10.5.3.1 EN-DC FR1 Intra-frequency measurement accuracy on PSCC under CCA | Average Noc ±1.5 dB<br>Average Ês2 / Noc ±0.3 dB<br>Average Ês3 / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB Ês2 / Noc ±0.8 dB<br>Meas PRB Ês3 / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>Ês2 / Noc is the cell 2 SNR<br>Ês3 / Noc is the cell 3 SNR<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 10.5.3.2 EN-DC FR1 Inter-frequency measurement accuracy on PSCC under CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês2 / Noc1 ±0.3 dB<br>Average Ês3 / Noc2 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br>Meas PRB Ês2 / Noc1 ±0.8 dB<br>Meas PRB Ês3 / Noc2 ±0.8 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2<br>Ês2 / Noc1 is the cell 2 SNR<br>Ês3 / Noc2 is the cell 3 SNR<br><br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 10.5.3.3 EN-DC FR1 Intra-frequency measurement accuracy on SCC under CCA | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 10.5.4.1 EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 |
| 10.5.5.1 EN-DC FR1 RSSI measurement accuracy on PSCC with CCA | Average Noc ±1.5 dB | Noc is the AWGN on NR freq1 |
| 10.5.5.2 EN-DC FR1 RSSI measurement accuracy on SCC with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 10.5.5.3 EN-DC FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2 |
| 10.5.6.1 EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA | Average Noc ±1.5 dB | Noc is the AWGN on NR freq1 |
| 10.5.6.2 EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 10.5.6.3 EN-DC FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2 |

**Table F.1.1.2-13: Maximum test system uncertainty for RRM requirements for SA FR1 test cases for shared spectrum**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 11.1.1.1 NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell | Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 11.1.1.2 NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 11.1.2.1 Cell re-selection to NR with source NR carrier frequency under CCA | Same as 11.1.1.2 | Same as 11.1.1.2 |
| 11.1.3.1 NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA | Same as 11.1.1.2 | Same as 11.1.1.2 |
| 11.1.4.1 NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 (NR) frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN |

| | | |
|---|---|---|
| | | Noc2 is the AWGN on cell 2 (E-UTRAN) frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 11.1.4.2 NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA | Same as 11.1.4.1 | Same as 11.1.4.1 |
| 11.2.1.1 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell | Average Noc ±1.5 dB<br>Average Ês1 / Noc ±0.3 dB<br>Average Ês2 / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB $Ês_1$ / Noc ±0.3 dB<br>Meas PRB $Ês_2$ / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 11.2.1.2 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | Same as 11.2.1.1 | Same as 11.2.1.1 |
| 11.2.1.3 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 11.2.1.4 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell | Same as 11.2.1.3 | Same as 11.2.1.3 |
| 11.2.1.5 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell | Same as 11.2.1.3 | Same as 11.2.1.3 |
| 11.2.1.6 NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell | Same as 11.2.1.3 | Same as 11.2.1.3 |
| 11.2.1.7 NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell | Same as 11.1.4.1 | Same as 11.1.4.1 |
| 11.2.1.8 NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell | Same as 11.1.4.1 | Same as 11.1.4.1 |
| 11.2.2.1.1 NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1 | Same as 11.1.1.1 | Same as 11.1.1.1 |
| 11.2.2.1.2 NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1 | Same as 11.1.1.2 | Same as 11.1.1.2 |
| 11.2.2.1.3 NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing | Same as 11.1.1.1 | Same as 11.1.1.1 |
| 11.2.2.1.4 NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA | Same as 11.1.1.2 | Same as 11.1.1.2 |
| 11.2.2.2.1 NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.2 NR SA FR1 4-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.3 NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.4 NR SA FR1 2-step RA type non-contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.3.1 NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA | Same as 11.2.2.3.2 | Same as 11.2.2.3.2 |

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|---|---|---|
| 11.2.2.3.2 NR SA FR1 Redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 11.3.1.1 NR SA FR1 UE Transmit Timing Test with PCell under DL CCA | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 11.3.2.1 NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA | Same as 6.4.3.1 | Same as 6.4.3.1 |
| 11.4.1.2 NR SA FR1 Radio link monitoring out-of-sync test for PCell under CCA configured with SSB-based RLM-RS in non-DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 11.4.1.3 NR SA FR1 Radio link monitoring in-sync test for PCell under CCA configured with SSB-based RLM-RS in non-DRX mode | Same as 6.5.1.2 | Same as 6.5.1.2 |
| 11.4.3.1 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 11.4.3.2 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 11.4.3.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 11.4.4.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell under CCA configured with SSB-based BFD and LR in non-DRX mode | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 11.4.4.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell under CCA configured with SSB-based BFD and LR in DRX mode | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 11.4.5.1 NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA | 1.5dB | Measurement uncertainty for OCNG noise as defined in Table F.1.1.2-1 |
| 11.4.5.2.1 NR SA FR1 - NR FR1 DL active BWP switch of PCell under CCA with non-DRX | Same as 6.5.6.1.1 | Same as 6.5.6.1.1 |
| 11.4.5.2.2 NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA | Same as 6.5.6.1.1 | Same as 6.5.6.1.1 |
| 11.4.5.3.1 NR SA FR1 DL active BWP switch with non-DRX | Same as 6.5.6.1.1 | Same as 6.5.6.1.1 |
| 11.5.1.1 SA FR1 Event-triggered reporting tests on PCC without gaps under non-DRX | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 11.5.1.2 SA FR1 Event-triggered reporting tests on PCC without gaps under DRX | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 11.5.2.3 NR SA FR1-FR1 Event triggered reporting tests with CCA without SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 with | Same as 10.4.2.3 | Same as 10.4.2.3 |

| | | |
|---|---|---|
| CCA without SSB time index detection when DRX is used | | |
| 11.5.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.7 NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.8 NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.9 NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.10 NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.3.1 NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 11.5.3.2 NR SA FR1 - E-UTRAN event-triggered reporting in DRX | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 11.5.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 11.5.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is used | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 11.5.4.3 NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 11.5.4.4 NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 11.6.1.1 NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 11.6.1.2 NR SA FR1 Intra-frequency measurement accuracy on SCC on a carrier frequency with CCA | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 11.6.2.1 NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | Same as 6.7.2.1 | Same as 6.7.2.1 |
| 11.6.2.2 NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | Same as 6.7.2.2.1 | Same as 6.7.2.2.1 |
| 11.6.2.3 NR SA FR1 Intra-frequency measurement accuracy on SCC | Same as 10.5.2.1 | Same as 10.5.2.1 |
| 11.6.2.4 NR SA FR1 Inter-frequency measurement accuracy | FFS | FFS |
| 11.6.3.1 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 11.6.3.2 NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Average Ês2 / Noc2 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Noc2 ±1.5 dB<br>meas PRB Ês1 / Noc1 ±0.8 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2<br>Ês1 / Noc1 is the cell 2 SNR<br>Ês2 / Noc2 is the cell 3 SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |

| | | |
|---|---|---|
| | meas PRB Ês2 / Noc2 ±0.8 dB | |
| 11.6.3.3 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 11.6.3.4 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA | FFS | FFS |
| 11.6.4.1 NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA | Same as 10.5.4.1 | Same as 10.5.4.1 |
| 11.6.5.1 NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA | Average Noc ±1.5 dB | Noc is the AWGN on NR freq1 |
| 11.6.5.2 NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA | Same as 11.6.5.1 | Same as 11.6.5.1 |
| 11.6.5.3 NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2 |
| 11.6.6.1 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA | Average Noc ±1.5 dB | Noc is the AWGN on NR freq1 |
| 11.6.6.2 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA | Same as 11.6.6.1 | Same as 11.6.6.1 |
| 11.6.6.3 NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | Average Noc1 ±1.5 dB<br>Average Noc2 ±1.5 dB | Noc1 is the AWGN on NR freq1<br>Noc2 is the AWGN on NR freq2 |

**Table F.1.1.2-14: Maximum test system uncertainty for RRM requirements for E-UTRAN – SA FR1 Shared Spectrum test cases**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 12.1.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.2.1.1 E-UTRAN - NR with CCA handover with known target cell | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.4.2.1 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on cell 1 frequency<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 12.4.2.2 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.4.2.3 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.4.2.4 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 |

**Table F.1.1.2-15: Maximum test system uncertainty for RRM requirements for SA FR1 with SCell in Shared Spectrum test cases**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|

| | | |
|---|---|---|
| 13.2.2.1 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 13.2.2.2 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 13.2.2.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 13.3.1.1 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br>Average $\hat{E}s_3$ / Noc ±0.3 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_3$ / Noc ±0.3 dB | $Noc_1$ is the AWGN on frequency 1<br>$Noc_2$ is the AWGN on frequency 2<br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN<br>Meas PRB on cell 3 (in frequency 2) are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 13.3.1.2 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.1.3 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.1.4 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.2.3 NR SA FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used | Average $Noc_1$ ±1.5 dB<br>Average $Noc_3$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_3$ ±0.3 dB<br>Meas PRB $Noc_3$ ±1.5 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_3$ ±0.3 dB | $Noc_1$ is the AWGN on frequency 1<br>$Noc_3$ is the AWGN on frequency 3<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_3$ / $Noc_3$ is the ratio of cell 3 signal / AWGN<br>Meas PRB on cell 3 are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 13.3.2.4 NR SA FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.2.5 NR SA FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.2.6 NR SA FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.3.1 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 13.3.3.2 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 13.4.1.1 NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA | Same as 10.5.1.1 | Same as 10.5.1.1 |
| 13.4.2.1 NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA | Same as 10.5.2.1 | Same as 10.5.2.1 |
| 13.4.3.1 NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 13.4.4.1 NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA | Same as 10.5.4.1 | Same as 10.5.4.1 |
| 13.4.5.1 NR SA FR1 RSSI measurement accuracy on a carrier with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 13.4.5.2 NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA | Same as 10.5.5.3 | Same as 10.5.5.3 |

| | | |
|---|---|---|
| 13.4.6.1 NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 13.4.6.2 NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA | Same as 10.5.6.3 | Same as 10.5.6.3 |

**Table F.1.1.2-16: Maximum test system uncertainty for RRM requirements for SA FR1 Satellite Access test cases**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 14.1.1 NR SA FR1 Cell Reselection for Satellite Access | Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Note:<br>Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 14.1.2 NR SA FR1 Cell Reselection for Satellite Access | Same as 14.1.1 | Same as 14.1.1 |
| 14.1.3 NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.1 | Same as 14.1.1 |
| 14.1.4 NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.1 | Same as 14.1.1 |
| 14.1.5 NR SA FR1-FR1 Cell Reselection for Satellite Access | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 14.1.6 NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access | Same as 14.1.5 | Same as 14.1.5 |
| 14.1.7 NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.5 | Same as 14.1.5 |
| 14.1.8 NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.5 | Same as 14.1.5 |
| 14.1.9 NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access | $Noc_1$ ±1.5 dB<br>$Ês_1$ / $Noc_1$ ±0.3 dB<br>$Noc_2$ ±1.5 dB<br>$Ês_2$ / $Noc_2$ ±0.3 dB | Note:<br>$Noc_1$ is the AWGN on cell 1 frequency<br>$Ês_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$Noc_2$ is the AWGN on cell 2 frequency<br>$Ês_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN |
| 14.1.10 NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access | Same as 14.1.9 | Same as 14.1.9 |
| 14.2.1.1 NR SA FR1 Handover for Satellite Access | Noc ±1.5 dB<br>$Ês_1$ / Noc ±0.3 dB<br>$Ês_2$ / Noc ±0.3 dB | Note:<br>$Ês_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$Ês_2$ / Noc is the ratio of cell 2 signal / AWGN |
| 14.2.1.2 NR SA FR1-FR1 Handover for Satellite Access | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $Ês_1$ / $Noc_1$ ±0.3 dB<br>Average $Ês_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $Ês_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Ês_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$Ês_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$Ês_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 14.2.1.3 NR SA FR1 Time-based Conditional Handover for NR Satellite Access | Same as 14.2.1.1 | Same as 14.2.1.1 |
| 14.2.1.4 NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access | Same as 14.2.1.2 | Same as 14.2.1.2 |

| | | |
|---|---|---|
| 14.2.1.5 NR SA FR1 Distance-based Conditional Handover for Satellite Access | Same as 14.2.1.1 | Same as 14.2.1.1 |
| 14.2.1.6 NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access | Same as 14.2.1.2 | Same as 14.2.1.2 |
| 14.2.2.1.1 NR SA FR1 RRC Re-establishment for Satellite Access | Noc ±1.5 dB<br>Ês1 / Noc ±0.3 dB<br>Ês2 / Noc ±0.3 dB | Ês1 / Noc is the ratio of cell 1 signal / AWGN<br>Ês2 / Noc is the ratio of cell 2 signal / AWGN |
| 14.2.2.1.2 NR SA FR1-FR1 RRC Re-establishment for Satellite Access | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>Noc2 ±1.5 dB<br>Ês2 / Noc2 ±0.3 dB | Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Noc2 is the AWGN on cell 2 frequency<br>Ês2 / Noc2 is the ratio of cell 2 signal / AWGN |
| 14.3.1.1 NR SA FR1 UE transmit timing accuracy for Satellite Access | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>±352Tc Uplink signal transmit timing relative to downlink for satellite access<br>±88Tc Relative transmit timing accuracy during UE timing adjustment | Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 14.3.2.1 NR SA FR1 timing advance adjustment accuracy for Satellite Access | Noc1 ±1.5 dB<br>Ês1 / Noc1 ±0.3 dB<br>±88Tc Timing Advance Adjustment accuracy | Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the ratio of cell 1 signal / AWGN<br>Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7] |
| 14.4.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in non-DRX mode for Satellite Access | Average Noc ±1.5 dB<br>Average Ês / Noc ±0.3 dB<br>Meas PRB Noc ±1.5 dB<br>Meas PRB Ês / Noc ±0.3 dB<br>Fading profile ±0.7 dB | Noc is the AWGN on cell 1 frequency<br>Ês / Noc is the SNR<br><br>Meas PRB are the measurement PRB for SSB-based RLM #$RB_J$ to $RB_{J+19}$ |
| 14.4.1.2 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in non-DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.3 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.4 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.6 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.7 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.8 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access | Average $Noc_1$ ±1.5 dB<br>Average $Ês_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Ês_1$ / $Noc_1$ ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the SNR for the SSB<br><br>Meas PRB is the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |

| | | |
|---|---|---|
| 14.4.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access | Same as 14.4.2.1 | Same as 14.4.2.1 |
| 14.4.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access | Average Noc1 ±1.5 dB<br>Average Ês1 / Noc1 ±0.3 dB<br>Meas PRB Noc1 ±1.5 dB<br>Meas PRB Ês1 / Noc1 ±0.3 dB<br>Fading profile ±0.7 dB | Note:<br>Noc1 is the AWGN on cell 1 frequency<br>Ês1 / Noc1 is the SNR for the CSI-RS<br><br>Meas PRB is the measurement PRB for CSI-RSRP #$RB_0$ to $RB_{274}$ |
| 14.4.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access | Same as 14.4.2.3 | Same as 14.4.2.3 |
| 14.4.3.1.1 NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access | Average Ês / Iot ±0.6 dB | Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 14.4.3.2.1 NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 |
| 14.4.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 |
| 14.5.1.1 SA FR1 event triggered reporting tests without gap under non-DRX for NR satellite access | Noc ±1.5 dB<br>$\hat{E}s_1$ / Noc ±0.3 dB<br>$\hat{E}s_2$ / Noc ±0.3 dB | Note:<br>$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN |
| 14.5.1.2 SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.3 SA FR1 event triggered reporting tests without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.4 SA FR1 event triggered reporting tests with single measurement gap under non-DRX for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.5 SA FR1 event triggered reporting tests with FNO concurrent gaps under DRX for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.6 SA FR1 event triggered reporting tests with PPO concurrent gaps under non-DRX with SSB index reading for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.2.1 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 14.5.2.2 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access | Same as 14.5.2.1 | Same as 14.5.2.1 |
| 14.5.2.3 NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access | Same as 14.5.2.1 | Same as 14.5.2.1 |

| | | |
|---|---|---|
| 14.5.2.4 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access | Average $Noc_1$ ±1.5 dB<br>Average $Noc_2$ ±1.5 dB<br>Average $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Average $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Average $\hat{E}s_3$ / $Noc_2$ ±0.3 dB<br>Meas PRB $Noc_1$ ±1.5 dB<br>Meas PRB $Noc_2$ ±1.5 dB<br>Meas PRB $\hat{E}s_1$ / $Noc_1$ ±0.3 dB<br>Meas PRB $\hat{E}s_2$ / $Noc_2$ ±0.3 dB<br>Meas PRB $\hat{E}s_3$ / $Noc_2$ ±0.3 dB | $Noc_1$ is the AWGN on NR freq1<br>$Noc_2$ is the AWGN on NR freq2<br>$\hat{E}s_1$ / $Noc_1$ is the ratio of cell 1 signal / AWGN<br>$\hat{E}s_2$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br>$\hat{E}s_3$ / $Noc_2$ is the ratio of cell 2 signal / AWGN<br><br>Meas PRB are the measurement PRB for SS-RSRP #$RB_J$ to $RB_{J+19}$ |
| 14.5.2.6 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access | Same as 14.5.2.4 | Same as 14.5.2.4 |
| 14.6.3.1 NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access | Average Noc ±1.5 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Average $\hat{E}s_2$ / Noc ±0.3 dB<br><br>meas PRB $\hat{E}s_1$ / Noc ±0.8 dB<br>meas PRB $\hat{E}s_2$ / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_1$ / Noc is the cell 1 SNR<br>$\hat{E}s_2$ / Noc is the cell 2 SNR<br><br>meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 14.6.3.2 NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access | Same as 14.6.3.1 | Same as 14.6.3.1 |
| 14.6.4.1 NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access | Average Noc ±1.5 dB<br>Average $\hat{E}s_1$ / Noc ±0.3 dB<br>Meas PRB $\hat{E}s_1$ / Noc ±0.8 dB | Noc is the AWGN on NR freq1<br>$\hat{E}s_1$ / Noc is the cell 1 SNR<br>Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 |
| 14.6.4.2 NR SA FR1 CSI-RS based L1-RSRP Measurement Accuracy for Satellite Access | Same as 14.6.4.1 | Same as 14.6.4.1 |

**Table F.1.1.2-17: Maximum test system uncertainty for RRM requirements for SA FR1 Air-to-ground test cases**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 19.2.1.1 Intra-frequency handover from FR1 to FR1; known target cell | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 19.2.1.2 Inter-frequency handover from FR1 to FR1; unknown target cell | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 19.6.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |

| | | |
|---|---|---|
| 19.6.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |

## F.1.2 Interpretation of measurement results (normative)

See TS 38.521-1 [17] Annex F.2.

## F.1.3 Test Tolerance and Derivation of Test Requirements (informative)

See TS 38.521-1 [17] Annex F.3.

### F.1.3.1 Measurement of test environments

See TS 38.521-1 [17] Annex F.3.1.

### F.1.3.2 Measurement of RRM requirements

Because the relationships between the test system uncertainties and the test tolerances are often complex, it is not always possible to give a simple derivation of the test requirement in this document. The analysis is recorded in 3GPP TR 38 903 [22].

The derivation of the test requirements for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.3.2-1.

The derivation of the test requirements for the NE-DC FR1 test cases in chapter 4 is defined in Table F.1.3.2-1a.

The derivation of the test requirements for the NR/5GC FR1 test cases in chapter 6 is defined in Table F.1.3.2-2.

The derivation of the test requirements for the EN-DC FR2 test cases in chapter 5 is defined in Table F.1.3.2-3.

The derivation of the test requirements for the NR/5GC FR2 test cases in chapter 7 is defined in Table F.1.3.2-4.

The derivation of the test requirements for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases in chapter 8 is defined in Table F.1.3.2-5.

The derivation of the test requirements for the FR1 NR sidelink test cases in chapter 9 is defined in Table F.1.3.2-6.

The derivation of the test requirements for the EN-DC FR1 test cases for shared spectrum in chapter 10 is defined in Table F.1.3.2-10.

The derivation of the test requirements for the NR/5GC FR1 test cases for shared spectrum in chapter 11 is defined in Table F.1.3.2-11.

The derivation of the test requirements for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for shared spectrum in chapter 12 is defined in Table F.1.3.2-12.

The derivation of the test requirements for the NR/5GC FR1 test cases with SCell in shared spectrum in chapter 13 is defined in Table F.1.3.2-13.

The derivation of the test requirements for SA FR1 Satellite access test cases in chapter 14 is defined in Table F.1.3.2-14.

The derivation of the test requirements for the NR/5GC FR1 test cases for RedCap in chapter 16 is defined in Table F.1.3.2-7.

The derivation of the test requirements for the NR/5GC FR2 test cases for RedCap in chapter 17 is defined in Table F.1.3.2-8.

The derivation of the test requirements for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for RedCap in chapter 18 is defined in Table F.1.3.2-9.

The derivation of the test requirements for the NR/5GC FR1 test cases for ATG in chapter 19 is defined in Table F.1.3.2-15.

**Table F.1.3.2-1: Derivation of test requirements for EN-DC FR1 RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 4.3.2.2.1 | Absolute uplink power:<br>Normal conditions ±17dB<br><br>Relative uplink power step:<br>Normal conditions ±2.5dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±12*64*$T_c$<br>30kHz SCS $T_e$ ±8*64*$T_c$ | <br>2.1dB<br><br><br>0.7dB<br><br><br>112$T_c$<br>112$T_c$ | Absolute uplink power:<br>Normal conditions ±19.1dB<br><br>Relative uplink power step:<br>Normal conditions ±3.2dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±880*$T_c$<br>30kHz SCS Te ±624*$T_c$ |
| 4.3.2.2.2 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |
| 4.3.2.2.3 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |
| 4.3.2.2.4 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 | Same as 4.3.2.2.1 |
| 4.4.1.1 EN-DC FR1 UE transmit timing accuracy | Test 1 (no DRX):<br>Uplink timing:<br>±12*64 $T_c$ for 15 KHz SSB SCS,15 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,30 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,60 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,15 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,30 kHz UL SCS<br>±7*64 $T_c$ for 30 KHz SSB SCS,60 kHz UL SCS<br><br>Max step size $T_q$: 5.5*64*$T_c$<br>Min adjust rate $T_p$: 5.5*64*$T_c$<br>Max adjust rate: 5.5*64*$T_c$<br>$\hat{E}s_2$ / $N_{oc}$: +3.00dB<br>$N_{oc}$ = -98 dBm/15 kHz (Config 1,2,3)<br><br><br>Test 2 (with DRX):<br>±12*64 $T_c$ for 15 KHz SSB SCS,15 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,30 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,60 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,15 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,30 kHz UL SCS<br>±7*64 $T_c$ for 30 KHz SSB SCS,60 kHz UL SCS<br><br>$\hat{E}s_2$ / $N_{oc}$: +3.00dB | <br><br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br><br>+0.5*64$T_c$<br>-3.6*64*$T_c$<br>+1.1*64*$T_c$<br>+0.3 dB<br>+1.5 dB<br><br><br><br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br><br>+0.3dB | Test 1 (10MHz Ch BW):<br>Uplink timing: ±13.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±8.75*64*$T_c$<br><br>Max step size $T_q$: 6.0*64*$T_c$<br>Min adjust rate: 1.9*64*$T_c$<br>Max adjust rate: 6.6*64*$T_c$<br>$\hat{E}s_2$ / $N_{oc}$: +3.30dB<br>$N_{oc}$ = -98 dBm/15 kHz (Config 1,2,3) +1.5 dB<br><br>Test 2 (with DRX):<br><br>Uplink timing: ±13.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±8.75*64*$T_c$<br><br>$\hat{E}s_2$ / $N_{oc}$: +3.30dB |
| 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy | $N_{oc}$ = -98 dBm/15 kHz (Config 1, 2, 4, 5)<br><br>$N_{oc}$ = -95 dBm/15 kHz (Config 3, 6)<br><br>$\hat{E}s_x$ / $N_{oc}$ = 3 dB<br><br>UE Timing Advance Adjustment Accuracy for 15kHz SCS = ±256 $T_c$+ TT<br><br>UE Timing Advance Adjustment Accuracy for 30kHz SCS = ±256 $T_c$+ TT | 0<br><br>0<br><br>0<br><br>+/- 88 Tc<br><br>+/- 88 Tc | $N_{oc}$ = -98 dBm/15 kHz (Config 1, 2, 4, 5)<br><br>$N_{oc}$ = -95 dBm/15 kHz (Config 3, 6)<br><br>$\hat{E}s_x$ / $N_{oc}$ = 3 dB<br><br>UE TAAA for 15kHz SCS = ±344 $T_c$<br><br>UE TAAA for 30kHz SCS = ±344 $T_c$ |
| 4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB |
| 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB<br>T4: -4.5dB<br>T5: 1dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: +0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB<br>T4: -5.3dB<br>T5: 1.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is |

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| | | | modified as specified in clause D.4.1.1 |
| 4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | Same as 4.5.1.2 | Same as 4.5.1.2 | Same as 4.5.1.2 |
| 4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 4.5.1.2 | Same as 4.5.1.2 | Same as 4.5.1.2 |
| 4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 4.5.1.1 | Same as 4.5.1.1 | Same as 4.5.1.1 |
| 4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 4.5.1.2 | Same as 4.5.1.2 | Same as 4.5.1.2 |
| 4.5.1.9 EN-DC FR1 Radio Link Monitoring Out-of-sync Test for PSCell configured with SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | SNR during<br>T1: 1dB<br>T2: 1dB<br>T3: -15dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB | SNR during<br>T1: 1.8dB<br>T2: 1.8dB<br>T3: -15.8dB |
| 4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | SNRs as specified | 0.6dB | Formula: SNR + TT |
| 4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | Same as 4.5.2.1 | Same as 4.5.2.1 | Same as 4.5.2.1 |
| 4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB |
| 4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | Same as 4.5.2.3 | Same as 4.5.2.3 | Same as 4.5.2.3 |
| 4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz | During T1:<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz |

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| SCC in synchronous EN-DC | $\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB | 0dB | $\hat{E}s_1$ / Noc1: +17dB<br>$\hat{E}s_2$ / Noc2: +17dB<br>$\hat{E}s_3$ / Noc3: +17dB |
| 4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | Same as 4.5.2.5 | Same as 4.5.2.5 | Same as 4.5.2.5 |
| 4.5.2.8 | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB |
| 4.5.2.9 | Same as 4.5.2.8 | Same as 4.5.2.8 | Same as 4.5.2.8 |
| 4.5.2.10 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | During T1:<br>Noc: -104dBm/15kHz<br>$\hat{E}s_2$ / Noc: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>Noc: -104dBm/15kHz<br>$\hat{E}s_2$ / Noc: +17dB |
| 4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB |
| 4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | Same as 4.5.3.1 | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX | Same as 4.5.3.1 | Same as 4.5.3.1 | Same as 4.5.3.1 |
| 4.5.3.4 SCell Activation and deactivation of multiple unknown SCells in FR1 with single activation/deactivation command | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: -infinity<br>$\hat{E}s_4$ / $Noc_4$: -infinity<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br>$\hat{E}s_4$ / $Noc_4$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: -infinity<br>$\hat{E}s_4$ / $Noc_4$: -infinity<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br>$\hat{E}s_4$ / $Noc_4$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Noc_4$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB |

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| | $\hat{E}_{s3}$ / $N_{oc3}$: +17dB<br>$\hat{E}_{s4}$ / $N_{oc4}$: +17dB | 0dB<br>0dB | $\hat{E}_{s3}$ / $N_{oc3}$: +17dB<br>$\hat{E}_{s4}$ / $N_{oc4}$: +17dB |
| 4.5.3.5 EN-DC FR1 direct SCell activation at SCell addition of known SCell | During T1:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: +17dB<br><br>During T2:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: +17dB<br><br>During T2:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: +17dB |
| 4.5.3.6 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB<br><br>During T2:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB<br>In signalling:<br>A3-offset = -15dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0 dB | During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB<br><br>During T2:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +17dB<br>Ês3 / Noc3: +17dB<br>In signalling:<br>A3-offset = -15dB |
| 4.5.3.7 EN-DC FR1 fast SCell Activation of known SCell in non-DRX for 640 ms SCell measurement cycle | Same as 4.5.3.6 | Same as 4.5.3.6 | Same as 4.5.3.6 |
| 4.5.3.11 EN-DC FR1 TRS-based SCell Activation of SSB-less SCell in FR1 collocated inter-band in non-DRX | Config 1,2,4,5:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -120dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: 19dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: (35-$\Delta_{EPRE}$) dB<br><br>Config 3,6:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -120dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: 19dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: (35-$\Delta_{EPRE}$) dB | Config 1,2,4,5:<br>0dB<br>0dB<br>-2dB<br>1dB<br><br>Config 3,6:<br>0dB<br>0dB<br>-1dB<br>+2dB | Config 1,2,4,5:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -120dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: (36-$\Delta_{EPRE}$) dB<br><br>Config 3,6:<br>$N_{oc2}$: -104dBm/15kHz<br>$N_{oc3}$: -120dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +18dB<br>$\hat{E}_{s3}$ / $N_{oc3}$: (37-$\Delta_{EPRE}$) dB |
| 4.5.3.12 EN-DC FR1 Inter-band SSB-less SCell activation using A-TRS | Test Config 1,2,4,5:<br>During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +22dB<br><br>During T2:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +22dB<br><br>Test Config 3,6:<br>During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +22dB<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês2 / Noc2: +10dB | Test Config 1,2,4,5:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Test Config 3,6:<br>During T1:<br>0dB<br>0dB<br>0dB<br>-4dB<br><br>During T2:<br>0dB<br>0dB | Test Config 1,2,4,5:<br>During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +22dB<br><br>During T2:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +22dB<br><br>Test Config 3,6:<br>During T1:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc2: +10dB<br>Ês3 / Noc3: +18dB<br><br>During T2:<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês2 / Noc3: +10dB |

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| | Ês3 / Noc3: +22dB | 0dB<br>-4dB | Ês3 / Noc3: +18dB |
| 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay | During T1:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB<br><br>During T2:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB<br><br>During T3:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB<br><br>During T2:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB<br><br>During T3:<br>Noc2: -102dBm/15kHz<br>Noc3: -102dBm/15kHz<br>Ês2 / Noc2: +16dB<br>Ês3 / Noc3: +16dB |
| 4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10.2dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: +10.2dB |
| 4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX | Same as 4.5.5.1 | Same as 4.5.5.1 | Same as 4.5.5.1 |
| 4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | q0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 CSI-RS during T1:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 CSI-RS during T1:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T2:<br>0dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q1 CSI-RS during T1:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10.2dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -10.2dB |

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| | q1 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10dB | -0.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>0dB<br>+0.2dB | q1 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10.2dB |
| 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX | Same as 4.5.5.3 | Same as 4.5.5.3 | Same as 4.5.5.3 |
| 4.5.5.5 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10dB<br><br>q1 CSI-RS during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB<br><br>q1 CSI-RS during T1:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T2:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in section D.4.1.1<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10.2dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10.2dB<br><br>q1 CSI-RS during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10.2dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -10.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +10.2dB |
| 4.5.5.6 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | Same as 4.5.5.5 | Same as 4.5.5.5 | Same as 4.5.5.5 |
| 4.5.5.7 EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX | q0,0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q0,1 SSB SNR during:<br>T1-T5: 5dB<br><br>q1,0 and q1,1, SSB during T1:<br>$Noc_2$: -98dBm/15kHz | q0,0, Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q0,1, Offset during:<br>T1-T5: +0.8dB | q0,0, SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q0,1, SNR during:<br>T1-T5: +5.8dB |

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| | $\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,0 and q1,1, SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,0 and q1,1, SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10dB | q1,0 and q1,1, SSB during T1:<br>0dB<br>-0.2dB<br><br>q1,0 and q1,1, SSB during T2:<br>0dB<br>-0.2dB<br><br>q1,0 and q1,1, SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | <br><br>q1,0 and q1,1, SSB during T1:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,0 and q1,1, SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,0 and q1,1, SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10.2dB |
| 4.5.5.8 EN-DC FR1 SCell TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | q0,0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q0,1 CSI-RS SNR during:<br>T1-T5: 5dB<br><br>q1,0 SSB during T1:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,0 SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,0 SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10dB<br><br>q1,1 SSB during T1:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,1 SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10dB<br><br>q1,1 SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q0,1, Offset during:<br>T1-T5: +0.8dB<br><br>q1,0 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1,0 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1,0 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB<br><br>q1,1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1,1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1,1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in section D.4.1.1<br><br>q0,1, SNR during:<br>T1-T5: +5.8dB<br><br>q1,0 SSB during T1:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,0 SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,0 SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10.2dB<br><br>q1,1 SSB during T1:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,1 SSB during T2:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: -10.2dB<br><br>q1,1 SSB during T3, T4 and T5:<br>$N_{oc2}$: -98dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +10.2dB |
| 4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC | During T1:<br>$N_{oc2}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br><br>During T2:<br>$N_{oc2}$: -104dBm/15kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB | During T1:<br>$N_{oc2}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: +17dB<br><br>During T2:<br>$N_{oc2}$: -104dBm/15kHz |

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| | $\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB | 0dB<br><br>During T3:<br>0dB<br>0dB | $\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB |
| 4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB |
| 4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB |
| 4.5.6.3.1 Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB |
| 4.5.6.4.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br>$Noc_3$: -104dBm/15kHz<br>$\hat{E}s_3$ / $Noc_3$: +17dB: +17dB |
| 4.5.7.1 EN-DC FR1 addition and release delay of known PSCell | For Test Configurations 1,2,4,5<br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -93 dBm/SCS<br><br>For Test Configurations 3,6<br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -93 dBm/SCS | <br>0dB<br>0dB<br>-3dB<br><br><br>-4dB<br>0dB<br>-3dB | <br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -96 dBm/SCS<br><br><br>$N_{oc}$: -89dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -96 dBm/SCS |
| 4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers | $N_{oc}$: -104dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 14dB | 0dB<br>0dB | $N_{oc}$: -104dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 14dB |
| 4.5.9.1 UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC | $N_{oc}$: -104 dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 17 dB | 0dB<br>0dB | $N_{oc}$: -104 dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 17 dB |

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| 4.5.10.1 EN-DC FR1 PSCell activation and deactivation delay | For Test Configurations 1,2,4,5<br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB<br><br>For Test Configurations 3,6<br>$N_{oc}$: -82dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB | <br>-3.6dB<br>0dB<br><br><br>-3.6dB<br>0dB | <br>$N_{oc}$: -88.6dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB<br><br><br>$N_{oc}$: -85.6dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB |
| 4.5.11.1 EN-DC FR1 conditional PSCell addition delay | For Test Configurations 1,2,4,5<br>$N_{oc}$: -85 dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -96 dBm/SCS<br><br>For Test Configurations 3,6<br>$N_{oc}$: -85 dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -93 dBm/SCS | <br>0dB<br>0dB<br>0dB<br><br><br>-3.6dB<br>0dB<br>-3dB | <br>$N_{oc}$: -85 dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -96 dBm/SCS<br><br><br>$N_{oc}$: -88.6dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 0.0dB<br>B1-Threshold: -96 dBm/SCS |
| 4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.00dB<br>$\hat{E}s2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.00dB<br>$\hat{E}s2$ / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.00dB<br>$\hat{E}s2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.00dB<br>$\hat{E}s2$ / Noc: +4.00dB |
| 4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 4.6.1.1 | Same as 4.6.1.1 | Same as 4.6.1.1 |
| 4.6.1.8 EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-SCell-r17 | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB<br>$\hat{E}s_3$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB<br>$\hat{E}s_3$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +4.00dB |
| 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX | During T1:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>$\hat{E}s2$ / Noc: +4.00dB<br>$\hat{E}s3$ / Noc: -infinity<br><br>During T2: | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2: | During T1:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>$\hat{E}s2$ / Noc: +4.00dB<br>$\hat{E}s3$ / Noc: -infinity<br><br>During T2: |

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| | Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +7.00dB | 0dB<br>0dB<br>0dB<br>0dB | Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +7.00dB |
| 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX | Same as 4.6.2.1 | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | Same as 4.6.2.1 | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection | Same as 4.6.2.1 | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.2.9 EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | Same as 4.6.2.1 | Same as 4.6.2.1 | Same as 4.6.2.1 |
| 4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX | During T1:<br>Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: +0.00dB<br>$\hat{E}s_1$ / Noc: -infinity<br><br>During T2:<br>Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported SSB#0 SS-RSRP values ± 10dB<br>Reported SSB#1 SS-RSRP values ± 10dB<br>Reported Differential SS-RSRP values ± 3dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.5dB<br><br>Via mapping | During T1:<br>Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: +0.00dB<br>$\hat{E}s_1$ / Noc: -infinity<br><br>During T2:<br>Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.50dB<br><br>**For configuration 1,2,4,5**<br>SSB#1: RSRP_55 to RSRP_75<br>SSB#0: DIFFRSRP_0 to DIFFRSRP_3<br><br>**For configuration 3,6**<br>SSB#1: RSRP_58 to RSRP_78<br>SSB#0: DIFFRSRP_0 to DIFFRSRP_3 |
| 4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX | Same as 4.6.4.1 | Same as 4.6.4.1 | Same as 4.6.4.1 |
| 4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported CSI-RSRP values ± 10dB<br>Reported Differential CSI-RSRP values ± 3dB | 0dB<br>0dB<br>0.5dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.50dB<br><br>**For configuration 1,2,4,5**<br>CSI-RS#1: RSRP_55 to RSRP_75<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3<br><br>**For configuration 3,6**<br>CSI-RS#1: RSRP_58 to RSRP_78<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3 |
| 4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX | Same as 4.6.4.3 | Same as 4.6.4.3 | Same as 4.6.4.3 |
| 4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 4.6.4.1 | Same as 4.6.4.1 | Same as 4.6.4.1 |

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| 4.6.5.1 EN-DC FR1 SRS-RSRP measurement with non-DRX | Test Configuration 1:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +4dB<br><br>Test Configuration 2:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +4dB | Test Config 1:<br>T1:<br>0dB<br>0dB<br><br>T2:<br>0dB<br>+5.25dB<br><br>Test Config 2:<br>T1:<br>0dB<br>0dB<br><br>T2:<br>0dB<br>+4.75dB | Test Configuration 1:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +9.25dB<br><br>Test Configuration 2:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +8.75dB |
| 4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX | During T1:<br>Noc on CLI RSSI: -116 dBm/15kHz<br>Io on CLI RSSI : -97.43 dBm/ 1.08 MHz<br><br>During T2:<br>Noc on CLI RSSI: -108dBm/15kHz<br>Io on CLI RSSI : -89.43 dBm/ 1.08 Mhz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0.5dB | During T1:<br>Noc: -116 dBm/15kHz<br>Io on CLI RSSI : -97.43 dBm/ 1.08 MHz<br><br>During T2:<br>Noc: -116 dBm/15kHz<br>Io on CLI RSSI : -88.93 dBm/ 1.08 MHz |
| 4.6.6.1 EN-DC intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}_{S2}$ / Noc: +4.00dB<br>$\hat{E}_{S3}$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}_{S2}$ / Noc: +4.00dB<br>$\hat{E}_{S3}$ / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}_{S2}$ / Noc: +4.00dB<br>$\hat{E}_{S3}$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}_{S2}$ / Noc: +4.00dB<br>$\hat{E}_{S3}$ / Noc: +4.00dB |
| 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.00dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>Reported CSI-SINR values ± 5.5dB<br>Reported Differential CSI-SINR values ± 4.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.00dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>CSI-RS#1: SINR_41 to SINR_64<br>CSI-RS#0: DIFFSINR_0 to DIFFSINR_7 |
| 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.00dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>Reported SS-SINR values ±4.5dB<br>Reported Differential SS-SINR values ±3.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.00dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>SSB#1: SINR_43 to SINR_62<br>SSB#0: DIFFSINR_0 to DIFFSINR_6 |
| 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.00dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>Reported CSI-SINR values ±4dB<br>Reported Differential CSI-SINR values ±3dB | 0dB<br>0.5dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}_{S0}$ / Noc: 0.50dB<br>$\hat{E}_{S1}$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>CSI-RS#1: SINR_44 to SINR_61<br>CSI-RS#0: DIFFSINR_0 to DIFFSINR_5 |
| 4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc}$: -106dBm/15kHz<br>$\hat{E}_{S2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{S3}$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±4.5dB | Test 1:<br>-1.5dB<br>0dB<br>+0.4dB<br>Via mapping | Test 1:<br>$N_{oc}$: -107.5dBm/15kHz<br>$\hat{E}_{S2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{S3}$ / $N_{oc}$: +1.4dB<br>RSRP_44 to RSRP_56 |

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| | Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.4dB<br>RSRP_60 to RSRP_79<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -0.8dB<br><br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_49<br>RSRP_38 to RSRP_50<br>RSRP_39 to RSRP_51<br>RSRP_39 to RSRP_51<br>depending on operating band |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc}$: -110dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±4.5dB<br>N.A<br><br>Test 2:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>$N_{oc}$: -113dBm111dBm/30kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 1:<br>-0.8dB<br>0dB<br>+0.4dB<br>Via mapping<br>N/A<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB-1dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -110.8dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.4dB<br>RSRP_41 to RSRP_53<br>N/A<br><br>Test 2:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.4dB<br>RSRP_57 to RSRP_76<br><br>Test 3:<br>$N_{oc}$: -113dBm112dBm/30kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -0.8dB<br><br>RSRP_37 38 to RSRP_4950<br>RSRP_37 38 to RSRP_4950<br>RSRP_38 39 to RSRP_5051<br>RSRP_38 39 to RSRP_5051<br>RSRP_39 40 to RSRP_5152<br>RSRP_40 41 to RSRP_5253<br>RSRP_40 41 to RSRP_5253<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 3 SS-RSRP from $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions. | | | |
| 4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy | Test 1:<br>$N_{oc}$:<br>Test configuration 1, 2, 4, 5:-106dBm/15kHz<br>Test configuration 3, 6:-110dBm/30kHzN/A<br><br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported relative SS-RSRP values: ±3dB<br><br>Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported relative SS-RSRP values: ±3dB<br><br>Test 3:<br>$N_{oc}$: -116dBm114dBm/15kHz + $\Delta_{BG_offset}$ | Test 1:<br><br>0 dB<br>0 dB<br><br>0 dB<br>+1.0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>+1.0dB<br>Via mapping<br><br>Test 3:<br>0dB | Test 1:<br><br>$N_{oc}$: -106 dBm/15kHz<br>$N_{oc}$: -110 dBm/30kHz<br><br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 3: |

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| | $\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -1.0dB<br>Reported relative SS-RSRP values: ±3dB | 0dB<br>+1.0dB<br>Via mapping | $N_{oc}$: -116dBm114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: 0dB<br>RSRP_x-7 to RSRP_x+1 |
| The derivation of the SS-RSRP values takes into account the uncertainty in Cell 2 and Cell 3 RSRP from $N_{oc}$, $\hat{E}s_2$ / $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The RSRP values given above are for both normal and extreme conditions. | | | |
| 4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>RSRP_62 to RSRP_81<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>RSRP_32 to RSRP_45<br>RSRP_33 to RSRP_45<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>depending on operating band |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>-1.35dB<br>-1.35dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$N_{oc2}$: -96dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>RSRP_64 to RSRP_83<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_38 to RSRP_51<br>RSRP_39 to RSRP_51<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 3 SS-RSRP from $N_{oc2}$ and $\hat{E}s_3$ / $N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2. | | | |
| 4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>Reported relative RSRP values: ±4.5dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$ | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>RSRP_x-7 to RSRP_x+7<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$ |

| | | | |
|---|---|---|---|
| | $\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>Reported relative RSRP values: ±4.5dB | 0dB<br>0dB<br><br>Via mapping | $\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>RSRP_x-31 to RSRP_x-18 |
| The derivation of the SS-RSRP values takes into account the uncertainty in Cell 2 and Cell 3 RSRP from $N_{oc}$, $\hat{E}s_2$ / $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 1.5dB wider at each end. | | | |
| 4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc}$: -101dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: -2.9dB<br>$\hat{E}s_3$ / $N_{oc}$: -2.9dB<br>Reported RSRQ values: ±3.5dB<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -86.5dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +3.0dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>$N_{oc}$: -101dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: -2.9dB<br>$\hat{E}s_3$ / $N_{oc}$: -2.9dB<br>RSRQ_46 to RSRQ_60<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -4.0dB<br><br>RSRQ_44 to RSRQ_59 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc}$: -91dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.6dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>N/A<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -92.6dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +3.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +3.0dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4.0dB<br>$\hat{E}s_3$ / $N_{oc}$: -4.0dB<br><br>RSRQ_44 to RSRQ_59 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 3 SS-RSRQ from $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the SS-RSRQ values are 1.5dB wider at each end for Test 1, and 0.5 dB wider at each for Tests 2 and 3. | | | |
| 4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -80.18 dBm/15kHz<br>$N_{oc2}$: -80.18 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB<br><br>Test 3: | Test 1:<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3: | Test 1:<br>$N_{oc1}$: -81.68dBm/15kHz<br>$N_{oc2}$: -81.68dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62<br><br>Test 3: |

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|---|---|---|---|
| | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | 0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -86.27 dBm/15kHz<br>$N_{oc2}$: -86.27 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | Test 1:<br>-1.53dB<br>-1.53dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -87.8dBm/15kHz<br>$N_{oc2}$: -87.8dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 3 SS-RSRQ from $N_{oc2}$ and $\hat{E}s_3$ / $N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1.5dB wider at each end. | | | |
| 4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -80.18 dBm/15kHz<br>$N_{oc2}$: -80.18 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±3dB<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±3dB<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±3dB | Test 1:<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -81.68dBm/15kHz<br>$N_{oc2}$: -81.68dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>RSRQ_x-7 to RSRQ_x+7<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_x-7 to RSRQ_x+7<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_x-11 to RSRQ_x+2 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -86.27 dBm/15kHz<br>$N_{oc2}$: -86.27 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz | Test 1:<br>-1.53dB<br>-1.53dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB | Test 1:<br>$N_{oc1}$: -87.8dBm/15kHz<br>$N_{oc2}$: -87.8dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>RSRQ_x-7 to RSRQ_x+7<br><br>Test 2:<br>$N_{oc1}$: -106dBm/15kHz |

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| | $N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±3dB<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±3dB | 0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | $N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_x-7 to RSRQ_x+7<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: 3dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br><br>RSRQ_x-11 to RSRQ_x+2 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 2 and Cell 3 SS-RSRQ from $N_{oc2}$ and $\hat{E}s_3$ / $N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1dB wider at each end. | | | |
| 4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.54dB<br>$\hat{E}s_3$ / $N_{oc}$: +4.54dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4dB<br>$\hat{E}s_3$ / $N_{oc}$: -4dB<br>Reported SINR values: ±3.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.5dB<br>0.5dB<br>Via mapping | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.54dB<br>$\hat{E}s_3$ / $N_{oc}$: +4.54dB<br>SINR_31 to SINR_49<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -3.5dB<br>$\hat{E}s_3$ / $N_{oc}$: -3.5dB<br>SINR_28 to SINR_45 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.54dB<br>$\hat{E}s_3$ / $N_{oc}$: +4.54dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -4dB<br>$\hat{E}s_3$ / $N_{oc}$: -4dB<br>Reported SINR values: ±3.5dB | Test 1:<br>-0.2dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.5dB<br>0.5dB<br>Via mapping | Test 1:<br>$N_{oc}$: -93.2dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.54dB<br>$\hat{E}s_3$ / $N_{oc}$: +4.54dB<br>SINR_31 to SINR_49<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc}$: -3.5dB<br>$\hat{E}s_3$ / $N_{oc}$: -3.5dB<br>SINR_28 to SINR_45 |
| The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end. | | | |
| 4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 3, 4, 5, 6** | | |
| | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported SINR values: ±3dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 20dB<br>$\hat{E}s_3$ / $N_{oc2}$: 20dB<br><br>Reported SINR values: ±3dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$ | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>SINR_35 to SINR_51<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 20dB<br>$\hat{E}s_3$ / $N_{oc2}$: 20dB<br><br>SINR_79 to SINR_94<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$ |

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|---|---|---|---|
| | $\hat{E}s_2$ / $N_{oc1}$: -4dB<br>$\hat{E}s_3$ / $N_{oc2}$: -4dB<br><br>Reported SINR values: ±3.5dB | 0.8dB<br>0.8dB<br><br>Via mapping | $N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: -3.2dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.2dB<br><br>SINR_32 to SINR_49 |
| The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3. | | | |
| 4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy | **TEST CONFIGURATION 1, 2, 3, 4, 5, 6** | | |
| | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 20dB<br>$\hat{E}s_3$ / $N_{oc2}$: 20dB<br><br>Reported SINR values: ±3.5dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_2$ / $N_{oc1}$: -4dB<br>$\hat{E}s_3$ / $N_{oc2}$: -4dB<br><br>Reported SINR values: ±4dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br><br>0.8dB<br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: -1.75dB<br>$\hat{E}s_3$ / $N_{oc2}$: -1.75dB<br>SINR_x-10 to SINR_x+10<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 20dB<br>$\hat{E}s_3$ / $N_{oc2}$: 20dB<br><br>SINR_x-10 to SINR_x+10<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: -3.2dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.2dB<br><br>SINR_x-11 to SINR_x+11 |
| The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from $N_{oc}$ and $\hat{E}s_3$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each for Tests 1 and 2 and 0dB wider at each end for Test 3. | | | |
| 4.7.4.1.1 EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_2$ / $N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>RSRP_62 to RSRP_82<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: -2.2dB<br><br>RSRP_31 to RSRP_44<br>RSRP_31 to RSRP_45<br>RSRP_32 to RSRP_45<br>RSRP_32 to RSRP_46<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_48<br>depending on operating band |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$ | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>RSRP_63 to RSRP_84<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$ |

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| | $\hat{E}s_2$ / $N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions) | 0.8dB<br><br>Via mapping | $\hat{E}s_2$ / $N_{oc1}$: -2.2dB<br><br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_48<br>RSRP_35 to RSRP_48<br>RSRP_35 to RSRP_49<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_37 to RSRP_51<br>depending on operating band |
| 4.7.4.1.2 EN-DC FR1 SSB based L1-RSRP relative measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_2$ / $N_{oc1}$: -3dB<br><br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br><br><br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br><br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: -2.2dB<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_2$ / $N_{oc1}$: -3dB<br><br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br><br><br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: 10dB<br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br><br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: -2.2dB<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2 |
| 4.7.4.2.1 EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 | Same as 4.7.4.1.1 |
| 4.7.4.2.2 EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy | Same as 4.7.4.1.2 | Same as 4.7.4.1.2 | Same as 4.7.4.1.2 |
| 4.7.5.1 EN-DC FR1 SFTD measurement accuracy | $N_{oc1}$: -104dBm/15kHz<br>$\hat{E}_{s1}$ / $N_{oc1}$: -3.0dB<br><br>$N_{oc2}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: 17.0dB | 0dB<br>0.3dB<br><br>0dB<br>0dB | $N_{oc1}$: -104dBm/15kHz<br>$\hat{E}_{s1}$ / $N_{oc1}$: -2.7dB<br><br>$N_{oc2}$: -104dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc2}$: 17.0dB |
| 4.7.6.1 EN-DC FR1 SRS-RSRP measurement accuracy | Test Configuration 1:<br>Test 1:<br>$N_{oc}$ = -106dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±3dB<br><br>Test 2:<br>$N_{oc}$ = -88dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±6.5dB | Test Config 1:<br>Test 1:<br>0dB<br>+0.5dB<br>Via mapping<br><br>Test 2:<br>0dB<br>+0.5dB<br>Via mapping | Test Config 1:<br>Test 1:<br>$N_{oc}$ = -106dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 30 to 41<br><br>Test 2:<br>$N_{oc}$ = -88dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 45 to 62 |

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| | Test 3:<br>$N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br><br>Reported SRS-RSRP values: ±3dB | Test 3:<br>0dB<br>+0.75dB for BG_A<br>+0.5dB otherwise<br>Via mapping | Test 3:<br>$N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.75dB for BG_A<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB otherwise<br>Reported SRS-RSRP:<br>BG_A: 23 to 33<br>BG_C: 23 to 34<br>BG_D: 24 to 34<br>BG_E: 24 to 35 |
| | Test Configuration 2:<br>Test 1:<br>Test 1 is not used when configuring SCS 30kHz<br><br>Test 2:<br>$N_{oc}$ = -91dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±7dB<br><br>Test 3:<br>$N_{oc}$ = -114+ $\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br><br>Reported SRS-RSRP values: ±3.5dB | Test Config 2:<br>Test 1:<br>N/A<br><br>Test 2:<br>0dB<br>+0.5dB<br>Via mapping<br><br>Test 3:<br>0dB<br>+1.25dB for BG_A<br>+0.5dB otherwise<br>Via mapping | Test Config 2:<br>Test 1:<br>N/A<br><br>Test 2:<br>$N_{oc}$ = -91dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 44 to 63<br><br>Test 3:<br>$N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +2.25dB for BG_A<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB otherwise<br>Reported SRS-RSRP:<br>BG_A: 26 to 37<br>BG_C: 26 to 37<br>BG_D: 26 to 38<br>BG_E: 27 to 38 |
| 4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported CSI-SINR values: ±5.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported CSI-SINR values: ±5.5dB<br>(±1dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_28 to L1-SINR_57<br><br>Test 2:<br>$N_{oc1}$: -119.2dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_27 to L1-SINR_58 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported CSI-SINR values: ±5.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported CSI-SINR values: ±5.5dB<br>(±1dB additionally for extreme conditions) | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_28 to L1-SINR_57<br><br>Test 2:<br>$N_{oc1}$: -116.2dBm/15kHz + ΔBG_offset<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_27 to L1-SINR_58 |
| 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy | | | |
| Same as 4.7.7.1.1 | Same as 4.7.7.1.1 | Same as 4.7.7.1.1 | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>L1-SINR_x-9 to L1-SINR_x+9<br><br>Test 2: |

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| | | | $N_{oc1}$: -119.2dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>L1-SINR_x-9 to L1-SINR_x+9 |
| Same as 4.7.7.1.1 | Same as 4.7.7.1.1 | Same as 4.7.7.1.1 | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>L1-SINR_x-9 to L1-SINR_x+9<br><br>Test 2:<br>$N_{oc1}$: -116.2dBm/15kHz + ΔBG_offset<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>L1-SINR_x-9 to L1-SINR_x+9 |
| 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported SS-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported SS-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_30 to L1-SINR_55<br><br>Test 2:<br>$N_{oc1}$: -119.2dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_29 to L1-SINR_56 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions) | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_30 to L1-SINR_55<br><br>Test 2:<br>$N_{oc1}$: -116.2dBm/15kHz + ΔBG_offset<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_29 to L1-SINR_56 |
| 4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_30 to L1-SINR_55<br><br>Test 2:<br>$N_{oc1}$: -119.2dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_29 to L1-SINR_56 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2: | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2: | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc1}$: 10dB<br>All bands: L1-SINR_30 to L1-SINR_55 |

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| | $N_{oc1}$: -119.5dBm/15kHz + ΔBG_offset<br><br>$\hat{E}_{s2}$ / $N_{oc1}$: -3dB<br><br>Reported CSI-SINR values: ±4.5dB<br>(±1dB additionally for extreme conditions) | 0dB<br><br>0.8dB<br><br>Via mapping | Test 2:<br>$N_{oc1}$: -116.2dBm/15kHz + ΔBG_offset<br>$\hat{E}_{s2}$ / $N_{oc1}$: -2.2dB<br><br>All bands: L1-SINR_29 to L1-SINR_56 |
| 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy | | | |
| Same as 4.7.7.1.2 | Same as 4.7.7.1.2 | Same as 4.7.7.1.2 | Same as 4.7.7.1.2 |
| Same as 4.7.7.1.2 | Same as 4.7.7.1.2 | Same as 4.7.7.1.2 | Same as 4.7.7.1.2 |
| 4.7.8.1 EN-DC FR1 CSI-RSRP absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc}$: -106dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±4.5dB<br><br>Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc}$: +3.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 1:<br>-1.5dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -107.5dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.4dB<br>RSRP_44 to RSRP_56<br><br>Test 2:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.4dB<br>RSRP_60 to RSRP_79<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc}$: +3.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: -0.8dB<br><br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_38 to RSRP_50<br>RSRP_38 to RSRP_51<br>RSRP_39 to RSRP_51<br>RSRP_39 to RSRP_52<br>RSRP_40 to RSRP_52<br>depending on operating band |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 2:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>$N_{oc}$: -111dBm/30kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc}$: +3.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 2:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}_{s2}$ / $N_{oc}$: +6.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: +1.4dB<br>RSRP_57 to RSRP_76<br><br>Test 3:<br>$N_{oc}$: -111dBm/30kHz + $\Delta_{BG_offset}$<br>$\hat{E}_{s2}$ / $N_{oc}$: +3.0dB<br>$\hat{E}_{s3}$ / $N_{oc}$: -0.8dB<br><br>RSRP_39 to RSRP_51<br>RSRP_39 to RSRP_51<br>RSRP_40 to RSRP_52<br>RSRP_40 to RSRP_52<br>RSRP_41 to RSRP_53<br>RSRP_41 to RSRP_53<br>RSRP_41 to RSRP_53<br>RSRP_41 to RSRP_53<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 3 CSI-RSRP from $N_{oc}$ and $\hat{E}_{s3}$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The CSI-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions. | | | |
| 4.7.8.2 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1: | Test 1: | Test 1: |

| | | | |
|---|---|---|---|
| | $N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | 0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | $N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>RSRP_62 to RSRP_81<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>RSRP_32 to RSRP_45<br>RSRP_33 to RSRP_45<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_35 to RSRP_47<br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>depending on operating band |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>-1.35dB<br>-1.35dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$N_{oc2}$: -96dBm/15kHz<br>$\hat{E}s_2$ / $N_{oc1}$: +10.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10.0dB<br>RSRP_64 to RSRP_83<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_2$ / $N_{oc1}$: +13.0dB<br>$\hat{E}s_3$ / $N_{oc2}$: -3.0dB<br><br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_38 to RSRP_50<br>RSRP_38 to RSRP_51<br>RSRP_39 to RSRP_51<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 3 CSI-RSRP from $N_{oc2}$ and $\hat{E}s_3$ / $N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The CSI-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2. | | | |

**Table F.1.3.2-1a: Derivation of test requirements for NE-DC FR1 RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell | Noc: -104dBm/15kHz<br>$\hat{E}s$ / Noc: +17dB<br>B1 Threshold<br>Test Configuration 1, 2, 4, 5: -96 dBm/15kHz<br>Test Configuration 3,6: -93 dBm/15kHz | 0dB<br>0dB<br><br>-1dB<br><br>-4dB | Noc: -104dBm/15kHz<br>$\hat{E}s$ / Noc: +17dB<br><br>Test Configuration 1, 2, 4, 5: -97 dBm/15kHz<br>Test Configuration 3,6: -97 dBm/15kHz |
| 4A.2.1.1 NE-DC FR1 SFTD accuracy | Noc1:<br>Test Configuration 1, 2, 4, 5: -104dBm/15kHz<br>Test Configuration 3,6: -101dBm/15kHz<br><br>$\hat{E}s1$ / Noc1: -3dB | 0dB<br><br><br>0dB<br><br>0.3dB | Noc1:<br>Test Configuration 1, 2, 4, 5: -104dBm/15kHz<br>Test Configuration 3,6: -101dBm/15kHz<br>$\hat{E}s1$ / Noc1: -2.7dB |

| | | | |
|---|---|---|---|
| | Noc2: -104dBm/15kHz<br>Ês2 / Noc2: +17dB | 0dB<br>0dB | Noc2: -104dBm/15kHz<br>Ês2 / Noc2: +17dB |

**Table F.1.3.2-2: Derivation of test requirements for NR SA FR1 RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 6.1.1.1 NR SA FR1 cell re-selection | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB |
| 6.1.1.2 NR SA FR1-FR1 cell re-selection | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB<br><br>In Signalling<br>SSearchDeltaP = 3dB | During T1:<br>0dB<br>-0.45dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-0.45dB<br><br>In Signalling<br>3dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +12.55dB<br>Ês2 / Noc: +16dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +12.55dB<br><br>In Signalling<br>SSearchDeltaP = 6dB |
| 6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>-0.45dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-0.45dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +12.55dB<br>Ês2 / Noc: +16dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +12.55dB |
| 6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -4dB<br><br>During T2: | During T1:<br>0dB<br>0dB<br>0dB<br>0.3dB<br><br>During T2: | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -3.7dB<br><br>During T2: |

| | | | |
|---|---|---|---|
| | Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: +12dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 48dB<br>Thresh_X_LowP of Cell 1 = 50dB<br>Thresh_X_LowP of Cell 2 = 50dB<br>Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 44dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 3dB | 0dB<br>0dB<br>0dB<br>-2.25dB<br><br>In signalling:<br>0dB<br>-4dB<br>-2dB<br>0dB<br>0dB<br>2dB<br>0dB<br>12dB | Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc1: -98dBm/15kHz<br>Ês2 / Noc2: +9.75dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 44dB<br>Thresh_X_LowP of Cell 1 = 48dB<br>Thresh_X_LowP of Cell 2 = 50dB<br>Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 46dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 15dB |
| 6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: +12dB<br><br>In signalling:<br>SSearchThresholdP of Cell 1 = 50dB<br>SSearchThresholdP of Cell 2 = 50dB | During T1:<br>0dB<br>2dB<br>-2dB<br>0.35dB<br><br>During T2:<br>0dB<br>0dB<br>-2dB<br>4dB<br><br>In signalling:<br>0dB<br>-16dB | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +16dB<br>Noc2: -100dBm/15kHz<br>Ês2 / Noc2: -3.65dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc1: -100dBm/15kHz<br>Ês2 / Noc2: +16dB<br><br>In signalling:<br>SSearchThresholdP of Cell 1 = 50dB<br>SSearchThresholdP of Cell 2 = 34dB |
| 6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16 | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB |
| 6.1.1.8 NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17 | Same as 6.1.1.2 | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 6.1.1.9 NR SA FR1 cell reselection to intra-frequency NR case for UE operating on a cell with less than 5MHz BW | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB |

| | | | |
|---|---|---|---|
| 6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>1.6dB<br><br>During T3:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB |
| 6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14dB | During T1:<br>-2dB<br>0dB<br>0.4dB<br>1.6dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -3.6dB<br>Ês2 / Noc2: +15.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.6dB<br>Ês2 / Noc2: +14dB |
| 6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14dB | During T1:<br>-2dB<br>0dB<br>0.4dB<br>1.6dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -3.6dB<br>Ês2 / Noc2: +15.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.6dB<br>Ês2 / Noc2: +14dB |
| 6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14dB | During T1:<br>-2dB<br>0dB<br>0.4dB<br>1.6dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -3.6dB<br>Ês2 / Noc2: +15.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.6dB<br>Ês2 / Noc2: +14dB |
| 6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 | Same as 6.1.2.2 | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 6.2.1 NR SA FR1 TA Validation for CG-SDT | During T1:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0 dB<br><br>During T2:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 12dB<br><br>During T3:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br>During T4:<br>Noc = -100 dBm/15kHz | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB<br><br>During T3:<br>0 dB<br>0 dB<br><br>During T4:<br>0 dB | During T1:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0 dB<br><br>During T2:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 12 dB<br><br>During T3:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0 dB<br><br>During T4:<br>Noc = -100 dBm/15kHz |

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| | Es/Noc = 14dB<br><br>During T5:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14dB<br><br>During T6:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br><br><br>In Signalling<br>cg-SDT-RSRP-ChangeThreshold = 8dB<br><br><br>cg-SDT-RSRP-ThresholdSSB = -110 dBm/SCS | 0 dB<br><br>During T5:<br>0 dB<br>0 dB<br><br>During T6:<br>0 dB<br>0.25 dB for Config 1,2,4<br>0 dB for Config 3<br><br>In Signalling<br>0 dB<br><br><br>0 dB | Es/Noc = 14 dB<br><br>During T5:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14 dB<br><br>During T6:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0.25 dB for Config 1,2,4<br>Es/Noc = 0 dB for Config 3<br><br>In Signalling<br>cg-SDT-RSRP-ChangeThreshold = 8dB<br><br>cg-SDT-RSRP-ThresholdSSB = -110 dBm/SCS |
| 6.3.1.1 NR SA FR1 handover with known target cell | TEST CONFIGURATION 1, 2<br>A3-Offset: 0dB | <br>-1dB | <br>A3-Offset: -1dB |
| | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-1dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>-1dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB |
| | TEST CONFIGURATION 3<br>A3-Offset: 0dB | <br>-1dB | <br>A3-Offset: -1dB |
| | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-1dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>-1dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB |
| 6.3.1.2 NR SA FR1 handover with unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB |

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| 6.3.1.3 NR SA FR1-FR1 Handover with unknown Target Cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB |
| 6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +8dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +8dB | During T1:<br>0dB<br>0dB<br>1.55dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1.55dB<br>1.55dB<br><br>During T3:<br>0dB<br>0dB<br>-1.55dB<br>1.55dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.55dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -5.55dB<br>Ês2 / Noc2: +9.55dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -5.55dB<br>Ês2 / Noc2: +9.55dB |
| 6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +7dB |
| 6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell | During T1:<br>Noc: -100dBm/15kHz<br>Ês / Noc: 12dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T2:<br>Noc: -100dBm/15kHz<br>Ês / Noc: -4dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T3:<br>Noc: -100dBm/15kHz<br>Ês / Noc: -4dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB | During T1:<br>-1.54dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>-1.54dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>-1.54dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -101.54dBm/15kHz<br>Ês / Noc: 12dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T2:<br>Noc: -101.54dBm/15kHz<br>Ês / Noc: -4dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T3:<br>Noc: -101.54dBm/15kHz<br>Ês / Noc: -4dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB |
| 6.3.1.7 NR SA FR1 synchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity | During T1:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity |

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| | During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>In signalling:<br>A3-offset: 0dB | During T2:<br>0dB<br>0dB<br>1dB<br><br>During T3:<br>0dB<br>0dB<br>1dB<br><br>During T4:<br>0dB<br>0dB<br>1dB<br><br>During T5:<br>0dB<br>0dB<br>1dB<br><br>In signalling:<br>-1dB | During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>In signalling:<br>A3-offset: -1dB |
| 6.3.1.8 NR SA FR1 asynchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +9dB<br><br>In signalling:<br>A3-offset: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>1dB<br><br>During T3:<br>0dB<br>0dB<br>1dB<br><br>During T4:<br>0dB<br>0dB<br>1dB<br><br>During T5:<br>0dB<br>0dB<br>1dB<br><br>In signalling:<br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>In signalling:<br>A3-offset: -1dB |
| 6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>3.7dB<br><br>During T3:<br>0dB<br>0dB<br>3.7dB<br><br>During T4:<br>0dB<br>0dB<br>3.7dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB |

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| | During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>In signalling:<br>A3-offset: 0dB | During T5:<br>0dB<br>0dB<br>3.7dB<br><br>In signalling:<br>-3dB | During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>In signalling:<br>A3-offset: -3dB |
| 6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>In signalling:<br>A3-offset: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>3.7dB<br><br>During T3:<br>0dB<br>0dB<br>3.7dB<br><br>During T4:<br>0dB<br>0dB<br>3.7dB<br><br>During T5:<br>0dB<br>0dB<br>3.7dB<br><br>In signalling:<br>-3dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11.7dB<br><br>In signalling:<br>A3-offset: -3dB |
| 6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>In signalling:<br>A3-offset: -6dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br><br>During T4:<br>0dB<br>0dB<br>0dB<br><br>During T5:<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>-1dB for config 1,2,4,5,9<br><br>In signalling:<br>-4dB for config 3,6<br><br>In signalling: | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>In signalling:<br>-7dB for config 1,2,4,5,9<br><br>In signalling:<br>-10dB for config 3,6<br><br>In signalling:<br>-4dB for config 7,8 |

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| | | 2dB for config 7,8 | |
| 6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>In signalling:<br>A3-offset: -4dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br><br>During T4:<br>0dB<br>0dB<br>0dB<br><br>During T5:<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>-3dB for config 1,2,4,5,9<br><br>In signalling:<br>-6dB for config 3,6<br><br>In signalling:<br>0dB for config 7,8 | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T4:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>During T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br><br>In signalling:<br>-7dB for config 1,2,4,5,9<br><br>In signalling:<br>-10dB for config 3,6<br><br>In signalling:<br>-4dB for config 7,8 |
| 6.3.1.18 NR SA FR1 Intra-frequency handover for unknown target cell operating with 12 PRB SSB bandwidth | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB |
| 6.3.2.1.1 NR SA FR1 RRC re-establishment | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB |
| 6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz |

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| | Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB | 0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB |
| 6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: +4dB |
| 6.3.2.2.1 | Absolute uplink power:<br>Normal conditions ±17dB<br><br>Relative uplink power step:<br>Normal conditions ±2.5dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±12*64*$T_c$<br>30kHz SCS $T_e$ ±8*64*$T_c$ | <br>2.1dB<br><br><br>0.7dB<br><br><br>112$T_c$<br>112$T_c$ | Absolute uplink power:<br>Normal conditions ±19.1dB<br><br>Relative uplink power step:<br>Normal conditions ±3.2dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±880*$T_c$<br>30kHz SCS $T_e$ ±624*$T_c$ |
| 6.3.2.2.2 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.2.3 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.2.4 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 6.3.2.3.1 NR SA FR1 RRC connection release with redirection | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB |
| 6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB |
| 6.3.2.4.1 PDCCH-order RACH on neighbor cell in FR1 when RACH BW is within active UL BWP | Noc: -98dBm/SCS<br>$\hat{E}s_0$ / Noc: +8dB<br>$\hat{E}s_1$ / Noc: +8dB<br><br>In signalling:<br>A3-offset: -6dB<br><br>PRACH Timing:<br>±12*64 Tc for 15 KHz SSB SCS,15 kHz UL SCS | 0dB<br>0dB<br>0dB<br><br>In signalling:<br>0dB<br><br>PRACH Timing:<br>±112Tc<br><br>±112Tc | Noc: -98dBm/SCS<br>$\hat{E}s_0$ / Noc: +8dB<br>$\hat{E}s_1$ / Noc: +8dB<br><br>In signalling:<br>A3-offset: -6dB<br><br>PRACH Timing:<br>±880 Tc for 15 KHz SSB SCS,15 kHz UL SCS |

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| | ±8*64 Tc for 30 KHz SSB SCS,30 kHz UL SCS | | ±624 Tc for 30 KHz SSB SCS,30 kHz UL SCS |
| 6.3.2.4.2 PDCCH-ordered RACH to an inter-frequency candidate cell in FR1 for LTM | Noc: -98dBm/SCS<br>$\hat{E}s_0$ / Noc: +8dB<br>$\hat{E}s_1$ / Noc: +4dB<br><br>In signalling:<br>A3-offset: -6dB<br><br>PRACH Timing:<br>±12*64 Tc for 15 KHz SSB SCS,15 kHz UL SCS<br>±8*64 Tc for 30 KHz SSB SCS,30 kHz UL SCS | 0dB<br>0dB<br>0dB<br><br>In signalling:<br>-5dB<br><br>PRACH Timing:<br>±112Tc<br><br>±112Tc | Noc: -98dBm/SCS<br>$\hat{E}s_0$ / Noc: +8dB<br>$\hat{E}s_1$ / Noc: +4dB<br><br>In signalling:<br>A3-offset: -11dB<br><br>PRACH Timing:<br>±880 Tc for 15 KHz SSB SCS,15 kHz UL SCS<br>±624 Tc for 30 KHz SSB SCS,30 kHz UL SCS |
| 6.3.2.4.3 PDCCH-order RACH on neighbour cell without L1-RSRP measurement in FR1 when RACH BW is within active UL BWP | Same as 6.3.2.4.1 | Same as 6.3.2.4.1 | Same as 6.3.2.4.1 |
| 6.3.3.1 NR SA FR1 conditional handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11dB<br><br>In signalling:<br>A3-offset: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1dB<br><br>In signalling:<br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB<br><br>In signalling:<br>A3-offset: -1dB |
| 6.3.3.2 NR SA FR1-FR1 conditional handover | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>1.7dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +6.7dB |
| 6.3.3.3 NR-DC SA FR1 conditional handover including target MCG and target SCG | Test Config 1, 2:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity | Test Config 1, 2:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Test Config 3:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | Test Config 1,2:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity |

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| | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB | During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB |
| 6.3.3.4 NR-DC SA FR1 conditional handover including target MCG and candidate SCG | Test Config 1, 2:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +5dB<br>Ês4 / Noc2: +5dB | Test Config 1, 2:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>+1.5dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>+1.5dB<br>+1.5dB<br><br>Test Config 3:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>+1.5dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>+1.5dB<br>+1.5dB | Test Config 1,2:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +6.5dB<br>Ês4 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +6.5dB<br>Ês4 / Noc2: +6.5dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: -infinity<br>Ês4 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +6.5dB<br>Ês4 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br>Ês3 / Noc1: +6.5dB<br>Ês4 / Noc2: +6.5dB |
| 6.3.3.6 NR SA FR1 Intra-frequency NES triggering conditional handover | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +11dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +10dB |

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| | In signalling:<br>A3-offset: 0dB | In signalling:<br>-1dB | In signalling:<br>A3-offset: -1dB |
| 6.3.3.7 NR SA FR1-FR1 Inter-frequency NES-based conditional handover | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB<br><br>In signalling:<br>A3-offset for CHO: 6dB<br>A3-offset for NES CHO: -4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>1.7dB<br><br>In signalling:<br>CHO: 4dB<br>NES CHO: 0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +6.7dB<br><br>In signalling:<br>A3-offset for CHO: 10dB<br>A3-offset for NES CHO: -4dB |
| 6.3.4.1 RACH-based Intra-frequency PCell switch from FR1 to FR1 | During T1~T4:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br><br>In signalling:<br>A3-offset = -6dB | During T1~T4:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>0 dB | During T1~T4:<br>0dB<br>0dB<br>+8dB<br>+8dB<br><br>In signalling:<br>A3-offset = -6dB |
| 6.3.4.2 RACH-based Inter-frequency PCell switch from FR1 to FR1 | During T1~T4:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br><br>In signalling:<br>A3-offset = -6dB | During T1~T4:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>-1 dB | During T1~T4:<br>0dB<br>0dB<br>+8dB<br>+8dB<br><br>In signalling:<br>A3-offset = -7dB |
| 6.3.4.3 RACH-less Intra-frequency PCell switch from FR1 to FR1 | During T1~T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>In signalling:<br>A3-offset: -6dB | During T1~T5:<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>0dB | During T1~T5:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB<br><br>In signalling:<br>A3-offset: -6dB |
| 6.3.4.4 NR SA FR1 RACH-less Intra-frequency PCell switch from FR1 to FR1 without L1-RSRP measurement | Same as 6.3.4.3 | Same as 6.3.4.3 | Same as 6.3.4.3 |
| 6.4.1.1 EN-DC FR1 UE transmit timing accuracy | <u>Test 1 (no DRX):</u><br>Uplink timing:<br>±12*64 $T_c$ for 15 KHz SSB SCS,15 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,30 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,60 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,15 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,30 kHz UL SCS<br>±7*64 $T_c$ for 30 KHz SSB SCS,60 kHz UL SCS<br><br>Max step size $T_q$: 5.5*64*$T_c$<br>Min adjust rate $T_p$: 5.5*64*$T_c$<br>Max adjust rate: 5.5*64*$T_c$<br>$Ês_2$ / $N_{oc}$: +3.00dB<br>$N_{oc}$ = -98 dBm/15 kHz (Config 1,2,3)<br><br><u>Test 2 (with DRX):</u> | <br><br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br><br>+0.5*64$T_c$<br>-3.6*64*$T_c$<br>+1.1*64*$T_c$<br>+0.3 dB<br>+1.5 dB<br><br><br><br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$<br>±1.75*64*$T_c$ | <br><u>Test 1 (10MHz Ch BW):</u><br>Uplink timing: ±13.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±8.75*64*$T_c$<br><br>Max step size $T_q$: 6.0*64*$T_c$<br>Min adjust rate: 1.9*64*$T_c$<br>Max adjust rate: 6.6*64*$T_c$<br>$Ês_1$ / $N_{oc}$: +3.30dB<br>$N_{oc}$ = -98 dBm/15 kHz (Config 1,2,3) +1.5 dB<br><br><u>Test 2 (with DRX):</u><br><br>Uplink timing: ±13.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±11.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±9.75*64*$T_c$<br>Uplink timing: ±8.75*64*$T_c$ |

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| | ±12*64 $T_c$ for 15 KHz SSB SCS,15 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,30 kHz UL SCS<br>±10*64 $T_c$ for 15 KHz SSB SCS,60 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,15 kHz UL SCS<br>±8*64 $T_c$ for 30 KHz SSB SCS,30 kHz UL SCS<br>±7*64 $T_c$ for 30 KHz SSB SCS,60 kHz UL SCS<br><br>$\hat{E}s_1$ / $N_{oc}$: +3.00dB | +0.3dB | <br>$\hat{E}s_1$ / $N_{oc}$: +3.30dB |
| 6.4.3.1 NR SA FR1 timing advance adjustment accuracy | $N_{oc}$ = -98 dBm/15 kHz (Config 1, 2, 4, 5)<br><br>$N_{oc}$ = -95 dBm/15 kHz (Config 3, 6)<br><br>$\hat{E}s_x$ / $N_{oc}$ = 3 dB<br><br>UE Timing Advance Adjustment Accuracy for 15kHz SCS = ±256 $T_c$+ TT<br><br>UE Timing Advance Adjustment Accuracy for 30kHz SCS = ±256 $T_c$+ TT | 0<br><br>0<br><br>0<br><br>+/- 88 Tc<br><br>+/- 88 Tc | $N_{oc}$ = -98 dBm/15 kHz (Config 1, 2)<br>$N_{oc}$ = -95 dBm/15 kHz (Config 3)<br>$\hat{E}s_x$ / $N_{oc}$ = 3 dB<br><br>UE TAAA for 15kHz SCS = ±344 $T_c$<br><br>UE TAAA for 30kHz SCS = ±344 $T_c$ |
| 6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB |
| 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB<br>T4: -4.5dB<br>T5: 1dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: +0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB<br>T4: -5.3dB<br>T5: 1.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4.1.1 |
| 6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in DRX mode | Same as 6.5.1.2 | Same as 6.5.1.2 | Same as 6.5.1.2 |
| 6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode | Same as 6.5.1.2 | Same as 6.5.1.2 | Same as 6.5.1.2 |
| 6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 6.5.1.1 | Same as 6.5.1.1 | Same as 6.5.1.1 |
| 6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM-RS in DRX mode | Same as 6.5.1.2 | Same as 6.5.1.2 | Same as 6.5.1.2 |
| 6.5.1.9 SA FR1 radio link monitoring out-of-sync Test for | SNR during<br>T1: 1dB | Offset during<br>T1: +0.8dB | SNR during<br>T1: 1.8dB |

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| PSCell configured with CSI-RS-based RLM for UE fulfilling relaxed measurement criterion | T2: 1dB<br>T3: -15dB | T2: +0.8dB<br>T3: -0.8dB | T2: 1.8dB<br>T3: -15.8dB |
| 6.5.1.13 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in DRX mode for UE operating on a cell with less than 5MHz BW | SNR during<br>T1: 4dB<br>T2: -4dB<br>T3: -12dB | Offset during<br><br>T1: +0.8dB<br><br>T2: +0.8dB<br><br>T3: -0.8dB | SNR during<br><br>T1: 4.8dB<br><br>T2: -3.2dB<br><br>T3: -12.8dB |
| 6.5.1.14 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode for UE operating on a cell with less than 5MHz BW | SNR during<br>T1: 2dB<br>T2: -6dB<br>T3: -14dB | Offset during<br><br>T1: +0.8dB<br><br>T2: +0.8dB<br><br>T3: -0.8dB | SNR during<br><br>T1: 2.8dB<br><br>T2: -5.2dB<br><br>T3: -14.8dB |
| 6.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for PCell with 3MHz Channel Bandwidth configured with SSB-based RLM-RS in DRX mode | SNR during<br>T1: 4dB<br>T2: -4dB<br>T3: -12dB<br>T4: 0dB<br>T5: 5.5dB | Offset during<br><br>T1: +0.8dB<br><br>T2: +0.8dB<br><br>T3: -0.8dB<br><br>T4: -0.8dB<br><br>T5: +0.8dB | SNR during<br>T1: 4.8dB<br>T2: -3.2dB<br>T3: -12.8dB<br>T4: -0.8dB<br>T5: 6.3dB |
| 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB |
| 6.5.2.2 | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB |
| 6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle | Same as 6.5.3.1 | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX | Same as 6.5.3.1 | Same as 6.5.3.1 | Same as 6.5.3.1 |
| 6.5.3.4 NR SA FR1 direct SCell activation at SCell addition of known SCell | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB |

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| 6.5.3.5 NR SA FR1 direct SCell activation at handover with known SCell | During T1:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br><br>During T2:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br><br>During T3:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br>In signalling:<br>A3-offset = -15dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0dB | During T1:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br><br>During T2:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br><br>During T3:<br>Noc1: -98 dBm/15 kHz<br>Noc2: -98 dBm/15 kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +8dB<br>Ês3 / Noc1: +8dB<br>In signalling:<br>A3-offset = -15dB |
| 6.5.3.10 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 160ms SCell measurement cycle | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Ês_1$ / $Noc_1$: +17dB<br>$Ês_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Ês_1$ / $Noc_1$: +17dB<br>$Ês_2$ / $Noc_2$: +17dB<br>In signalling:<br>A3-offset = -15dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0 dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Ês_1$ / $Noc_1$: +17dB<br>$Ês_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$Ês_1$ / $Noc_1$: +17dB<br>$Ês_2$ / $Noc_2$: +17dB<br>In signalling:<br>A3-offset = -15dB |
| 6.5.3.11 NR SA FR1 fast SCell Activation of known SCell in non-DRX for 640 ms SCell measurement cycle | Same as 6.5.3.10 | Same as 6.5.3.10 | Same as 6.5.3.10 |
| 6.5.3.16 NR SA FR1 Inter-band SSB-less SCell Activation based on A-TRS in non-DRX | Test Config 1, 2:<br>During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB | Test Config 1, 2:<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Test Config 3:<br>During T1:<br>0dB<br>0dB<br>0dB<br>-4dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-4dB | Test Config 1,2:<br>During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +22dB<br><br>Test Config 3:<br>During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +18dB<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +10dB<br>Ês2 / Noc2: +18dB |
| 6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB |

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| | T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10.2dB |
| 6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX | Same as 6.5.5.1 | Same as 6.5.5.1 | Same as 6.5.5.1 |
| 6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX | q0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 CSI-RS during T1:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T2:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 CSI-RS during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10.2dB |
| 6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX | Same as 6.5.5.3 | Same as 6.5.5.3 | Same as 6.5.5.3 |
| 6.5.5.5 NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | On the SCell:<br>q0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB | On the SCell:<br>Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB | On the SCell:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB |

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| | q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10.2dB |
| 6.5.5.6 NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | Same as 6.5.5.5 | Same as 6.5.5.5 | Same as 6.5.5.5 |
| 6.5.5.7 NR SA FR1 PCell TRP Specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | q0,0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q0,1 CSI-RS SNR during:<br>T1-T5: 5dB<br><br>q1,0 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1,0 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1,0 CSI-RS during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | q0,0 Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q0,1 Offset during:<br>T1-T5: +0.8dB<br><br>q1,0 CSI-RS during T1:<br>0dB<br>-0.2dB<br><br>q1,0 CSI-RS during T2:<br>0dB<br>-0.2dB<br><br>q1,0 CSI-RS during T3, T4 and T5:<br>0dB<br>+0.2dB | q0,0 SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1<br><br>q0,1 SNR during:<br>T1-T5: +5.8dB<br><br>q1,0 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1,0 CSI-RS during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1,0 CSI-RS during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10.2dB |
| 6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br>$\hat{E}s_2$ / $Noc_2$: +17dB |
| 6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB<br><br>During T2:<br>$Noc_1$: -104dBm/15kHz |

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| | $\hat{E}s_1$ / $Noc_1$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB | 0dB<br><br>During T3:<br>0dB<br>0dB | $\hat{E}s_1$ / $Noc_1$: +17dB<br><br>During T3:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB |
| 6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB |
| 6.5.6.3.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 6.5.6.5.1 NR FR1- NR FR1 DL active BWP switch on multiple CCs with non-DRX in SA | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +14dB<br><br>Reported CSI-RSRP values ± 10dB | 0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +14dB<br><br>CSI-RS#0: RSRP_65 to RSRP_86 |
| 6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +14dB<br>Ês2 / Noc: +14dB<br><br>Reported CSI-RSRP values ± 10dB | 0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +14dB<br>Ês2 / Noc: +14dB<br><br>CSI-RS#0: RSRP_65 to RSRP_86 |
| 6.5.7A.1 NR SA FR1 DL interruptions at switching between two uplink carriers in FDD-TDD CA | Same as 6.5.7.1 | Same as 6.5.7.1 | Same as 6.5.7.1 |
| 6.5.7A.2 NR SA FR1 DL interruptions at switching between two uplink carriers in TDD-TDD CA | Same as 6.5.7.2 | Same as 6.5.7.2 | Same as 6.5.7.2 |
| 6.5.7B.1 NR SA FR1 DL interruptions at switching between two uplink bands in FDD-TDD CA | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>Reported CSI-RSRP values ± 10dB | 0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>CSI-RS#0: RSRP 65 to RSRP_86 |
| 6.5.7B.2 NR SA FR1 DL interruptions at switching between two uplink bands in TDD-TDD CA | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc: +14dB<br>Ês2 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>Reported CSI-RSRP values ± 10dB | 0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Ês1 / Noc: +14dB<br>Ês2 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>CSI-RS#0: RSRP_65 to RSRP_86 |
| 6.5.7C.1 NR SA FR1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in FDD-TDD CA | Same as 6.5.7B.1 | Same as 6.5.7B.1 | Same as 6.5.7B.1 |
| 6.5.7C.2 NR SA FR1 DL interruptions at switching between two uplink bands with two transmit antenna connectors in TDD-TDD CA | Same as 6.5.7B.2 | Same as 6.5.7B.2 | Same as 6.5.7B.2 |
| 6.5.7D.1 NR SA FR1 DL interruptions at switching across | Same as 6.5.7B.1 | Same as 6.5.7B.1 | Same as 6.5.7B.1 |

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| three uplink bands in TDD-TDD CA for single TAG | | | |
| 6.5.7D.2 NR SA FR1 DL interruptions at switching across four uplink bands in FDD-TDD CA for single TAG | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Noc4: -104dBm/15kHz<br><br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +17dB<br>Ês3 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>Reported CSI-RSRP values ± 10dB | 0dB<br>0dB<br>0dB<br>0dB<br><br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Noc1: -104dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Noc3: -104dBm/15kHz<br>Noc4: -104dBm/15kHz<br><br>Ês1 / Noc: +17dB<br>Ês2 / Noc: +17dB<br>Ês3 / Noc: +14dB<br>Ês3 / Noc: +14dB<br><br>CSI-RS#0: RSRP_65 to RSRP_86 |
| 6.5.7D.3 NR SA FR1 DL interruptions at switching across three uplink bands in FDD-TDD CA for two TAGs | Same as 6.5.7B.1 | Same as 6.5.7B.1 | Same as 6.5.7B.1 |
| 6.5.7D.4 NR SA FR1 DL interruptions at switching across four uplink bands in TDD-TDD CA for two TAGs | Same as 6.5.7D.2 | Same as 6.5.7D.2 | Same as 6.5.7D.2 |
| 6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX | During T1:<br>Noc1: -104dBm/15kHz<br>Ês1 / Noc1: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>Noc1: -104dBm/15kHz<br>Ês1 / Noc1: +17dB |
| 6.6.1.1 SA event triggered reporting tests without gap under non-DRX | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB |
| 6.6.1.2 SA event triggered reporting tests without gap under DRX | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.8 NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-SCell-r17 | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB<br>$Ês_3$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB<br>$Ês_3$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB |

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| 6.6.1.9 NR SA FR1 event triggered reporting with MUSIM gap configured | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.12 NR SA FR1 event triggered reporting with SSB index detection without measurement gap in non-DRX mode for UE operating with 12 PRB SSB bandwidth | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.1.13 NR SA FR1 event triggered reporting tests without gap in DRX under Cell DTX | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB |
| 6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.9 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.10 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.11 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.12 NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.13 NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +7.00dB<br><br>During T3:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T4:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T4:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +7.00dB<br><br>During T3:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T4:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB |
| 6.6.2.14 NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.15 NR SA FR1 event triggered reporting without SSB index detection in DRX mode for | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |

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| UE operating on a cell with less than 5MHz BW | | | |
| 6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +16.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: 0dB<br>Ês2 / Noc: +17.00dB | During T1:<br>0dB<br>0dB<br>+1.55dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1.55dB<br>+1.55dB | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +17.55dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104+TTdBm/15kHz<br>Freq 2 Noc: -104+TTdBm/15kHz<br>Ês1 / Noc: -1.55dB<br>Ês2 / Noc: +18.55dB |
| 6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16 | During T1:<br>Freq 1 Noc: -106dBm/15kHz<br>Freq 2 Noc: -106dBm/15kHz<br>Ês1 / Noc: +18.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -106dBm/15kHz<br>Freq 2 Noc: -106dBm/15kHz<br>Ês1 / Noc: -2dB<br>Ês2 / Noc: +19.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -106dBm/15kHz<br>Freq 2 Noc: -106dBm/15kHz<br>Ês1 / Noc: +18.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -106dBm/15kHz<br>Freq 2 Noc: -106dBm/15kHz<br>Ês1 / Noc: -2dB<br>Ês2 / Noc: +19.00dB |
| 6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_0$ / Noc: +0.00dB<br>$Ês_1$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +3.00dB<br><br>Reported SSB#0 SS-RSRP values ± 10dB<br>Reported SSB#1 SS-RSRP values ± 10dB<br>Reported Differential SS-RSRP values ± 3dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.5dB<br><br>Via mapping | During T1:<br>Noc: -94.65dBm/15kHz<br>$Ês_0$ / Noc: +0.00dB<br>$Ês_1$ / Noc: -infinity<br><br>During T2:<br>Noc: -94.65dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +3.50dB<br><br>**For configuration 1,2,4,5**<br>SSB#1: RSRP_55 to RSRP_75<br>SSB#0: DIFFRSRP_0 to DIFFRSRP_3<br><br>**For configuration 3,6**<br>SSB#1: RSRP_58 to RSRP_78<br>SSB#0: DIFFRSRP_0 to DIFFRSRP_3 |
| 6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX | Same as 6.6.4.1 | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX | Noc: -98dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +3.00dB<br><br>Reported CSI-RSRP values ± 10dB<br>Reported Differential CSI-RSRP values ± 3dB | 0dB<br>0dB<br>0.5dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +3.50dB<br><br>**For configuration 1,2,4,5**<br>CSI-RS#1: RSRP_55 to RSRP_75<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3<br><br>**For configuration 3,6**<br>CSI-RS#1: RSRP_58 to RSRP_78<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3 |
| 6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX | Same as 6.6.4.3 | Same as 6.6.4.3 | Same as 6.6.4.3 |
| 6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX | Same as 6.6.4.1 | Same as 6.6.4.1 | Same as 6.6.4.1 |

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| for UE configured with highSpeedMeasFlag-r16 | | | |
| 6.6.4.6 NR SA FR1 Inter-cell SSB based L1-RSRP measurements on PCell in DRX | Same as 6.6.4.1 | Same as 6.6.4.1 | Same as 6.6.4.1 |
| 6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX | During T1:<br>Noc: -106dBm/15kHz<br>Ês / Noc: 18dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T2:<br>Noc: -106dBm/15kHz<br>Ês / Noc: -2dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -1.8dB<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -106dBm/15kHz<br>Ês / Noc: 18dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -infinity<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB<br><br>During T2:<br>Noc: -106dBm/15kHz<br>Ês / Noc: -2dB<br>Ioc: -70dBm/3.84MHz<br>Îor / Ioc: -1.8dB<br>CPICH Ec / Ior: -10dB<br>SCH Ec / Ior: -12dB |
| 6.6.6.1 NR SA FR1 SRS-RSRP measurement with non-DRX | Test Configuration 1:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +4dB<br><br>Test Configuration 2:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +4dB | Test Config 1:<br>T1:<br>0dB<br>0dB<br><br>T2:<br>0dB<br>+5.25dB<br><br>Test Config 2:<br>T1:<br>0dB<br>0dB<br><br>T2:<br>0dB<br>+4.75dB | Test Configuration 1:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +9.25dB<br><br>Test Configuration 2:<br>T1:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = -infinity dB<br><br>T2:<br>$N_{oc}$ = -98dBm/15kHz<br>$\hat{E}_s / N_{oc}$ = +8.75dB |
| 6.6.7.1 SA intra-frequency CGI identification of NR neighbor cell in FR1 | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4dB |
| 6.6.7.2 Identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA | During T1<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB<br><br>During T3<br>Noc1: -106dBm/15kHz | During T1<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3<br>0dB | During T1<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB<br><br>During T3<br>Noc1: -106dBm/15kHz |

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| | Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB | 0dB<br>0dB<br>0dB | Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB |
| 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported CSI-SINR values ±5.5dB<br>Reported Differential CSI-SINR values ±4.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>CSI-RS#1: SINR_41 to SINR_64<br>CSI-RS#0: DIFFSINR_0 to DIFFSINR_7 |
| 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported SS-SINR values ±4dB<br>Reported Differential SS-SINR values ±3dB | 0dB<br>0.5dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.50dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>SSB#1: SINR_44 to SINR_61<br>SSB#0: DIFFSINR_0 to DIFFSINR_5 |
| 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported CSI-SINR values ±4.5dB<br>Reported Differential CSI-SINR values ±3.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>**For configuration 1,2,3,4,5,6**<br>CSI-RS#1: SINR_43 to SINR_62<br>CSI-RS#0: DIFFSINR_0 to DIFFSINR_6 |
| 6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1 | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>Reported SS-RSRP and SS-RSRQ | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>**Configuration 1 and 2:**<br>Cell 1:<br>RSRP_54 to RSRP_77<br>RSRQ_55 to RSRQ_72<br><br>Cell 2:<br>RSRP_47 to RSRP_70<br>RSRQ_51 to RSRQ_67<br><br>**Configuration 3:**<br>Cell 1:<br>RSRP_57 to RSRP_80<br>RSRQ_55 to RSRQ_72<br><br>Cell 2:<br>RSRP_50 to RSRP_73<br>RSRQ_51 to RSRQ_67 |

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| 6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: -3dB<br><br>During T4:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +8dB<br><br>During T5:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>Thresh_X_HighP 48dB<br><br>Reported SS-RSRP and SS-RSRQ | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T4:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T5:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>+4dB<br><br>Via Mapping | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: -3dB<br><br>During T4:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +8dB<br><br>During T5:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +5dB<br>$\hat{E}s_2$ / $Noc_2$: +5dB<br><br>52dB<br><br>**Configuration 1 and 2:**<br>Cell 1:<br>RSRP_52 to RSRP_75<br>RSRQ_54 to RSRQ_71<br><br>Cell 2:<br>RSRP_39 to RSRP_62<br>RSRQ_6 to RSRQ_27<br><br>**Configuration 3:**<br>Cell 1:<br>RSRP_55 to RSRP_78<br>RSRQ_54 to RSRQ_71<br><br>Cell 2:<br>RSRP_39 to RSRP_62<br>RSRQ_6 to RSRQ_27 |
| 6.6.17.1 NR SA FR1 event triggered reporting tests with autonomous activation/deactivation Pre-MG | During T1, T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1, T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB |
| 6.6.17.2 NR SA FR1 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | Same as 6.6.17.1 | Same as 6.6.17.1 | Same as 6.6.17.1 |

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| 6.6.18.1 NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>Freq 3 $Noc_3$: -98dBm/15kHz<br>Freq 1 $\hat{E}s_1$ / $Noc_1$: +4.00dB<br>Freq 2 $\hat{E}s_2$ / $Noc_2$: -infinity<br>Freq 3 $\hat{E}s_3$ / $Noc_3$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>Freq 3 $Noc_3$: -98dBm/15kHz<br>Freq 1 $\hat{E}s_1$ / $Noc_1$: +4.00dB<br>Freq 2 $\hat{E}s_2$ / $Noc_2$: +7.00dB<br>Freq 3 $\hat{E}s_3$ / $Noc_3$: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>Freq 3 $Noc_3$: -98dBm/15kHz<br>Freq 1 $\hat{E}s_1$ / $Noc_1$: +4.00dB<br>Freq 2 $\hat{E}s_2$ / $Noc_2$: -infinity<br>Freq 3 $\hat{E}s_3$ / $Noc_3$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>Freq 3 $Noc_3$: -98dBm/15kHz<br>Freq 1 $\hat{E}s_1$ / $Noc_1$: +4.00dB<br>Freq 2 $\hat{E}s_2$ / $Noc_2$: +7.00dB<br>Freq 3 $\hat{E}s_3$ / $Noc_3$: +7.00dB |
| 6.6.18.2 NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers | Same as 6.6.18.1 | Same as 6.6.18.1 | Same as 6.6.18.1 |
| 6.6.18.3 NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1 | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -104dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -104dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +17.00dB<br><br>In signalling:<br>b2-Threshold2EUTRA: -95dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>-6dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -104dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -104dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +17.00dB<br><br>In signalling:<br>b2-Threshold2EUTRA: -101dB |
| 6.6.18.4 NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>PRS Ês1 / Noc: -infinity<br>PRS Ês2 / Noc: N/A<br>PRS Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>PRS Ês1 / Noc: -3.00dB<br>PRS Ês2 / Noc: N/A<br>PRS Ês3 / Noc: -10.00dB<br><br>In signalling:<br>A3-Offset: -6dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>-9dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>PRS Ês1 / Noc: -infinity<br>PRS Ês2 / Noc: N/A<br>PRS Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>PRS Ês1 / Noc: -3.00dB<br>PRS Ês2 / Noc: NA<br>PRS Ês3 / Noc: -10.00dB<br><br>In signalling:<br>A3-Offset: -15dB |
| 6.6.19.1 NR SA FR1 event-triggered reporting tests with NCSG under non-DRX in FR1 | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.19.2 NR SA FR1 event-triggered reporting tests for FR1 with NCSG for inter-frequency measurement | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.19.3 NR SA FR1 NR - E-UTRAN event-triggered reporting in non-DRX in FR1 with NCSG | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.19.4 NR SA FR1 Event triggered reporting on SCC with | Same as 6.6.1.8 | Same as 6.6.1.8 | Same as 6.6.1.8 |

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| deactivated SCell test with per-UE NCSG under non-DRX | | | |
| 6.6.20.1 UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR1 SA | TEST CONFIGURATION 1, 2 | | |
| | During T1:<br>Noc : -98dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês / Noc: -2dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB | During T1:<br>Noc : -98dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês / Noc: -2dB |
| | TEST CONFIGURATION 3 | | |
| | During T1:<br>Noc: -95dBm/30kHz<br>Ês / Noc: infinity<br><br>During T2:<br>$Noc_1$: -95dBm/30kHz<br>$Ês_1$ / $Noc_1$: -2dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB | During T1:<br>Noc: -95dBm/30kHz<br>Ês / Noc: infinity<br><br>During T2:<br>$Noc_1$: -95dBm/30kHz<br>$Ês_1$ / $Noc_1$: -2dB |
| 6.6.21.1 UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA | TEST CONFIGURATION 1, 2 | | |
| | During T1:<br>Noc : -98 dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98 dBm/15kHz<br>Ês / Noc: -3 dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB | During T1:<br>Noc : -98 dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98 dBm/15kHz<br>Ês / Noc: -3 dB |
| | TEST CONFIGURATION 3 | | |
| | During T1:<br>Noc: -95 dBm/30kHz<br>Ês / Noc: infinity<br><br>During T2:<br>$Noc_1$: -95 dBm/30kHz<br>$Ês_1$ / $Noc_1$: -3 dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB | During T1:<br>Noc: -95 dBm/30kHz<br>Ês / Noc: infinity<br><br>During T2:<br>$Noc_1$: -95 dBm/30kHz<br>$Ês_1$ / $Noc_1$: -3 dB |
| 6.6.24.1 NR SA FR1 event-triggered reporting without gap with interruptions | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.24.2 NR SA FR1-FR1 event-triggered reporting without gap with interruption with SSB index | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.24.3 NR SA FR1-FR1 event-triggered reporting without gap with interruption | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.24.4 NR SA FR1-FR1 event-triggered reporting without gap without interruption | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.24.5 NR SA FR1 event-triggered reporting without gap without interruption | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 6.6.26.1 Intra-frequency SSB based L1-RSRP measurement | **Test configuration 1, 2**<br>During T1:<br>Noc: -101dBm/15kHz<br>$Ês_1$ / Noc: +3dB<br>$Ês_2$ / Noc: +3dB<br><br>During T2:<br>Noc: -101dBm/15kHz<br>$Ês_1$ / Noc: +13.5dB<br>$Ês_2$ / Noc: +13.5dB | **Test configuration 1,2**<br>During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | **Test configuration 1,2**<br>During T1:<br>Noc: -101dBm/15kHz<br>$Ês_1$ / Noc: +3dB<br>$Ês_2$ / Noc: +3dB<br><br>During T2:<br>Noc: -101dBm/15kHz<br>$Ês_1$ / Noc: +13.5dB<br>$Ês_2$ / Noc: +13.5dB |

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| | Reported Cell 2 SS-RSRP values ± 10dB<br><br>**Test configuration 3**<br>During T1:<br>Noc: -101dBm/15kHz<br>$\hat{E}s_1$ / Noc: +3dB<br>$\hat{E}s_2$ / Noc: +3dB<br><br>During T2:<br>Noc: -101dBm/15kHz<br>$\hat{E}s_1$ / Noc: +13.5dB<br>$\hat{E}s_2$ / Noc: +13.5dB<br><br>Reported Cell 2 SS-RSRP values ± 10dB | Via mapping<br><br>**Test configuration 3**<br>During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>-1.2dB<br>0dB<br>0dB<br><br>Via mapping | Cell 2: RSRP_59 to RSRP_79<br><br>**Test configuration 3**<br>During T1:<br>Noc: -101dBm/15kHz<br>$\hat{E}s_1$ / Noc: +3dB<br>$\hat{E}s_2$ / Noc: +3dB<br><br>During T2:<br>Noc: -102.2dBm/15kHz<br>$\hat{E}s_1$ / Noc: +13.5dB<br>$\hat{E}s_2$ / Noc: +13.5dB<br><br>Cell 2: RSRP_61 to RSRP_81 |
| 6.6.27.1 Inter-frequency SSB based L1-RSRP measurement with measurement gap | In signalling:<br>A3-Offset: -6dB<br><br>During T1:<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>During T2:<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0dB<br>$\hat{E}s_2$ / $Noc_2$: +8dB<br><br>Reported Cell 2 SS-RSRP values ± 10dB | In signalling:<br>-1dB<br><br>During T1 :<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2 :<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | In signalling:<br>A3-Offset: -7dB<br><br>During T1:<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0dB<br>$\hat{E}s_2$ / $Noc_2$: 0dB<br><br>During T2:<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0dB<br>$\hat{E}s_2$ / $Noc_2$: +8dB<br><br>**Test configuration 1,2**<br>Cell 2: RSRP_60 to RSRP_80<br><br>**Test configuration 3**<br>Cell 2: RSRP_63 to RSRP_83 |
| 6.6.28.1 Inter-frequency SSB based L1-RSRP measurement without measurement gap | In signalling:<br>A3-Offset: -6dB<br><br>**Test configuration 1,2**<br><br>During T1:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 3dB<br>$\hat{E}s_2$ / $Noc_2$: 3dB<br><br>During T2:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +13.5dB<br>$\hat{E}s_2$ / $Noc_2$: +13.5dB<br><br>Reported Cell 2 SS-RSRP values ± 10dB<br><br>**Test configuration 3**<br><br>During T1:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 3dB<br>$\hat{E}s_2$ / $Noc_2$: 3dB | In signalling:<br>-1dB<br><br>**Test configuration 1,2**<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>**Test configuration 3**<br>During T1:<br>0dB<br>0dB<br>0dB<br>0dB | In signalling:<br>A3-Offset: -7dB<br><br>**Test configuration 1,2**<br><br>During T1:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 3dB<br>$\hat{E}s_2$ / $Noc_2$: 3dB<br><br>During T2:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +13.5dB<br>$\hat{E}s_2$ / $Noc_2$: +13.5dB<br><br>Cell 2: RSRP_59 to RSRP_79<br><br>**Test configuration 3**<br><br>During T1:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 3dB<br>$\hat{E}s_2$ / $Noc_2$: 3dB |

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| | During T2:<br>$Noc_1$: -101dBm/15kHz<br>$Noc_2$: -101dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +13.5dB<br>$\hat{E}s_2$ / $Noc_2$: +13.5dB<br><br>Reported Cell 2 SS-RSRP values ± 10dB | During T2:<br>-1.2dB<br>-1.2dB<br>0dB<br>0dB<br><br>Via mapping | During T2:<br>$Noc_1$: -102.2dBm/15kHz<br>$Noc_2$: -102.2dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +13.5dB<br>$\hat{E}s_2$ / $Noc_2$: +13.5dB<br><br>Cell 2: RSRP_61 to RSRP_81 |
| 6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy | TEST CONFIGURATION 1, 2, | | |
| | Test 1:<br>Noc: -106dBm/15kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.0dB<br>Reported RSRP values: ±4.5dB<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>$\hat{E}s1$ / Noc: +3.0dB<br>$\hat{E}s2$ / Noc: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 1:<br>-1.5dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>Noc: -107.5dBm/15kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.4dB<br>RSRP_44 to RSRP_56<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.4dB<br>RSRP_60 to RSRP_79<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>$\hat{E}s1$ / Noc: +3.0dB<br>$\hat{E}s2$ / Noc: -0.8dB<br><br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_49<br>RSRP_38 to RSRP_50<br>RSRP_39 to RSRP_51<br>RSRP_39 to RSRP_51<br>depending on operating band |
| | TEST CONFIGURATION 3 | | |
| | Test 1:<br>Noc: -110dBm/30kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.0dB<br>Reported RSRP values: ±4.5dB<br>N/A<br><br>Test 2:<br>Noc: -91dBm/30kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>Noc: -113dBm111dBm/30kHz + ΔBG_offset<br>$\hat{E}s1$ / Noc: +3.0dB<br>$\hat{E}s2$ / Noc: -1.0dB<br><br>Reported RSRP values: ±6dB | Test 1:<br>-0.8dB<br>0dB<br>+0.4dB<br>Via mapping<br>N/A<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB-1dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>Noc: -110.8dBm/30kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.4dB<br>RSRP_41 to RSRP_53<br>N/A<br><br>Test 2:<br>Noc: -91dBm/30kHz<br>$\hat{E}s1$ / Noc: +6.0dB<br>$\hat{E}s2$ / Noc: +1.4dB<br>RSRP_57 to RSRP_76<br><br>Test 3:<br>Noc: -113dBm112dBm/30kHz + ΔBG_offset<br>$\hat{E}s1$ / Noc: +3.0dB<br>$\hat{E}s2$ / Noc: -0.8dB<br><br>RSRP_37 38 to RSRP_4950<br>RSRP_37 38 to RSRP_4950<br>RSRP_38 39 to RSRP_5051<br>RSRP_38 39 to RSRP_5051<br>RSRP_39 40 to RSRP_5152<br>RSRP_40 41 to RSRP_5253<br>RSRP_40 41 to RSRP_5253<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from $N_{oc}$ and $\hat{E}s_2$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. | | | |

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| The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions. | | | |
| 6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy | Test 1:<br>Noc:<br>Test configuration 1, 2:-106dBm/15kHz<br>Test configuration 3:<br><br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported rel. SS-RSRP values: ±3dB<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported rel. SS-RSRP values: ±3dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br><br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: -1.0dB<br>Reported re. SS-RSRP values: ±3dB | Test 1:<br><br>0 dB<br><br>0 dB<br>+1.0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>+1.0dB<br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br>+1.0dB<br>Via mapping | Test 1:<br><br>Noc: -106 dBm/15kHz<br><br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: 0dB<br>RSRP_x-7 to RSRP_x+1 |
| The derivation of the SS-RSRP values takes into account the uncertainty in Cell 1 and Cell 2 RSRP from $N_{oc}$, $\hat{E}s_1 / N_{oc}$ and $\hat{E}s_2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The RSRP values given above are for both normal and extreme conditions. | | | |
| 6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_62 to RSRP_81<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_32 to RSRP_45<br>RSRP_33 to RSRP_45<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>depending on operating band |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>-1.35dB<br>-1.35dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$N_{oc2}$: -96dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_64 to RSRP_83<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_49 |

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| | | | RSRP_37 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_38 to RSRP_51<br>RSRP_39 to RSRP_51<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from $N_{oc2}$ and $\hat{E}s2 / N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0 dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2. | | | |
| 6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported relative RSRP values: ±4.5dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported relative RSRP values: ±4.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_x-7 to RSRP_x+7<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -118dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_x-31 to RSRP_x-18 |
| The derivation of the SS-RSRP values takes into account the uncertainty in Cell 1 and Cell 2 RSRP from $N_{oc}$, $\hat{E}s1 / N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 1.5dB wider at each end. | | | |
| 6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc}$: -85dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc}$: -101dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: -2.9dB<br>$\hat{E}s2 / N_{oc}$: -2.9dB<br>Reported RSRQ values: ±3.5dB<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc}$: -4.0dB<br>$\hat{E}s2 / N_{oc}$: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -86.5dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>$N_{oc}$: -101dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: -2.9dB<br>$\hat{E}s2 / N_{oc}$: -2.9dB<br>RSRQ_46 to RSRQ_60<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc}$: -3.5dB<br>$\hat{E}s2 / N_{oc}$: -3.5dB<br><br>RSRQ_44 to RSRQ_59 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc}$: -91dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc}$: -4.0dB<br>$\hat{E}s2 / N_{oc}$: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.6dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>N/A<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -92.6dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -114dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc}$: -3.5dB<br>$\hat{E}s2 / N_{oc}$: -3.5dB<br><br>RSRQ_44 to RSRQ_59 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. | | | |

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| The SS-RSRQ values given above are for normal conditions. For extreme conditions, the SS-RSRQ values are 1.5dB wider at each end for Test 1, and 0.5 dB wider at each for Tests 2 and 3. | | | |
| 6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -80.18 dBm/15kHz<br>$N_{oc2}$: -80.18 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB | Test 1:<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -81.68dBm/15kHz<br>$N_{oc2}$: -81.68dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>RSRQ_52 to RSRQ_62 |
| | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| | Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: 3dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | Test 3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: 3dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1:<br>$N_{oc1}$: -86.27 dBm/15kHz<br>$N_{oc2}$: -86.27 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB | Test 1:<br>-1.53dB<br>-1.53dB<br>0dB<br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -87.8dBm/15kHz<br>$N_{oc2}$: -87.8dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>RSRQ_52 to RSRQ_62 |
| | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| | Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: 3dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | Test 3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: 3dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from $N_{oc2}$ and $\hat{E}s2 / N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1.5dB wider at each end. | | | |
| 6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1:<br>$N_{oc1}$: -80.18 dBm/15kHz<br>$N_{oc2}$: -80.18 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±3dB | Test 1:<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -81.68dBm/15kHz<br>$N_{oc2}$: -81.68dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>RSRQ_x-7 to RSRQ_x+7 |
| | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB | Test 2:<br>0dB<br>0dB<br>0dB | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>$N_{oc2}$: -106dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB |

| | | | |
|---|---|---|---|
| | $\hat{E}s2 / N_{oc2}$: -1.75dB | 0dB | $\hat{E}s2 / N_{oc2}$: -1.75dB |
| | Reported RSRQ values: ±3dB | Via mapping | RSRQ_x-7 to RSRQ_x+7 |
| | Test 3: | Test 3: | Test 3: |
| | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$ | 0dB | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$ |
| | $N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$ | 0dB | $N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$ |
| | $\hat{E}s1 / N_{oc1}$: 3dB | 0dB | $\hat{E}s1 / N_{oc1}$: 3dB |
| | $\hat{E}s2 / N_{oc2}$: -1.75dB | 0dB | $\hat{E}s2 / N_{oc2}$: -1.75dB |
| | Reported RSRQ values: ±3dB | Via mapping | RSRQ_x-11 to RSRQ_x+2 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1: | Test 1: | Test 1: |
| | $N_{oc1}$: -86.27 dBm/15kHz | -1.53dB | $N_{oc1}$: -87.8dBm/15kHz |
| | $N_{oc2}$: -86.27 dBm/15kHz | -1.53dB | $N_{oc2}$: -87.8dBm/15kHz |
| | $\hat{E}s1 / N_{oc1}$: -1.75dB | 0dB | $\hat{E}s1 / N_{oc1}$: -1.75dB |
| | $\hat{E}s2 / N_{oc2}$: -1.75dB | 0dB | $\hat{E}s2 / N_{oc2}$: -1.75dB |
| | Reported RSRQ values: ±2.5dB | Via mapping | RSRQ_x-7 to RSRQ_x+7 |
| | Test 2: | Test 2: | Test 2: |
| | $N_{oc1}$: -106dBm/15kHz | 0dB | $N_{oc1}$: -106dBm/15kHz |
| | $N_{oc2}$: -106dBm/15kHz | 0dB | $N_{oc2}$: -106dBm/15kHz |
| | $\hat{E}s1 / N_{oc1}$: -1.75dB | 0dB | $\hat{E}s1 / N_{oc1}$: -1.75dB |
| | $\hat{E}s2 / N_{oc2}$: -1.75dB | 0dB | $\hat{E}s2 / N_{oc2}$: -1.75dB |
| | Reported RSRQ values: ±3dB | Via mapping | RSRQ_x-7 to RSRQ_x+7 |
| | Test 3: | Test 3: | Test 3: |
| | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$ | 0dB | $N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$ |
| | $N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$ | 0dB | $N_{oc2}$: -116dBm/15kHz + $\Delta_{BG_offset}$ |
| | $\hat{E}s1 / N_{oc1}$: 3dB | 0dB | $\hat{E}s1 / N_{oc1}$: 3dB |
| | $\hat{E}s2 / N_{oc2}$: -1.75dB | 0dB | $\hat{E}s2 / N_{oc2}$: -1.75dB |
| | Reported RSRQ values: ±3dB | Via mapping | RSRQ_x-11 to RSRQ_x+2 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 1 and Cell 2 SS-RSRQ from $N_{oc2}$ and $\hat{E}s2 / N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1dB wider at each end. | | | |
| 6.7.3.1 NR SA FR1 SS-SINR measurement accuracy | **TEST CONFIGURATION 1, 2, 4, 5** | | |
| | Test 1: | Test 1: | Test 1: |
| | $N_{oc}$: -93dBm/15kHz | 0dB | $N_{oc}$: -93dBm/15kHz |
| | $\hat{E}s1 / N_{oc}$: +4.54dB | 0dB | $\hat{E}s1 / N_{oc}$: +4.54dB |
| | $\hat{E}s2 / N_{oc}$: +4.54dB | 0dB | $\hat{E}s2 / N_{oc}$: +4.54dB |
| | Reported SINR values: ±3.5dB | Via mapping | SINR_31 to SINR_49 |
| | Test 2: | Test 2: | Test 2: |
| | $N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$ | 0dB | $N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$ |
| | $\hat{E}s1 / N_{oc}$: -4dB | 0.5dB | $\hat{E}s1 / N_{oc}$: -3.5dB |
| | $\hat{E}s2 / N_{oc}$: -4dB | 0.5dB | $\hat{E}s2 / N_{oc}$: -3.5dB |
| | Reported SINR values: ±3.5dB | Via mapping | SINR_28 to SINR_45 |
| | **TEST CONFIGURATION 3, 6** | | |
| | Test 1: | Test 1: | Test 1: |
| | $N_{oc}$: -93dBm/15kHz | -0.2dB | $N_{oc}$: -93.2dBm/15kHz |
| | $\hat{E}s1 / N_{oc}$: +4.54dB | 0dB | $\hat{E}s1 / N_{oc}$: +4.54dB |
| | $\hat{E}s2 / N_{oc}$: +4.54dB | 0dB | $\hat{E}s2 / N_{oc}$: +4.54dB |
| | Reported SINR values: ±3.5dB | Via mapping | SINR_31 to SINR_49 |
| | Test 2: | Test 2: | Test 2: |
| | $N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$ | 0dB | $N_{oc}$: -116dBm/15kHz+ $\Delta_{BG_offset}$ |
| | $\hat{E}s1 / N_{oc}$: -4dB | 0.5dB | $\hat{E}s1 / N_{oc}$: -3.5dB |
| | $\hat{E}s2 / N_{oc}$: -4dB | 0.5dB | $\hat{E}s2 / N_{oc}$: -3.5dB |
| | Reported SINR values: ±3.5dB | Via mapping | SINR_28 to SINR_45 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end. | | | |

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| 6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy | **TEST CONFIGURATION 1, 2, 3, 4, 5, 6** | | |
| | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>Reported SINR values: ±3dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 20dB<br>$\hat{E}s2 / N_{oc2}$: 20dB<br><br>Reported SINR values: ±3dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s1 / N_{oc1}$: -4dB<br>$\hat{E}s2 / N_{oc2}$: -4dB<br><br>Reported SINR values: ±3.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br><br>0.8dB<br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>SINR_35 to SINR_51<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 20dB<br>$\hat{E}s2 / N_{oc2}$: 20dB<br><br>SINR_79 to SINR_94<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s1 / N_{oc1}$: -3.2dB<br>$\hat{E}s2 / N_{oc2}$: -3.2dB<br><br>SINR_32 to SINR_49 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3. | | | |
| 6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy | **TEST CONFIGURATION 1, 2, 3, 4, 5, 6** | | |
| | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 20dB<br>$\hat{E}s2 / N_{oc2}$: 20dB<br><br>Reported SINR values: ±3.5dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s1 / N_{oc1}$: -4dB<br>$\hat{E}s2 / N_{oc2}$: -4dB<br><br>Reported SINR values: ±4dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br><br>0.8dB<br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB<br>$\hat{E}s2 / N_{oc2}$: -1.75dB<br>SINR_x-10 to SINR_x+10<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 20dB<br>$\hat{E}s2 / N_{oc2}$: 20dB<br><br>SINR_x-10 to SINR_x+10<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$N_{oc2}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s1 / N_{oc1}$: -3.2dB<br>$\hat{E}s2 / N_{oc2}$: -3.2dB<br><br>SINR_x-11 to SINR_x+11 |
| The derivation of the SINR values takes into account the uncertainty in Cell 1 and Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each for Tests 1 and 2 and 0dB wider at each end for Test 3. | | | |
| 6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>RSRP_62 to RSRP_82 |

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| | Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions) | Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_1$ / $N_{oc1}$: -2.2dB<br><br>RSRP_31 to RSRP_44<br>RSRP_31 to RSRP_45<br>RSRP_32 to RSRP_45<br>RSRP_32 to RSRP_46<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_48<br>depending on operating band |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>RSRP_63 to RSRP_84<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_1$ / $N_{oc1}$: -2.2dB<br><br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_48<br>RSRP_35 to RSRP_48<br>RSRP_35 to RSRP_49<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_37 to RSRP_51<br>depending on operating band |
| 6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB<br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $N_{oc1}$: -3dB<br><br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br><br><br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>DIFFRSRP_0 to DIFFRSRP_2<br>DIFFRSRP_0 to DIFFRSRP_2<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_1$ / $N_{oc1}$: -2.2dB<br><br>DIFFRSRP_0 to DIFFRSRP_2<br>DIFFRSRP_0 to DIFFRSRP_2 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB<br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $N_{oc1}$: -3dB<br><br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br><br><br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc1}$: 10dB<br>DIFFRSRP_0 to DIFFRSRP_2<br>DIFFRSRP_0 to DIFFRSRP_2<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_1$ / $N_{oc1}$: -2.2dB<br><br>DIFFRSRP_0 to DIFFRSRP_2<br>DIFFRSRP_0 to DIFFRSRP_2 |
| 6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |

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| 6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 |
| 6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy | Test 1:<br>$N_{oc}$: -91.65dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: +10.0dB<br>Reported RSRP values: ±8dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc}$: -117dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}_s$ / $N_{oc}$: -4.0dB<br>Reported RSRP values: ±4.5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.8dB<br>Via mapping | Test 1:<br>$N_{oc}$: -91.65dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 10dB<br>RSRP_49 to RSRP_69<br><br>Test 2:<br>$N_{oc}$: -117dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s$ / $N_{oc}$: -3.2dB<br>RSRP_14 to RSRP_27<br>RSRP_15 to RSRP_27<br>RSRP_15 to RSRP_28<br>RSRP_16 to RSRP_28<br>RSRP_16 to RSRP_29<br>RSRP_17 to RSRP_30<br>RSRP_18 to RSRP_30<br>Depending on operating band |
| 6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy | Test 1:<br>$N_{oc}$: -83dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc}$: -104.7dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: -4.0dB<br>Reported RSRQ values: ±3.5dB<br>(±0.5dB additionally for extreme conditions)<br><br>Test 3:<br>$N_{oc}$: -119.5dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}_s$ / $N_{oc}$: -4.0dB<br>Reported RSRQ values: ±3.5dB<br>(±0.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.8dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0.8dB<br>Via mapping | Test 1:<br>$N_{oc}$: -83dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: -1.75dB<br>RSRQ_4 to RSRQ_16<br><br>Test 2:<br>$N_{oc}$: -104.7dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: -3.2dB<br>RSRQ_0 to RSRQ_16<br><br>Test 3:<br>$N_{oc}$: -119.5dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s$ / $N_{oc}$: -3.2dB<br>RSRQ_0 to RSRQ_16 |
| 6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy | Test 1:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: -1.75dB<br>Reported RS-SINR values: ±3.0dB<br>(±1.0dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc}$: -108.5dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$: 20.0dB<br>Reported RS-SINR values: ±3.0dB<br>(±1.0dB additionally for extreme conditions)<br><br>Test 3:<br>$N_{oc}$: -119.5dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}_s$ / $N_{oc}$: -4.0dB<br>Reported RS-SINR values: ±3.5dB<br>(±0.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0.8dB<br>Via mapping | Test 1:<br>$N_{oc}$: -88dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: -1.75dB<br>SINR_35 to SINR_51<br><br>Test 2:<br>$N_{oc}$: -108.5dBm/15kHz<br>$\hat{E}s$ / $N_{oc}$: 20.0dB<br>SINR_79 to SINR_94<br><br>Test 3:<br>$N_{oc}$: -119.5dBm/15kHz+ $\Delta_{BG_offset}$<br>$\hat{E}s$ / $N_{oc}$: -3.2dB<br>SINR_32 to SINR_49 |
| 6.7.8.1 NR SA FR1 SRS-RSRP measurement accuracy | Test Configuration 1:<br>Test 1:<br>$N_{oc}$ = -106dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±3dB<br><br>Test 2:<br>$N_{oc}$ = -88dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±6.5dB<br><br>Test 3: | Test Config 1:<br>Test 1:<br>0dB<br>+0.5dB<br>Via mapping<br><br>Test 2:<br>0dB<br>+0.5dB<br>Via mapping<br><br>Test 3: | Test Config 1:<br>Test 1:<br>$N_{oc}$ = -106dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 30 to 41<br><br>Test 2:<br>$N_{oc}$ = -88dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 45 to 62<br><br>Test 3: |

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| | $N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br><br>Reported SRS-RSRP values: ±3dB<br><br><br><br><br><br><br>Test Configuration 2:<br>Test 1:<br>Test 1 is not used when configuring SCS 30kHz<br><br>Test 2:<br>$N_{oc}$ = -91dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br>Reported SRS-RSRP values: ±7dB<br><br>Test 3:<br>$N_{oc}$ = -114+ $\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1dB<br><br>Reported SRS-RSRP values: ±3.5dB | 0dB<br>+0.75dB for BG_A<br>+0.5dB otherwise<br>Via mapping<br><br><br><br><br><br><br>Test Config 2:<br>Test 1:<br>N/A<br><br>Test 2:<br>0dB<br>+0.5dB<br>Via mapping<br><br>Test 3:<br>0dB<br>+1.25dB for BG_A<br>+0.5dB otherwise<br>Via mapping | $N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.75dB for BG_A<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB otherwise<br>Reported SRS-RSRP:<br>BG_A: 23 to 33<br>BG_C: 23 to 34<br>BG_D: 24 to 34<br>BG_E: 24 to 35<br><br>Test Config 2:<br>Test 1:<br>N/A<br><br>Test 2:<br>$N_{oc}$ = -91dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB<br>Reported SRS-RSRP: 44 to 63<br><br>Test 3:<br>$N_{oc}$ = -114+$\Delta_{BG_offset}$ dBm/15kHz<br>$\hat{E}_s$ / $N_{oc}$ = +2.25dB for BG_A<br>$\hat{E}_s$ / $N_{oc}$ = +1.5dB otherwise<br>Reported SRS-RSRP:<br>BG_A: 26 to 37<br>BG_C: 26 to 37<br>BG_D: 26 to 38<br>BG_E: 27 to 38 |
| 6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Same as 4.7.7.1 | Same as 4.7.7.1 | Same as 4.7.7.1 |
| Test Configuration 3,6 | Same as 4.7.7.1 | Same as 4.7.7.1 | Same as 4.7.7.1 |
| 6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Same as 4.7.7.2 | Same as 4.7.7.2 | Same as 4.7.7.2 |
| Test Configuration 3,6 | Same as 4.7.7.2 | Same as 4.7.7.2 | Same as 4.7.7.2 |
| 6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | | | |
| Test Configuration 1,2,4,5 | Same as 4.7.7.3 | Same as 4.7.7.3 | Same as 4.7.7.3 |
| Test Configuration 3,6 | Same as 4.7.7.3 | Same as 4.7.7.3 | Same as 4.7.7.3 |
| 6.7.17.1.1 Inter-frequency L1-RSRP absolute accuracy requirements for neighbour cell in FR1 | **Test configuration 1, 2**<br><br>Test 1 :<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br><br>$\hat{E}s_1$ / $Noc_1$: +10dB<br>$\hat{E}s_2$ / $Noc_2$: +10dB<br><br>Normal condition :<br>Reported Cell 2 SS-RSRP values ± 10dB<br>Extreme condition :<br>Reported Cell 2 SS-RSRP values ± 13dB<br><br><br>Test 2 :<br>$Noc_1$: -109dBm/15kHz + $\Delta_{BG_offset}$<br>$Noc_2$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br><br>$\hat{E}s_1$ / $Noc_1$: +13dB<br>$\hat{E}s_2$ / $Noc_2$: -3dB<br><br>Normal condition :<br>Reported Cell 2 SS-RSRP values ± 6.5dB<br>Extreme condition : | **Test configuration 1, 2**<br>Test 1 :<br>0dB<br>0dB<br><br>0dB<br>0dB<br><br>Via mapping<br><br><br><br><br><br><br>Test 2 :<br>0dB<br>0dB<br><br><br><br><br>0dB<br>0.3dB<br><br>Via mapping | **Test configuration 1, 2**<br>Test 1 :<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br><br>$\hat{E}s_1$ / $Noc_1$: +10dB<br>$\hat{E}s_2$ / $Noc_2$: +10dB<br><br>Normal condition: RSRP_62 to RSRP_82<br>Extreme condition: RSRP_59 to RSRP_85<br><br><br><br><br>Test 2:<br>$Noc_1$: -109dBm/15kHz + $\Delta_{BG_offset}$<br>$Noc_2$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br><br>$\hat{E}s_1$ / $Noc_1$: +13dB<br>$\hat{E}s_2$ / $Noc_2$: -2.7dB<br><br>Normal condition:<br>RSRP_30 to RSRP_43<br>RSRP_31 to RSRP_44<br>RSRP_31 to RSRP_44<br>RSRP_32 to RSRP_45 |

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| | Reported Cell 2 SS-RSRP values ± 11dB | | RSRP_32 to RSRP_45<br>RSRP_33 to RSRP_46<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_37 to RSRP_50<br>Depending on band groups<br><br>Extreme condition:<br>RSRP_26 to RSRP_48<br>RSRP_26 to RSRP_48<br>RSRP_27 to RSRP_49<br>RSRP_27 to RSRP_49<br>RSRP_28 to RSRP_50<br>RSRP_28 to RSRP_50<br>RSRP_29 to RSRP_51<br>RSRP_29 to RSRP_51<br>RSRP_32 to RSRP_54<br>Depending on band groups |
| | **Test configuration 3**<br><br>Test 1 :<br>$Noc_1$: -94.65dBm/15kHz<br>$Noc_2$: -94.65dBm/15kHz<br><br>$\hat{E}s_1$ / $Noc_1$: +10dB<br>$\hat{E}s_2$ / $Noc_2$: +10dB<br><br>Normal condition :<br>Reported Cell 2 SS-RSRP values ± 10dB<br>Extreme condition :<br>Reported Cell 2 SS-RSRP values ± 13dB<br><br>Test 2 :<br>$Noc_1$: -109dBm/15kHz + $\Delta_{BG_offset}$<br>$Noc_2$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $Noc_1$: +13dB<br>$\hat{E}s_2$ / $Noc_2$: -3dB<br><br>Normal condition :<br>Reported Cell 2 SS-RSRP values ± 6.5dB<br>Extreme condition :<br>Reported Cell 2 SS-RSRP values ± 11dB | **Test configuration 3**<br>Test 1 :<br>-1.35dB<br>-1.35dB<br><br>0dB<br>0dB<br><br>Via mapping<br><br>Test 2 :<br>0dB<br>0dB<br><br>0dB<br>0.3dB<br><br>Via mapping | **Test configuration 3**<br><br>Test 1 :<br>$Noc_1$: -96dBm/15kHz<br>$Noc_2$: -96dBm/15kHz<br><br>$\hat{E}s_1$ / $Noc_1$: +10dB<br>$\hat{E}s_2$ / $Noc_2$: +10dB<br><br>Normal condition: RSRP_63 to RSRP_84<br>Extreme condition: RSRP_60 to RSRP_87<br><br>Test 2:<br>$Noc_1$: -109dBm/15kHz + $\Delta_{BG_offset}$<br>$Noc_2$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1$ / $Noc_1$: +13dB<br>$\hat{E}s_2$ / $Noc_2$: -2.7dB<br><br>Normal condition:<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_47<br>RSRP_35 to RSRP_48<br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_49<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_40 to RSRP_53<br>Depending on band groups<br><br>Extreme condition:<br>RSRP_29 to RSRP_51<br>RSRP_29 to RSRP_51<br>RSRP_30 to RSRP_52<br>RSRP_30 to RSRP_52<br>RSRP_31 to RSRP_53<br>RSRP_31 to RSRP_53<br>RSRP_32 to RSRP_54<br>RSRP_32 to RSRP_54<br>RSRP_35 to RSRP_57<br>Depending on band groups |

**Table F.1.3.2-3: Derivation of test requirements for EN-DC FR2 RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 5.3.2.2.1 EN-DC FR2 contention based random access | Absolute uplink power:<br>$P_{int} \geq P \geq P_{min}$ ±14.0dB<br>$P_{UMAX} \geq P > P_{int}$ ±12.0dB<br><br>Relative uplink power step:<br>$P_{int} \geq P \geq P_{min}$ ±6.0dB<br><br>$P_{UMAX} \geq P > P_{int}$ ±4.0dB<br><br>Uplink timing:<br>120kHz SCS $T_e$ ±3.5*64*$T_c$ | <br>Not applicable due to UL calibration<br><br><br>FFS dB<br><br>FFS dB<br><br><br>[48]$T_c$ | Absolute uplink power:<br>±FFSdB<br><br><br>Relative uplink power step:<br>±(6+FFS)dB, either PRACH being compared ≤ ($P_{max}$ – 6dB)<br>±(4+FFS)dB, both PRACHs being compared > ($P_{max}$ – 6dB)<br><br>Uplink timing:<br>120kHz SCS $T_e$ ±224±[48]*$T_c$ |
| 5.3.2.2.2 EN-DC FR2 non-contention based random access | Same as 5.3.2.2.1 | Same as 5.3.2.2.1 | Same as 5.3.2.2.1 |
| 5.4.1.1 EN-DC FR2 UE transmit timing accuracy | Test 1 (no DRX):<br>Uplink timing: ±3*64*$T_c$ for 240 kHz SSB SCS<br>Max step size $T_q$: 2.5*64*$T_c$<br>Min adjust rate $T_p$: 2.5*64*$T_c$<br>Max adjust rate: 2.5*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.0dB<br><br>Test 2 (with DRX):<br>Uplink timing: ±3*64*$T_c$ for 240 kHz SSB SCS<br>$N_{oc}$ = -112 dBm/15 kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.0dB | <br>±0.75*64*$T_c$<br>+0.625*64$T_c$<br>-3.725*64*$T_c$<br>+1.225*64*$T_c$<br>0dB<br>0dB<br><br><br>±0.75*64*$T_c$<br>0dB<br>0dB | Test 1 (no DRX):<br>Uplink timing: ±3.75*64*$T_c$<br>Max step size $T_q$: 3.125*64*$T_c$<br>Min adjust rate: -1.225*64*$T_c$<br>Max adjust rate: 3.725*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.0dB<br><br>Test 2 (with DRX):<br>Uplink timing: ±3.75*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$\hat{E}s_2$ / $N_{oc}$: +4.0dB |
| 5.4.1.2 NR UE Transmit Timing Test with 2-TA for FR2 UE supporting multiDCI-IntraCellMultiTRP-TwoTA-r18 | Same as 5.4.1.1 | Same as 5.4.1.1 | Same as 5.4.1.1 |
| 5.4.3.1 EN-DC FR2 UE timing advance adjustment accuracy | Noc = -112 dBm/15 kHz<br><br>$\hat{E}s1$ / Noc = 4 dB<br><br>UE Timing Advance Adjustment Accuracy for 120kHz SCS = ±32 Tc | 0dB<br><br>0dB<br><br>+/- 40 Tc | Noc = -112 dBm/15 kHz<br><br>$\hat{E}s1$ / Noc = 4 dB<br><br>UE TAAA for 120kHz SCS = ±72 Tc |
| 5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | During T1:<br>Noc: -92.1 dBm/15kHz<br>$\hat{E}s1$ / Noc: +2 dB<br>$\hat{E}s2$ / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>$\hat{E}s1$ / Noc: -6 dB<br>$\hat{E}s2$ / Noc: -15 dB<br><br>During T3:<br>Noc: -92.1dBm/15kHz<br>$\hat{E}s1$ / Noc: -15 dB<br>$\hat{E}s2$ / Noc: -15 dB | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3:<br>-2.7 dB<br>0 dB<br>0 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.1 dB<br>$\hat{E}s2$ / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>$\hat{E}s1$ / Noc: -3.9 dB<br>$\hat{E}s2$ / Noc: -15 dB<br><br>During T3:<br>Noc: -94.8 dBm/15kHz<br>$\hat{E}s1$ / Noc: -15 dB<br>$\hat{E}s2$ / Noc: -15 dB |
| 5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | During T1:<br>Noc: -92.1 dBm/15kHz<br>$\hat{E}s1$ / Noc: +2 dB<br>$\hat{E}s2$ / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>$\hat{E}s1$ / Noc: -6 dB<br>$\hat{E}s2$ / Noc: -15 dB<br><br>During T3: | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3: | During T1:<br>Noc: -94.8 dBm/15kHz<br>$\hat{E}s1$ / Noc: +4.1 dB<br>$\hat{E}s2$ / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>$\hat{E}s1$ / Noc: -3.9 dB<br>$\hat{E}s2$ / Noc: -15 dB<br><br>During T3: |

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| | Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +2 dB | -2.7 dB<br>0 dB<br>0 dB<br><br>During T4:<br>-2.7 dB<br>0 dB<br>0 dB<br><br>During T5:<br>-2.7 dB<br>0 dB<br>2.1 dB | Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +4.1 dB |
| 5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB<br><br>During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB |
| 5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.5 dB<br>Ês2 / Noc: -15 dB<br><br>During T5:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: -14 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB<br><br>During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T4:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T5:<br>0 dB<br>1.3 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T4:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.9 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T5:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: 3.3 dB<br>Ês2 / Noc: -15.4 dB |
| 5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode | During T1:<br>Noc: -92.1 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3:<br>-2.7 dB<br>0 dB<br>0 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: +4.1 dB<br>Ês2 / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -3.9 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB |
| 5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured | During T1:<br>Noc: -92.1 dBm/15kHz<br>Ês1 / Noc: +2 dB | During T1:<br>-2.7 dB<br>2.1 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: +4.1 dB |

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| with CSI-RS-based RLM-RS in non-DRX mode | Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +2 dB | 2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3:<br>-2.7 dB<br>0 dB<br>0 dB<br><br>During T4:<br>-2.7 dB<br>0 dB<br>0 dB<br><br>During T5:<br>-2.7 dB<br>0 dB<br>2.1 dB | Ês2 / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -3.9 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +4.1 dB |
| 5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB<br><br>During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB |
| 5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -4.5 dB<br>Ês2 / Noc: -15 dB<br><br>During T5:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: -15 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB<br><br>During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T4:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T5:<br>0 dB<br>1.3 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T4:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.9 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T5:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: 3.3 dB<br>Ês2 / Noc: -15.4 dB |
| 5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions | During T1:<br>Noc: -92.1 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: +4.1 dB<br>Ês2 / Noc: +4.1 dB |
| 5.5.1.10 EN-DC FR2 Radio Link Monitoring Out-of-sync Test for PSCell configured with | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB | During T1:<br>0 dB<br>1.25 dB<br>1.25 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.25 dB<br>Ês2 / Noc: +3.25 dB |

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| SSB-based RLM-RS for UE fulfilling relaxed measurement criterion | During T2:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T3:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T2:<br>0 dB<br>1.25 dB<br>1.25 dB<br><br>During T3:<br>0 dB<br>-0.5 dB<br>-0.5 dB | During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.25 dB<br>Ês2 / Noc: +3.25 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.5 dB<br>Ês2 / Noc: -15.5 dB |
| 5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | During T1:<br>Noc1: -111.7 dBm/15kHz<br>Noc2: -104.7 dBm/15kHz<br>Ês1 / Noc: +12 dB<br>Ês2 / Noc: +5 dB | During T1:<br>0 dB<br>0 dB<br>0 dB<br>0 dB | During T1:<br>Noc1: -111.7 dBm/15kHz<br>Noc2: -104.7 dBm/15kHz<br>Ês1 / Noc: +12 dB<br>Ês2 / Noc: +5 dB |
| 5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | During T1:<br>Noc1: -111.7 dBm/15kHz<br>Noc2: -104.7 dBm/15kHz<br>Ês1 / Noc: +12 dB<br>Ês2 / Noc: +5 dB | During T1:<br>0 dB<br>0 dB<br>0 dB<br>0 dB | During T1:<br>Noc1: -111.7 dBm/15kHz<br>Noc2: -104.7 dBm/15kHz<br>Ês1 / Noc: +12 dB<br>Ês2 / Noc: +5 dB |
| 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX | During T1:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB<br><br>During T2:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB<br><br>During T3:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB<br><br>During T2:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB<br><br>During T3:<br>$Noc_2$: -104.7dBm/15kHz<br>$Noc_3$: -104.7dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7dB<br>$Ês_3$ / $Noc_3$: +7dB |
| 5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 | During T1:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: N/A<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: NA<br><br>During T2:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: -112dBm/15kHz<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: +14dB<br><br>During T3:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: -112dBm/15kHz<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: +14dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: N/A<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: NA<br><br>During T2:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: -112dBm/15kHz<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: +14dB<br><br>During T3:<br>$Noc_3$: -112dBm/15kHz<br>$Noc_4$: -112dBm/15kHz<br>$Ês_3$ / $Noc_3$: +14dB<br>$Ês_4$ / $Noc_4$: +14dB |
| 5.5.3.7 EN-DC FR2 direct SCell activation at SCell addition of known SCell | Same as 5.5.3.1 | Same as 5.5.3.1 | Same as 5.5.3.1 |
| 5.5.3.8 EN-DC FR2 fast SCell Activation for SCell in FR2 intra-band | During T1:<br>$Noc_2$: -104.7 dBm/15kHz<br>$Noc_3$: -104.7 dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7 dB<br>$Ês_3$ / $Noc_3$: +7 dB<br><br>During T2:<br>$Noc_2$: -104.7 dBm/15kHz<br>$Noc_3$: -104.7 dBm/15kHz<br>$Ês_2$/ $Noc_2$: +7 dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104.7 dBm/15kHz<br>$Noc_3$: -104.7 dBm/15kHz<br>$Ês_2$ / $Noc_2$: +7 dB<br>$Ês_3$ / $Noc_3$: +7 dB<br><br>During T2:<br>$Noc_2$: -104.7 dBm/15kHz<br>$Noc_3$: -104.7 dBm/15kHz<br>$Ês_2$/ $Noc_2$: +7 dB |

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| | $\hat{E}s_3$/ $Noc_3$: +7 dB<br>In signalling:<br>A3-offset = -15dB | 0dB<br>In signalling:<br>0dB | $\hat{E}s_3$/ $Noc_3$: +7 dB<br>In signalling:<br>A3-offset = -15dB |
| 5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX | During T1:<br>SNR_SSB $q_0$: 5 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: -3 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20.2 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1,2<br>rsrp-ThresholdSSB: -92 dBm/240kHz for Config 3,4 | <br>+8.70 dB<br>0 dB<br><br><br>+8.70 dB<br>0 dB<br><br><br>0 dB<br>-0.2 dB<br><br><br>-14 dB<br><br>-14 dB | During T1:<br>SNR_SSB $q_0$: 13.7 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: 5.7 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1,2<br>srp-ThresholdSSB: -106 dBm/240kHz for Config 3,4 |
| 5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX | Same as 5.5.5.1 | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB<br><br>rsrp-ThresholdSSB: -95 dBm/SCS kHz | 0 dB<br><br><br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br><br>-14 dB | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB<br><br>rsrp-ThresholdSSB: -109.0 dBm/SCS kHz |
| 5.5.5.4 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX | Same as 5.5.5.3 | Same as 5.5.5.3 | Same as 5.5.5.3 |
| 5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX | Same as 5.5.5.1 | Same as 5.5.5.1 | Same as 5.5.5.1 |
| 5.5.5.6 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_3$ / $N_{oc}$ for CSI-RS set q0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_3$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB | 0 dB<br><br><br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_3$ / $N_{oc}$ for CSI-RS set q0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_3$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB |

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| | rsrp-ThresholdBFR: -95 dBm/SCS kHz | -14 dB | rsrp-ThresholdBFR: -109.0 dBm/SCS kHz |
| 5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | Same as 5.5.5.6 | Same as 5.5.5.6 | Same as 5.5.5.6 |
| 5.5.5.8 EN-DC FR2 PSCell CSI-RS-based TRP specific Beam Failure Detection and Link Recovery in DRX mode | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q0,0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q0,1:<br>T1-T5: 5 dB<br><br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q1,0 and q1,1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB<br><br>rsrp-ThresholdBFR: -95 dBm/SCS kHz | 0 dB<br><br>q0,0:<br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br>q0,1:<br>8.7 dB<br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br><br>-14 dB | Noc = -104.7 dBm/120 kHz<br><br>q0,0:<br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q0,0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q0,1<br>T1-T5: 13.7 dB<br><br>$\hat{E}s_3 / N_{oc}$ for CSI-RS set q1,0 and q1,1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB<br><br>rsrp-ThresholdBFR: -109.0 dBm/SCS kHz |
| 5.5.5.9 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX mode for UE fulfilling relaxed measurement criterion | During T1:<br>SNR_SSB $q_0$: 6 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: 6 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20.2 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1,2<br>rsrp-ThresholdSSB: -92 dBm/240kHz for Config 3,4 | +8.70 dB<br>0 dB<br><br>+8.70 dB<br>0 dB<br><br>0 dB<br>-0.2 dB<br><br>-14 dB<br><br>-14 dB | During T1:<br>SNR_SSB $q_0$: 14.70 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: 14.70 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1,2<br>srp-ThresholdSSB: -106 dBm/240kHz for Config 3,4 |
| 5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC | During T1:<br>Noc2: -112dBm/15kHz<br>$\hat{E}s2$ / Iot2: +18dB | During T1:<br>0dB<br>0dB | During T1:<br>Noc2: -112dBm/15kHz<br>$\hat{E}s2$ / Iot2: +18dB |
| 5.5.6.3.1 E-UTRAN - NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 | Same as 5.5.6.2.1 |
| 5.5.6.5.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC | During T1:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>$\hat{E}s1$ / Iot1: +18dB<br>$\hat{E}s2$ / Iot2: +18dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>$\hat{E}s1$ / Iot1: +18dB<br>$\hat{E}s2$ / Iot2: +18dB |
| 5.5.7.1 Addition and Release Delay of NR PSCell | During T1:<br>$\hat{E}s$: -infinity | During T1:<br>0dB | During T1:<br>$\hat{E}s$: -infinity |

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| | During T2:<br>Ês: -81 dBm/120kHz<br><br>During T3:<br>Ês: -81 dBm/120kHz<br><br>During T4:<br>Ês: -81 dBm/120kHz | During T2:<br>0dB<br><br>During T3:<br>0dB<br><br>During T4:<br>0dB | During T2:<br>Ês: -81 dBm/120kHz<br><br>During T3:<br>Ês: -81 dBm/120kHz<br><br>During T4:<br>Ês: -81 dBm/120kHz |
| 5.5.9.1.1 EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB | During T1:<br>0 dB<br><br>During T2:<br>0 dB<br><br>During T3:<br>0 dB<br><br>During T4:<br>0 dB | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB |
| 5.5.9.2.1 EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB | During T1:<br>0 dB<br><br>During T2:<br>0 dB<br><br>During T3:<br>0 dB<br><br>During T4:<br>0 dB | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB |
| 5.5.12.1 EN-DC FR2 PSCell activation and deactivation delay | During T1:<br>Ês2: - Infinity<br><br>During T2-T4:<br>Ês2: -81 dBm/120kHz | During T1:<br>0dB<br><br>During T2-T4:<br>0dB | During T1:<br>Ês2: - Infinity<br><br>During T2-T4:<br>Ês2: -81 dBm/120kHz |
| 5.5.13.1 EN-DC FR2 Addition and Release Delay of NR PSCell | During T1:<br>Ês: -infinity<br><br>During T2~T4:<br>Ês: -81dBm/SCS | During T1:<br>0dB<br><br>During T2~T4:<br>0dB | During T1:<br>Ês: -infinity<br><br>During T2~T4:<br>Ês: -81dBm/SCS |
| 5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX | During T1:<br>Ês2: -86dBm/120kHz<br>Ês3: -infinity<br><br>During T2:<br>Ês2: -86dBm/120kHz<br>Ês3: -86dBm/120kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Ês2: -86dBm/120kHz<br>Ês3: -infinity<br><br>During T2:<br>Ês2: -86dBm/120kHz<br>Ês3: -86dBm/120kHz |
| 5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX | During T1:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +4.00dB<br><br>Signalled A3-offset:<br>-6.0 | During T1:<br>-3.5dB<br>0dB<br>0dB<br><br>During T2:<br>-3.5dB<br>0dB<br>0dB<br><br>Signalled A3-offset:<br>-1.0 | During T1:<br>Noc: -101.5dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -101.5dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +4.00dB<br><br>Signalled A3-offset:<br>-7.0 |
| 5.6.1.3 EN-DC FR2 event-triggered reporting with gap in non-DRX | Same as 5.6.1.1 | Same as 5.6.1.1 | Same as 5.6.1.1 |
| 5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX | Same as 5.6.1.2 | Same as 5.6.1.2 | Same as 5.6.1.2 |

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| 5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX | During T1:<br>Ês1: -87 dBm/120kHz<br>Ês2: - infinity<br><br>During T2:<br>Ês1: -87 dBm/120kHz<br>Ês2: -87 dBm/120kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Ês1: -87 dBm/120kHz<br>Ês2: -- infinity<br><br>During T2:<br>Ês1: -87 dBm/120kHz<br>Ês2: -87 dBm/120kHz |
| 5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX | During T1:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +9.00dB<br><br>Signalled A3-offset:<br>-6.0 | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>Signalled A3-offset:<br>-6.0 | During T1:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +9.00dB<br><br>Signalled A3-offset:<br>-12.0 |
| 5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 5.6.2.1 | Same as 5.6.2.1 | Same as 5.6.2.1 |
| 5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 5.6.2.2 | Same as 5.6.2.2 | Same as 5.6.2.2 |
| 5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -87 dBm/120kHz | During T1:<br>0dB<br><br>During T2:<br>0dB | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -87 dBm/120kHz |
| 5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = - Infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = 9 dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = - Infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = 9 dB |
| 5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 5.6.2.5 | Same as 5.6.2.5 | Same as 5.6.2.5 |
| 5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 5.6.2.6 | Same as 5.6.2.6 | Same as 5.6.2.6 |
| 5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX | During T1:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +9.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +9.00dB |
| 5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX | Same as 5.6.3.1 | Same as 5.6.3.1 | Same as 5.6.3.1 |
| 5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX | Noc: -105dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +9.00dB<br><br>Reported CSI-RSRP values ± 29dB<br>Reported Differential CSI-RSRP values ± 7dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -105dBm/15kHz<br>$Ês_0$ / Noc: 0.00dB<br>$Ês_1$ / Noc: +9.00dB<br><br>CSI-RS#1: RSRP_40 to RSRP_99 |

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| | | | CSI-RS#0: DIFFRSRP_1 to DIFFRSRP_7 |
| 5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX | Same as 5.6.3.3 | Same as 5.6.3.3 | Same as 5.6.3.3 |
| 5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX | During T1:<br>Noc: -98 dBm/15kHz<br>Neighbour cell UE Es/Noc: -infinity<br><br>During T2:<br>Noc: -98 dBm/15kHz<br>Neighbour cell UE Es/Noc: 4dB<br><br>In signalling:<br>i1-threshold: -103dBm/SCS | During T1:<br>-2.5dB<br>3dB<br><br>During T2:<br>-2.5dB<br>3dB<br><br>-9dB | During T1:<br>Noc: -100.5 dBm/15kHz<br>Neighbour cell UE Es/Noc: -infinity<br><br>During T2:<br>Noc: -100.5 dBm/15kHz<br>Neighbour cell UE Es/Noc: 7dB<br><br>i1-threshold: -112dBm/SCS |
| 5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>Reported CSI-SINR values ± 5.5dB<br>Reported Differential CSI-SINR values ± 4.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>CSI-RS#1: SINR_51 to SINR_74<br>CSI-RS#0: DIFFSINR_4 to DIFFSINR_13 |
| 5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | During T1:<br>Noc: -105dBm/15kHz<br>$\hat{E}s0$ / Noc: 0.00dB<br>$\hat{E}s1$ / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>$\hat{E}s0$ / Noc: 0.00dB<br>$\hat{E}s1$ / Noc: +9.00dB<br><br>Reported SS-SINR values ± 4.0dB<br>Reported Differential SS-SINR values ± 3.0dB | During T1:<br>0dB<br>1.5dB<br>0dB<br><br>During T2:<br>0dB<br>1.5dB<br>0dB<br><br>Via mapping | During T1:<br>Noc: -105dBm/15kHz<br>$\hat{E}s0$ / Noc: +1.50dB<br>$\hat{E}s1$ / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>$\hat{E}s0$ / Noc: +1.50dB<br>$\hat{E}s1$ / Noc: +9.00dB<br><br>SSB#1: SINR_54 to SINR_71<br>SSB#0: DIFFSINR_4 to DIFFSINR_10 |
| 5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>Reported CSI-SINR values ± 4.5dB<br>Reported Differential CSI-SINR values ± 3.5dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>CSI-RS#1: SINR_53 to SINR_72<br>CSI-RS#0: DIFFSINR_5 to DIFFSINR_12 |
| 5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used | During T1:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +6 dB<br>$\hat{E}s_2$ / $Noc_2$: +6 dB<br><br>During T2:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +6 dB<br>$\hat{E}s_2$ / $Noc_2$: +6 dB<br>In signalling:<br>A3-offset = -6dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0dB | During T1:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +6 dB<br>$\hat{E}s_2$ / $Noc_2$: +6 dB<br><br>During T2:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +6 dB<br>$\hat{E}s_2$ / $Noc_2$: +6 dB<br>In signalling:<br>A3-offset = -6dB |
| 5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy | UE PC1 | | |
| | Test 1:<br>Noc: -91.60dBm/15kHz<br>$\hat{E}s2$ / Noc: +6.0dB<br>$\hat{E}s3$ / Noc: +1.0dB<br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB | Test 1:<br>-5.80dB<br>0dB<br>0.4dB<br>Via Mapping | Test 1:<br>Noc: -97.40dBm/15kHz<br>$\hat{E}s2$ / Noc: +6.0dB<br>$\hat{E}s3$ / Noc: +1.4dB<br>Cell 2: RSRP_61 to RSRP_126<br>Cell 3: RSRP_56 to RSRP_126 |

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| | For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês2: -108.2dBm/120kHz<br>n257 Ês3: -108.2dBm/120kHz<br>n260 Ês2: -105.2dBm/120kHz<br>n260 Ês3: -105.2dBm/120kHz<br><br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | <br><br><br>Test 2:<br>6dB<br>6dB<br>6dB<br>6dB<br><br>Via Mapping | Cell 3: RSRP_x-12 to RSRP_X+2<br><br>Test 2:<br>n257 Ês2: -102.2dBm/120kHz<br>n257 Ês3: -102.2dBm/120kHz<br>n260 Ês2: -99.2dBm/120kHz<br>n260 Ês3: -99.2dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.1.1.5 |
| | UE PC3 | | |
| | Test 1:<br>Noc: -91.60dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.0dB<br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês2: -110.0dBm/120kHz<br>n257 Ês3: -110.0dBm/120kHz<br>n260 Ês2: -107.4dBm/120kHz<br>n260 Ês3: -107.4dBm/120kHz<br><br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.80dB<br>0dB<br>0.4dB<br>Via Mapping<br><br><br><br>Test 2:<br>7.70dB<br>7.70dB<br>7.70dB<br>7.70dB<br><br>Via Mapping | Test 1:<br>Noc: -97.40dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.4dB<br>Cell 2: RSRP_50 to RSRP_108<br>Cell 3: RSRP_46 to RSRP_103<br>Cell 3: RSRP_x-12 to RSRP_X+2<br><br>Test 2:<br>n257 Ês2: -102.3dBm/120kHz<br>n257 Ês3: -102.3dBm/120kHz<br>n260 Ês2: -99.7dBm/120kHz<br>n260 Ês3: -99.7dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.1.1.5 |
| 5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy | Test 1 Config 1:<br>Noc1: -90.60dBm/15kHz<br>Noc2: -90.60dBm/15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Test 2 Config 1:<br>n257 Noc1: -108.13dBm/15kHz<br>n257 Noc2: -113.13dBm/15kHz<br>n260 Noc1: -105.53dBm/15kHz<br>n260 Noc2: -110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: -1.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB | Test 1 Config 1:<br>-5.70dB<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br>Via Mapping<br><br><br><br>Test 2 Config 1:<br>-6.60dB<br>0dB<br>-6.60dB<br>0dB<br>0dB<br>2dB<br>Via Mapping<br><br><br><br>Via Mapping | Test 1 Config 1:<br>Noc1: -96.30dBm/15kHz<br>Noc2: -96.30dBm /15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Cell 2<br>n257: RSRP_41 to RSRP_109<br>n260: RSRP_39 to RSRP_109<br>Cell 3:<br>RSRP_52 to RSRP_109<br><br>Cell 3:<br>n257: RSRP_x-23 to RSRP_x+26<br>n260: RSRP_x-23 to RSRP_x+27<br><br>Test 2 Config 1:<br>-114.73dBm/15kHz<br>-113.13dBm/15kHz<br>-112.13dBm/15kHz<br>-110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: 1.0dB<br>Cell 2<br>n257: RSRP_33 to RSRP_101<br>n260: RSRP_34 to RSRP_104<br>Cell 3:<br>n257: RSRP_32 to RSRP_87<br>n260: RSRP_34 to RSRP_90<br><br>Cell 3: |

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| | For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Test 1 Config 2:<br>Noc1: -93.70dBm/15kHz<br>Noc2: -93.70dBm/15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Test 2 Config 2:<br>n257 Noc1: -108.13dBm/15kHz<br>n257 Noc2: -113.13dBm/15kHz<br>n260 Noc1: -105.53dBm/15kHz<br>n260 Noc2: -110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: -1.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1 Config 2:<br>-5.60dB<br>-5.60dB<br>0dB<br>0dB<br>Via Mapping<br><br>Via Mapping<br><br>Test 2 Config 2:<br>-6.60dB<br>0dB<br>-6.60dB<br>0dB<br>0dB<br>2dB<br>Via Mapping<br><br>Via Mapping | n257: RSRP_x-37 to RSRP_x+17<br>n260: RSRP_x-37 to RSRP_x+19<br><br>Test 1 Config 2:<br>Noc1: -99.30dBm/15kHz<br>Noc2: -99.30dBm /15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Cell 12<br>n257: RSRP_41 to RSRP_109<br>n260: RSRP_39 to RSRP_109<br>Cell 3:<br>RSRP_52 to RSRP_109<br><br>Cell 3:<br>n257: RSRP_x-23 to RSRP_x+26<br>n260: RSRP_x-23 to RSRP_x+27<br><br>Test 2 Config 2:<br>-114.73dBm/15kHz<br>-113.13dBm/15kHz<br>-112.13dBm/15kHz<br>-110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: 1.0dB<br>Cell 2<br>n257: RSRP_36 to RSRP_104<br>n260: RSRP_37 to RSRP_107<br>Cell 3:<br>n257: RSRP_35 to RSRP_90<br>n260: RSRP_37 to RSRP_93<br><br>Cell 3:<br>n257: RSRP_x-37 to RSRP_x+17<br>n260: RSRP_x-37 to RSRP_x+19 |
| 5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy | Test 1:<br>Noc: -90dBm/15kHz<br>Ês3 / Noc: +5.0dB<br>Reported absolute RSRP values: ±8dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês3: -98.2dBm/120kHz<br>n260 Ês3: -93.9dBm/120kHz<br><br>Reported absolute RSRP values: ±8dBFor extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.50dB<br>0dB<br>Via Mapping<br><br>Test 2:<br>5.50dB<br>5.50dB<br><br>Via Mapping | Test 1:<br>Noc: -95.50dBm/15kHz<br>Ês3 / Noc: +5dB<br>Band dependent. See test case tables in clause 5.7.1.3.5<br><br>Test 2:<br>n257 Ês3: -92.7dBm/120kHz<br>n260 Ês3: -88.4dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.1.3.5 |
| 5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy | Test 1:<br>Noc: -95.0dBm/15kHz<br>Ês2 / Noc: +3.0dB<br>Ês3 / Noc: +3.0dB<br>Reported absolute RSRQ values: ±2.5dB<br>For extreme conditions allow ±1.5dB+ FFS MU additionally<br><br>Test 2:<br>Noc: -95.0dBm/15kHz<br>Ês2 / Noc: -3.0dB<br>Ês3 / Noc: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB | Test 1:<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping<br><br>Test 2:<br>-1.70dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc: -100.70dBm/15kHz<br>Ês2 / Noc: +3.0dB<br>Ês3 / Noc: +3.0dB<br>Cell 3:<br>All bands: RSRQ_41 to RSRQ_73<br><br>Test 2:<br>Noc: -96.70dBm/15kHz<br>Ês2 / Noc: -3.0dB<br>Ês3 / Noc: -3.0dB |

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| | For extreme conditions allow ±0.5dB+ FFS MU additionally | | Cell 3:<br>n257, n258, n261:<br>RSRQ_35 to RSRQ_71<br>n260: RSRQ_34 to RSRQ_71 |
| 5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy | Test 1:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Reported absolute RSRQ values: ±2.5dB<br>For extreme conditions allow ±1.5dB+ FFS MU additionally<br>Reported relative RSRQ values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally<br><br>Test 2:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br>Reported relative RSRQ values: ±4.0dB<br>For extreme conditions allow ±0.0dB+ FFS MU additionally | Test 1:<br>-1.90dB<br>-1.90dB<br>0dB<br>0dB<br>Via Mapping<br><br><br>Via Mapping<br><br><br><br>Test 2:<br>-1.41dB<br>-1.41dB<br>0dB<br>0dB<br>Via Mapping<br><br><br>Via Mapping | Test 1:<br>Noc1: -95.93dBm/15kHz<br>Noc2: -95.93dBm /15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Cell 2 and Cell 3:<br>RSRQ_41 to RSRQ_73<br><br>Cell 3: RSRQ_x-7 to RSRQ_x+7<br><br>Test 2:<br>Noc1: -95.44dBm/15kHz<br>Noc2: -95.44dBm /15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Cell 2 and Cell 3:<br>RSRQ_37 to RSRQ_74<br><br>Cell 3: RSRQ_x-9 to RSRQ_x+9 |
| 5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês2 / Noc: +4.54dB<br>Ês3 / Noc: +2.66dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br><br><br>Test 2:<br>Noc: -105.0dBm/15kHz<br>Ês2 / Noc: -3.0dB<br>Ês3 / Noc: -3.0dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally | Test 1:<br>0dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Test 2:<br>0dB<br>0.2dB<br>0.2dB<br>Via Mapping | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês2 / Noc: +4.54dB<br>Ês3 / Noc: +2.66dB<br>Cell 3:<br>n257, n258, n261:<br>SINR_22 to RSRQ_58<br>n260: SINR_21 to RSRQ_58<br><br>Test 2:<br>Noc: -105.0dBm/15kHz<br>Ês2 / Noc: -2.8dB<br>Ês3 / Noc: -2.8dB<br>Cell 3:<br>n257, n258, n261:<br>SINR_18 to RSRQ_55<br>n260: SINR_18 to RSRQ_54 |
| 5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement accuracy | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Reported absolute SINR values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally<br><br><br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br><br>Test 2:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: +11.0dB<br>Ês2 / Noc2: +11.0dB<br>Reported absolute SINR values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Via Mapping<br><br><br><br>Test 2:<br>-0.1dB<br>-0.1dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Cell 2 and Cell 3:<br>n257, n258, n261:<br>SINR_27 to SINR_62<br>n260: SINR_27 to SINR_61<br><br>Cell 3: SINR_x-8 to SINR_x+8<br><br><br><br>Test 2:<br>Noc1: -105.1dBm/15kHz<br>Noc2: -105.1dBm/15kHz<br>Ês1 / Noc1: +11.0dB<br>Ês2 / Noc2: +11.0dB<br>Cell 2 and Cell 3:<br>n257, n258, n261:<br>SINR_48 to SINR_87<br>n260: SINR_48 to SINR_86 |

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| | Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br>Test 3:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br>Reported absolute SINR values: ±4.0dB<br>For extreme conditions allow ±0.0dB+ FFS MU additionally | Via Mapping<br><br>Test 3:<br>0dB<br>0dB<br>0.9dB<br>0.9dB<br>Via Mapping<br><br>Via Mapping | Cell 3: SINR_x-17 to SINR_x+17<br><br>Test 3:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -2.1dB<br>Ês2 / Noc2: -2.1dB<br>Cell 2 and Cell 3:<br>n257, n258, n261:<br>SINR_23 to SINR_60<br>n260: SINR_22 to SINR_59<br><br>Cell 3: SINR_x-9 to SINR_x+9 |
| 5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: -2.0dB<br>Reported absolute RSRP values: ±8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 SSB#0 Ês: -108.1dBm/120kHz<br><br>n257 SSB#1 Ês: -105.5dBm/120kHz<br><br>n260 SSB#0 Ês: -108.1dBm/120kHz<br><br>n260 SSB#1 Ês: -105.5dBm/120kHz<br><br>Reported absolute RSRP values: -6.5 +8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.4dB<br><br>Test 2:<br>5.7dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: -1.6dB<br>SSB#0: RSRP_42 to RSRP_101<br>SSB#1: RSRP_31 to RSRP_89<br>SSB#1-SSB#0: -9 to -2<br><br>Test 2:<br>n257 SSB#0 Ês: -102.4dBm/120kHz<br>n257 SSB#1 Ês: -99.8dBm/120kHz<br>n260 SSB#0 Ês: -102.4dBm/120kHz<br>n260 SSB#1 Ês: -99.8dBm/120kHz<br><br>SSB#0 and SSB#1<br>n257: RSRP_27 to RSRP_83<br>n260: RSRP_30 to RSRP_86<br>SSB#1-SSB#0: -4 to +4 |
| 5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -2.0dB<br>Reported absolute RSRP values: ±8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 CSI-RS#0 Ês: -108.1dBm/120kHz<br><br>n257 CSI-RS#1 Ês: -105.5dBm/120kHz<br><br>n260 CSI-RS#0 Ês: -108.1dBm/120kHz<br><br>n260 CSI-RS#1 Ês: -105.5dBm/120kHz<br><br>Reported absolute RSRP values: -6.5 +8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.2dB<br><br>Test 2:<br>5.7dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -1.8dB<br>CSI-RS#0: RSRP_42 to RSRP_101<br>CSI-RS#1: RSRP_30 to RSRP_89<br>CSI-RS#1-CSI-RS#0: -9 to -2<br><br>Test 2:<br>n257 CSI-RS#0 Ês: -102.4dBm/120kHz<br>n257 CSI-RS#1 Ês: -99.8dBm/120kHz<br>n260 CSI-RS#0 Ês: -102.4dBm/120kHz<br>n260 CSI-RS#1 Ês: -99.8dBm/120kHz<br><br>CSI-RS#0 and CSI-RS#1<br>n257: RSRP_27 to RSRP_83<br>n260: RSRP_30 to RSRP_86<br>CSI-RS#1-CSI-RS#0: -4 to +4 |

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| 5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy | During T1:<br>Noc: -100 dBm/15kHz<br>SRS Es/Noc: 2dB<br><br>During T2:<br>Noc: -100 dBm/15kHz<br><br>Reported absolute SRS-RSRP values:<br>-89 ± 11.5dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br><br>Via mapping | During T1:<br>Noc: -100 dBm/15kHz<br>SRS Es/Noc: 2dB<br><br>During T2:<br>Noc: -100 dBm/15kHz<br><br>Reported SRS-RSRP range<br>n257: SRS_RSRP_50 to SRS_RSRP_85<br>n260: SRS_RSRP_50 to SRS_RSRP_85 |
| 5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -2.0dB<br>Reported absolute SINR values: ±5.5dB<br>Reported relative SINR values: ±4.5dB<br>For extreme conditions allow ±1dB + FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.2dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -1.8dB<br>CSI-RS#0: SINR_53 to SINR_76<br>CSI-RS#1-CSI-RS#0: 6 to 15 |
| 5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: 0.0dB<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: 0.0dB<br>Reported absolute SINR values: ±4dB<br>Reported relative SINR values: ±3dB<br>For extreme conditions allow ±1dB + FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.2dB<br>0dB<br>0.2dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: 1.2dB<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: 1.2dB<br>SSB#0: SINR_56 to SINR_73<br>SSB#1-SSB#0: 5 to 12 |
| 5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -2.0dB<br>Reported absolute SINR values: ±4.5dB<br>Reported relative SINR values: ±3.5dB<br>For extreme conditions allow ±1dB + FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.2dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -1.8dB<br>CSI-RS#0: SINR_55 to SINR_74<br>CSI-RS#1-CSI-RS#0: 7 to 15 |
| 5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | Test 1:<br>Noc: -91.60dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.0dB<br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês2: -110.0dBm/120kHz<br>n257 Ês3: -110.0dBm/120kHz<br>n260 Ês2: -107.4dBm/120kHz<br>n260 Ês3: -107.4dBm/120kHz<br><br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.80dB<br>0dB<br>0.4dB<br>Via Mapping<br><br>Test 2:<br>7.70dB<br>7.70dB<br>7.70dB<br>7.70dB<br><br>Via Mapping | Test 1:<br>Noc: -97.40dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.4dB<br>Cell 2: RSRP_50 to RSRP_108<br>Cell 3: RSRP_46 to RSRP_103<br>Cell 3: RSRP_x-12 to RSRP_X+2<br><br>Test 2:<br>n257 Ês2: -102.3dBm/120kHz<br>n257 Ês3: -102.3dBm/120kHz<br>n260 Ês2: -99.7dBm/120kHz<br>n260 Ês3: -99.7dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.7.1.5 |
| 5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | Test 1:<br>Noc1: -90.60dBm/15kHz<br>Noc2: -90.60dBm/15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.70dB<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc1: -96.30dBm/15kHz<br>Noc2: -96.30dBm /15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Cell 2<br>n257: RSRP_41 to RSRP_109<br>n260: RSRP_39 to RSRP_109 |

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| | | | Cell 3:<br>RSRP_52 to RSRP_109 |
| | Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Via Mapping | Cell 3:<br>n257: RSRP_x-23 to RSRP_x+26<br>n260: RSRP_x-23 to RSRP_x+27 |
| | Test 2:<br>n257 Noc1: -108.13dBm/15kHz<br>n257 Noc2: -113.13dBm/15kHz<br>n260 Noc1: -105.53dBm/15kHz<br>n260 Noc2: -110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: -1.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 2:<br>-6.60dB<br>0dB<br>-6.60dB<br>0dB<br>0dB<br>2dB<br>Via Mapping | Test 2:<br>-114.73dBm/15kHz<br>-113.13dBm/15kHz<br>-112.13dBm/15kHz<br>-110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: 1.0dB<br>Cell 2<br>n257: RSRP_33 to RSRP_101<br>n260: RSRP_34 to RSRP_104<br>Cell 3:<br>n257: RSRP_32 to RSRP_87<br>n260: RSRP_34 to RSRP_90 |
| | Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Via Mapping | Cell 3:<br>n257: RSRP_x-37 to RSRP_x+17<br>n260: RSRP_x-37 to RSRP_x+19 |
| 5.7.8.1 EN-DC intra-frequency FR2 CSI-RSRQ measurement accuracy | Test 1:<br>Noc: -95.0dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Reported absolute RSRQ values: ±2.5dB | Test 1:<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc: -100.70dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Cell 3:<br>n257, n258, n261:<br>RSRQ_52 to RSRQ 62<br>n260:<br>RSRQ_51 to RSRQ_62 |
| | Test 2:<br>Noc: -95.0dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB | Test 2:<br>-1.70dB<br>0dB<br>0dB<br>Via Mapping | Test 2:<br>Noc: -96.70dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Cell 3:<br>All bands: RSRQ_46 to RSRQ_60 |
| 5.7.8.2 EN-DC inter-frequency FR2 CSI-RSRQ measurement accuracy | Test 1:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Reported absolute RSRQ values: ±2.5dB | Test 1:<br>-1.90dB<br>-1.90dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc1: -95.93dBm/15kHz<br>Noc2: -95.93dBm/15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Cell 2:<br>All bands:<br>RSRQ_52 to RSRQ_62<br>Cell 3:<br>All bands:<br>RSRQ_52 to RSRQ_62 |
| | Reported relative RSRQ values: ±3dB | Via Mapping | Cell 3:<br>RSRQ_x-7 to RSRQ_x+7 |
| | Test 2:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB | Test 2:<br>-1.41dB<br>-1.41dB<br>0dB<br>0dB<br>Via Mapping | Test 2:<br>Noc1: -95.44dBm/15kHz<br>Noc2: -95.44dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Cell 2:<br>n257, n258, n261:<br>RSRQ_48 to RSRQ_63 |

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| | | | n260:<br>RSRQ_48 to RSRQ_62<br>Cell 3:<br>n257, n258, n261:<br>RSRQ_48 to RSRQ_63<br>n260:<br>RSRQ_48 to RSRQ_62 |
| | Reported relative RSRQ values: ±4dB | Via Mapping | Cell 3:<br>RSRQ_x-9 to RSRQ_x+9 |
| 5.7.9.1 EN-DC intra-frequency FR2 CSI-SINR measurement accuracy | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: +4.54dB<br>Ês2 / Noc: +2.66dB<br>Reported absolute SINR values: ±3dB | Test 1:<br>0dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: +4.54dB<br>Ês2 / Noc: +2.66dB<br>Cell 3:<br>All bands:<br>SINR_32 to SINR_48 |
| | Test 2:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Reported absolute SINR values: ±3.5dB | Test 2:<br>0dB<br>0.2dB<br>0.2dB<br>Via Mapping | Test 2:<br>Noc: -1050dBm/15kHz<br>Ês1 / Noc: -2.8dB<br>Ês2 / Noc: -2.8dB<br>Cell 3:<br>n257, n258, n261:<br>SINR_29 to SINR_45<br>n260:<br>SINR_28 to SINR_45 |
| 5.7.9.2 EN-DC inter-frequency FR2 CSI-SINR measurement accuracy | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Reported absolute SINR values: ±3dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Absolute accuracy:<br>Cell 2:<br>n257, n258, n261:<br>SINR_37 to SINR_52<br>n260:<br>SINR_36 to SINR_52<br>Cell 3:<br>n257, n258, n261:<br>SINR_37 to SINR_52<br>n260:<br>SINR_36 to SINR_52 |
| | Reported relative SINR values: ±3.5dB | Via Mapping | Cell 3:<br>SINR_x-8 to SINR_x+8 |
| | Test 2:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: +11.0dB<br>Ês2 / Noc2: +11.0dB<br>Reported absolute SINR values: ±3dB | Test 2:<br>-0.1dB<br>-0.1dB<br>0dB<br>0dB<br>Via Mapping | Test 2:<br>Noc1: -105.1dBm/15kHz<br>Noc2: -105.1dBm/15kHz<br>Ês1 / Noc1: 11dB<br>Ês2 / Noc2: 11dB<br>Cell 2:<br>n257, n258, n261:<br>SINR_54 to SINR_81<br>n260:<br>SINR_54 to SINR_80<br>Cell 3:<br>n257, n258, n261:<br>SINR_54 to SINR_81<br>n260:<br>SINR_54 to SINR_80 |
| | Reported relative RSRQ values: ±3.5dB | Via Mapping | Cell 3:<br>SINR_x-17 to SINR_x+17 |
| | Test 3:<br>Noc1: -105.0dBm/15kHz | Test 3:<br>0dB | Test 3:<br>Noc1: -105.0dBm/15kHz |

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| | Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Reported absolute SINR values: ±3.5dB<br><br><br><br><br><br><br><br>Reported relative SINR values: ±4dB | 0dB<br>0.9dB<br>0.9dB<br>Via Mapping<br><br><br><br><br><br><br><br>Via Mapping | Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -2.1dB<br>Ês2 / Noc2: -2.1dB<br>Cell 2:<br>n257, n258, n261:<br>SINR_33 to SINR_50<br>n260:<br>SINR_32 to SINR_50<br>Cell 3:<br>n257, n258, n261:<br>SINR_33 to SINR_50<br>n260:<br>SINR_32 to SINR_50<br><br>Cell 3:<br>SINR_x-9 to SINR_x+9 |

**Table F.1.3.2-4: Derivation of test requirements for NR SA FR2 RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 7.1.1.1 NR SA FR2 cell re-selection | UE PC1 | | |
| | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 8dB<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -3dB<br>$Es_2$/Noc = 1.5dB<br><br>During T3:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 1.5dB<br>$Es_2$/Noc = -3dB<br><br>In signalling:<br>SintraSearchP = 50<br><br>Qrxlevmin = -138dBm/SCS for config. 1<br><br>Qrxlevmin = -135dBm/SCS for config. 2 | During T1:<br>0dB<br>0dB<br>N/A<br><br>During T2:<br>0dB<br>0.5dB<br>1.0dB<br><br>During T3:<br>0dB<br>1.0dB<br>0.5dB<br><br>In signalling:<br>12<br><br>37 dB<br><br>37 dB | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 8dB<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -2.50dB<br>$Es_2$/Noc = 2.5dB<br><br>During T3:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 2.5dB<br>$Es_2$/Noc = -2.50dB<br><br>In signalling:<br>SintraSearchP = 62<br><br>Qrxlevmin = -101dBm/SCS for config. 1<br><br>Qrxlevmin = -98dBm/SCS for config. 2 |
| | UE PC3 | | |
| | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 8dB<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -3dB<br>$Es_2$/Noc = 1.5dB<br><br>During T3:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 1.5dB<br>$Es_2$/Noc = -3dB<br><br>In signalling:<br>Qrxlevmin = -138dBm/SCS for config. 1<br><br>Qrxlevmin = -135dBm/SCS for config. 2 | During T1:<br>0dB<br>0dB<br>N/A<br><br>During T2:<br>0dB<br>0.1dB<br>0.55dB<br><br>During T3:<br>0dB<br>0.55dB<br>0.1dB<br><br>In signalling:<br>18 dB<br><br>18 dB | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 8dB<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -2.90dB<br>$Es_2$/Noc = 2.05dB<br><br>During T3:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 2.05dB<br>$Es_2$/Noc = -2.90dB<br><br>In signalling:<br>Qrxlevmin = -120dBm/SCS for config. 1<br>Qrxlevmin = -117dBm/SCS for config. 2 |
| 7.1.1.2 NR SA FR2-FR2 cell re-selection | During T1:<br>$Noc_1$ = -102 dBm/15kHz | During T1:<br>0dB | During T1:<br>$Noc_1$ = -102 dBm/15kHz |

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| | $Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -10.5dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -infinity<br><br>During T3:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB<br>$Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Cell 2 Qrxlevmin = -138dBm/SCS for config. 1<br><br>Cell 2 Qrxlevmin = -135dBm/SCS for config. 2<br><br>Cell 2 SnonintraSearchP = 50dB<br><br>Cell 1 Threshx, highP = 48dB<br>Cell 2 Threshserving, lowP = 44dB<br><br>Cell 2 Threshx, lowP = 50dB | 0dB<br>0dB<br>7.6dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>N/A<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>16 dB<br><br>16 dB<br><br>12dB<br><br>-16dB<br>18dB<br><br>-32dB | $Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -2.9dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -infinity<br><br>During T3:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB<br>$Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Qrxlevmin = -124dBm/SCS for config. 1<br><br>Qrxlevmin = -121dBm/SCS for config. 2<br><br>Cell 2 SnonintraSearchP = 62dB<br><br>Cell 1 Threshx, highP = 32dB<br>Cell 2 Threshserving, lowP = 62dB<br><br>Cell 2 Threshx, lowP = 18dB |
| 7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -3dB<br>$Es_2$/Noc = 1.5dB<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 1.5dB<br>$Es_2$/Noc = -3dB<br><br>In signalling:<br>Qrxlevmin = -140dBm/SCS for config. 1<br><br>Qrxlevmin = -137dBm/SCS for config. 2 | During T1:<br>0dB<br>0.1dB<br>0.55dB<br><br>During T2:<br>0dB<br>0.55dB<br>0.1dB<br><br>In signalling:<br>20dB<br><br>20dB | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -2.90dB<br>$Es_2$/Noc = 2.05dB<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 2.05dB<br>$Es_2$/Noc = -2.90dB<br><br>In signalling:<br>Qrxlevmin = -120dBm/SCS for config. 1<br><br>Qrxlevmin = -117dBm/SCS for config. 2 |
| 7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -3dB<br>$Es_2$/Noc = 1.5dB<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 1.5dB<br>$Es_2$/Noc = -3dB<br><br>In signalling:<br>Qrxlevmin = -140dBm/SCS for config. 1<br><br>Qrxlevmin = -137dBm/SCS for config. 2<br><br>SsearchThresholdP = 35dB | During T1:<br>0dB<br>0.1dB<br>0.55dB<br><br>During T2:<br>0dB<br>0.55dB<br>0.1dB<br><br>In signalling:<br>20dB<br><br>20dB<br><br>-27dB | During T1:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = -2.90dB<br>$Es_2$/Noc = 2.05dB<br><br>During T2:<br>Noc = -102 dBm/15kHz<br>$Es_1$/Noc = 2.05dB<br>$Es_2$/Noc = -2.90dB<br><br>In signalling:<br>Qrxlevmin = -120dBm/SCS for config. 1<br><br>Qrxlevmin = -117dBm/SCS for config. 2<br><br>SsearchThresholdP = 8dB |
| 7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | During T1:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -10.5dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB | During T1:<br>0dB<br>0dB<br>0dB<br>7.6dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -2.9dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB |

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| | $Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Cell 2 Qrxlevmin = -138dBm/SCS for config. 1<br><br>Cell 2 Qrxlevmin = -135dBm/SCS for config. 2<br><br>Cell 2 SnonintraSearchP = 50dB<br><br>Cell 1 Threshx, highP = 48dB<br>Cell 2 Threshserving, lowP = 44dB<br><br>Cell 2 Threshx, lowP = 50dB<br>SSearchDeltaP = 6dB | 0dB<br><br>In signalling:<br>16 dB<br><br>16 dB<br><br>12dB<br><br>-16dB<br>18dB<br><br>-32dB<br>6dB | $Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Qrxlevmin = -124dBm/SCS for config. 1<br>Qrxlevmin = -121dBm/SCS for config. 2<br>Cell 2 SnonintraSearchP = 62dB<br>Cell 1 Threshx, highP = 32dB<br>Cell 2 Threshserving, lowP = 62dB<br>Cell 2 Threshx, lowP = 18dB<br>SSearchDeltaP = 12dB |
| 7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | During T1:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -10.5dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB<br>$Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Cell 2 Qrxlevmin = -138dBm/SCS for config. 1<br><br>Cell 2 Qrxlevmin = -135dBm/SCS for config. 2<br><br>Cell 2 SnonintraSearchP = 50dB<br><br>Cell 1 Threshx, highP = 48dB<br>Cell 2 Threshserving, lowP = 44dB<br><br>Cell 2 Threshx, lowP = 50dB<br>Cell 2 SsearchThresholdP = 29dB | During T1:<br>0dB<br>0dB<br>0dB<br>7.6dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>In signalling:<br>16 dB<br><br>16 dB<br><br>12dB<br><br>-16dB<br>18dB<br><br>-32dB<br>-17dB | During T1:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 10.5dB<br>$Es_2/Noc_2$ = -2.9dB<br><br>During T2:<br>$Noc_1$ = -102 dBm/15kHz<br>$Noc_2$ = -102 dBm/15kHz<br>$Es_1/Noc_1$ = 8dB<br>$Es_2/Noc_2$ = 8.5dB<br><br>In signalling:<br>Qrxlevmin = -124dBm/SCS for config. 1<br>Qrxlevmin = -121dBm/SCS for config. 2<br>Cell 2 SnonintraSearchP = 62dB<br>Cell 1 Threshx, highP = 32dB<br>Cell 2 Threshserving, lowP = 62dB<br>Cell 2 Threshx, lowP = 18dB<br>Cell 2 SsearchThresholdP = 12dB |
| 7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell | During T1:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB |
| 7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell | During T1:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +5.00dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +5.00dB<br>Ês2 / Noc2: +5.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +5.00dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +5.00dB<br>Ês2 / Noc2: +5.00dB |
| 7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover | During T1:<br>Noc -104.7dBm/15kHz<br>$Es_2/Noc$ -infinity<br><br>During T2-T5:<br>Noc -104.7 dBm/15kHz<br>$Es_2/Noc$ 10 dB | During T1:<br>0 dB<br>0 dB<br><br>During T2-T5:<br>0 dB<br>0 dB | During T1:<br>Noc -104.7dBm/15kHz<br>$Es_2/Noc$ -infinity<br><br>During T2-T5:<br>Noc -104.7 dBm/15kHz<br>$Es_2/Noc$ 10 dB |

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| 7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover | Same as 7.3.1.4 | Same as 7.3.1.4 | Same as 7.3.1.4 |
| 7.3.2.1.1 NR SA FR2 RRC re-establishment | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = 4 dB<br>Ês2 / Noc = 2 dB<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 2 dB<br><br>During T3:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 2 dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = 4 dB<br>Ês2 / Noc = 2 dB<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 2 dB<br><br>During T3:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 2 dB |
| 7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment | During T1:<br>Noc1 = -92.1 dBm/15 kHz<br>Noc2 = -92.1 dBm/15 kHz<br>Ês1 / Noc1 = 0 dB<br>Ês2 / Noc 2= - Infinity<br><br>During T2:<br>Noc1 = -92.1 dBm/15 kHz<br>Noc2 = -92.1 dBm/15 kHz<br>Ês1 / Noc1 = - Infinity<br>Ês2 / Noc2 = - Infinity<br><br>During T3:<br>Noc1 = -92.1 dBm/15 kHz<br>Noc2 = -92.1 dBm/15 kHz<br>Ês1 / Noc1 = - Infinity<br>Ês2 / Noc2 = 0 dB | During T1:<br>-0.2dB<br>-0.2dB<br>0dB<br>0dB<br><br>During T2:<br>-0.2dB<br>-0.2dB<br>0dB<br>0dB<br><br>During T3:<br>-0.2dB<br>-0.2dB<br>0dB<br>0dB | During T1:<br>Noc1 = -92.3 dBm/15 kHz<br>Noc2 = -92.3 dBm/15 kHz<br>Ês1 / Noc1 = 0 dB<br>Ês2 / Noc 2= - Infinity<br><br>During T2:<br>Noc1 = -92.3 dBm/15 kHz<br>Noc2 = -92.3 dBm/15 kHz<br>Ês1 / Noc1 = - Infinity<br>Ês2 / Noc2 = - Infinity<br><br>During T3:<br>Noc1 = -92.3 dBm/15 kHz<br>Noc2 = -92.3 dBm/15 kHz<br>Ês1 / Noc1 = - Infinity<br>Ês2 / Noc2 = 0 dB |
| 7.3.2.1.3NR SA FR2 RRC re-establishment without serving cell timing | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = 5 dB<br>Ês2 / Noc = - infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = - infinity<br><br>During T3:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 5 dB | During T1:<br>0dB<br>0dB<br>N/A<br><br>During T2:<br>0dB<br>N/A<br>N/A<br><br>During T3:<br>0dB<br>N/A<br>0dB | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = 5 dB<br>Ês2 / Noc = - infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = - infinity<br><br>During T3:<br>Noc = -104.7 dBm/15 kHz<br>Ês1 / Noc = - Infinity<br>Ês2 / Noc = 5 dB |
| 7.3.2.2.1 NR SA FR2 contention based random access | Absolute uplink power:<br>$P_{int} \geq P \geq P_{min}$ ±14.0dB<br>$P_{UMAX} \geq P > P_{int}$ ±12.0dB<br><br>Relative uplink power step:<br>$P_{int} \geq P \geq P_{min}$ ±6.0dB<br><br>$P_{UMAX} \geq P > P_{int}$ ±4.0dB<br><br>Uplink timing:<br>120kHz SCS $T_e$ ±3.5*64*$T_c$ | Not applicable due to UL calibration<br><br>FFS dB<br><br>FFS dB<br><br>[48]$T_c$ | Absolute uplink power:<br>±FFSdB<br><br>Relative uplink power step:<br>±(6+FFS)dB, either PRACH being compared ≤ ($P_{max}$ – 6dB)<br>±(4+FFS)dB, both PRACHs being compared > ($P_{max}$ – 6dB)<br><br>Uplink timing:<br>120kHz SCS $T_e$ ±224±[48]*$T_c$ |
| 7.3.2.2.2 NR SA FR2 non-contention based random access | Same as 7.3.2.2.1 | Same as 7.3.2.2.1 | Same as 7.3.2.2.1 |
| 7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection | Same as 7.3.1.3 | Same as 7.3.1.3 | Same as 7.3.1.3 |

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| 7.3.3.1 NR SA FR2 conditional handover | During T1:<br>Noc -104.7dBm/15kHz<br>$Es_1$/Noc 6 dB<br>$Es_2$/Noc -infinity<br><br>During T2:<br>Noc -104.7dBm/15kHz<br>$Es_1$/Noc 6 dB<br>$Es_2$/Noc 11dB<br><br>In signalling:<br>A3-offset = -1dB | During T1<br>-1.5dB<br>0dB<br>0dB<br><br>During T2<br>-1.5dB<br>0dB<br>0dB<br><br>In signalling:<br>-1dB | During T1:<br>Noc -106.2 dBm/15kHz<br>$Es_1$/Noc 6 dB<br>$Es_2$/Noc -infinity<br><br>During T2:<br>Noc -106.2 dBm/15kHz<br>$Es_1$/Noc 6 dB<br>$Es_2$/Noc 11dB<br><br>In signalling:<br>A3-offset = -2dB |
| 7.3.3.3 | Same as 7.3.3.1 | Same as 7.3.3.1 | Same as 7.3.3.1 |
| 7.3.4.1 NR SA FR2 RACH based Intra-frequency PCell switch from FR2 to FR2 | During T1~T4:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB | During T1~T4:<br>0dB<br>0dB<br>0dB | During T1~T4:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB |
| 7.3.4.2 NR SA FR2 RACH-less Intra-frequency PCell switch from FR2 to FR2 | During T1~T5:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB | During T1~T5:<br>0dB<br>0dB<br>0dB | During T1~T5:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +7.00dB |
| 7.3.4.3 NR SA FR2 RACH-based Inter-frequency LTM PCell switch from FR2 to FR2 | During T1~T4:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +5.00dB<br>Ês2 / Noc: +5.00dB | During T1~T4:<br>0dB<br>0dB<br>0dB | During T1~T4:<br>Noc: -104.7dBm/15kHz<br>Ês1 / Noc: +5.00dB<br>Ês2 / Noc: +5.00dB |
| 7.4.1.1 SA FR2 UE transmit timing accuracy | Test 1 (no DRX):<br>Uplink timing: ±3*64*$T_c$ for 240 kHz SSB SCS<br>Max step size $T_q$: 2.5*64*$T_c$<br>Min adjust rate $T_p$: 2.5*64*$T_c$<br>Max adjust rate: 2.5*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$Ês_1$ / $N_{oc}$: +4.0dB<br><br>Test 2 (with DRX):<br>Uplink timing: ±3*64*$T_c$ for 240 kHz SSB SCS<br>$N_{oc}$ = -112 dBm/15 kHz<br>$Ês_1$ / $N_{oc}$: +4.0dB | <br>±0.75*64*$T_c$<br>+0.625*64$T_c$<br>-3.725*64*$T_c$<br>+1.225*64*$T_c$<br>0dB<br>0dB<br><br><br>±0.75*64*$T_c$<br>0dB<br>0dB | Test 1 (no DRX):<br>Uplink timing: ±3.75*64*$T_c$<br>Max step size $T_q$: 3.125*64*$T_c$<br>Min adjust rate: -1.225*64*$T_c$<br>Max adjust rate: 3.725*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$Ês_1$ / $N_{oc}$: +4.0dB<br><br>Test 2 (with DRX):<br>Uplink timing: ±3.75*64*$T_c$<br>$N_{oc}$ = -112 dBm/15 kHz<br>$Ês_1$ / $N_{oc}$: +4.0dB |
| 7.4.1.3 NR SA FR2 UE Transmit Timing Test with 2-TA for FR2 UE supporting multiDCI-IntraCellMultiTRP-TwoTA-r18 | Test 1 (no DRX):<br>Uplink timing: ±3*64*Tc for 240 kHz SSB SCS<br>Max step size Tq: 2.5*64*Tc<br>Min adjust rate Tp: 2.5*64*Tc<br>Max adjust rate: 2.5*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 2 (no DRX):<br>Uplink timing: ±3*64*Tc for 240 kHz SSB SCS<br>Max step size Tq: 2.5*64*Tc<br>Min adjust rate Tp: 2.5*64*Tc<br>Max adjust rate: 2.5*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 3 (with DRX):<br>Uplink timing: ±3*64*Tc for 240 kHz SSB SCS<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 4 (with DRX):<br>Uplink timing: ±3*64*Tc for 240 kHz SSB SCS<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB | <br>±0.75*64*Tc<br>+0.625*64Tc<br>-3.725*64*Tc<br>+1.225*64*Tc<br>0dB<br>0dB<br><br>±0.75*64*Tc<br>+0.625*64Tc<br>-3.725*64*Tc<br>+1.225*64*Tc<br>0dB<br>0dB<br><br>±0.75*64*Tc<br>0dB<br>0dB<br><br>±0.75*64*Tc<br>0dB<br>0dB | Test 1 (no DRX):<br>Uplink timing: ±3.75*64*Tc<br>Max step size Tq: 3.125*64*Tc<br>Min adjust rate: -1.225*64*Tc<br>Max adjust rate: 3.725*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 2 (no DRX):<br>Uplink timing: ±3.75*64*Tc<br>Max step size Tq: 3.125*64*Tc<br>Min adjust rate: -1.225*64*Tc<br>Max adjust rate: 3.725*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 3 (with DRX):<br>Uplink timing: ±3.75*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB<br><br>Test 4 (with DRX):<br>Uplink timing: ±3.75*64*Tc<br>Noc = -112 dBm/15 kHz<br>Ês1 / Noc: +4.0dB |

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| 7.4.3.1 NR SA FR2 UE timing advance adjustment accuracy | Noc = -112 dBm/15 kHz<br><br>Ês1 / Noc = 4 dB<br><br>UE Timing Advance Adjustment Accuracy for 120kHz SCS = ±32 Tc | 0dB<br><br>0dB<br><br>+/- 40 Tc | Noc = -112 dBm/15 kHz<br><br>Ês1 / Noc = 4 dB<br><br>UE TAAA for 120kHz SCS = ±72 Tc |
| 7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | During T1:<br>Noc: -92.1 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3:<br>-2.7 dB<br>0 dB<br>0 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: +4.1 dB<br>Ês2 / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -3.9 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB |
| 7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode | During T1:<br>Noc: -92.1 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -92.1dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +2 dB | During T1:<br>-2.7 dB<br>2.1 dB<br>2.1 dB<br><br>During T2:<br>-2.7 dB<br>2.1 dB<br>0 dB<br><br>During T3:<br>-2.7 dB<br>0 dB<br>0 dB<br><br>During T4:<br>-2.7 dB<br>0 dB<br>0 dB<br><br>During T5:<br>-2.7 dB<br>0 dB<br>2.1 dB | During T1:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: +4.1 dB<br>Ês2 / Noc: +4.1 dB<br><br>During T2:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -3.9 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -4.5 dB<br><br>During T5:<br>Noc: -94.8 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: +4.1 dB |
| 7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB<br><br>During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB |
| 7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: +2 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -6 dB<br>Ês2 / Noc: -15 dB | During T1:<br>0 dB<br>1.3 dB<br>1.3 dB<br><br>During T2:<br>0 dB<br>1.3 dB<br>-0.4 dB | During T1:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +3.3 dB<br>Ês2 / Noc: +3.3 dB<br><br>During T2:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.7 dB<br>Ês2 / Noc: -15.4 dB |

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| | During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15 dB<br>Ês2 / Noc: -15 dB<br><br>During T4:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.5 dB<br>Ês2 / Noc: -15 dB<br><br>During T5:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: +2 dB<br>Ês2 / Noc: -14 dB | During T3:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T4:<br>0 dB<br>-0.4 dB<br>-0.4 dB<br><br>During T5:<br>0 dB<br>1.3 dB<br>-0.4 dB | During T3:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -15.4 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T4:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: -4.9 dB<br>Ês2 / Noc: -15.4 dB<br><br>During T5:<br>Noc: -104.7 dBm/15kHz<br>Ês1 / Noc: 3.3 dB<br>Ês2 / Noc: -15.4 dB |
| 7.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions | Same as 5.5.1.9 | Same as 5.5.1.9 | Same as 5.5.1.9 |
| 7.5.3.4 NR SA FR2 direct SCell activation at SCell addition of known SCell | During T1:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br><br>During T2:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br><br>During T3:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br>In signalling:<br>A3-offset = -15dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0dB | During T1:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br><br>During T2:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br><br>During T3:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_2$: +14 dB<br>In signalling:<br>A3-offset = -15dB |
| 7.5.3.5 NR SA FR2 direct SCell activation at SCell addition of known SCell | During T1:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br><br>During T2:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br><br>During T3:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br>In signalling:<br>A3-offset = -15dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>In signalling:<br>0dB | During T1:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br><br>During T2:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br><br>During T3:<br>$Noc_1$: -112 dBm/15kHz<br>$Noc_2$: -112 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14 dB<br>$Ês_2$ / $Noc_1$: +14 dB<br>$Ês_3$ / $Noc_2$: +14 dB<br>In signalling:<br>A3-offset = -15dB |
| 7.5.3.13 NR SA FR2 SCell Activation for SCell in FR2 intra-band in non-DRX | During T1:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +7 dB<br>$Ês_2$ / $Noc_2$: +7 dB<br><br>During T2:<br>$Noc_1$: -104.7 dBm/15kHz | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB | During T1:<br>$Noc_1$: -104.7 dBm/15kHz<br>$Noc_2$: -104.7 dBm/15kHz<br>$Ês_1$ / $Noc_1$: +7 dB<br>$Ês_2$ / $Noc_2$: +7 dB<br><br>During T2:<br>$Noc_1$: -104.7 dBm/15kHz |

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| | $Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7 dB<br>$\hat{E}s_2$ / $Noc_2$: +7 dB<br>In signalling:<br>A3-offset = -15dB | 0dB<br>0dB<br>0dB<br>In signalling:<br>0dB | $Noc_2$: -104.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +7 dB<br>$\hat{E}s_2$ / $Noc_2$: +7 dB<br>In signalling:<br>A3-offset = -15dB |
| 7.5.3.14 NR SA FR2 SCell Activation for known SCell in FR2 inter-band | During T1:<br>$Noc_1$: -92.1 dBm/15kHz<br>$Noc_2$: -92.1 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0 dB<br>$\hat{E}s_2$ / $Noc_2$: 0 B<br><br>During T2:<br>$Noc_1$: -92.1 dBm/15kHz<br>$Noc_2$: -92.1 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0 dB<br>$\hat{E}s_2$ / $Noc_2$: 0 B<br><br>In signalling:<br>A3-offset = -15dB | During T1:<br>-4.6dB<br>-4.6dB<br>0dB<br>0dB<br><br>During T2:<br>-4.6dB<br>-4.6dB<br>0dB<br>0dB<br><br>In signalling:<br>0dB | During T1:<br>$Noc_1$: -96.7 dBm/15kHz<br>$Noc_2$: -96.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0 dB<br>$\hat{E}s_2$ / $Noc_2$: 0 B<br><br>During T2:<br>$Noc_1$: -96.7 dBm/15kHz<br>$Noc_2$: -96.7 dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: 0 dB<br>$\hat{E}s_2$ / $Noc_2$: 0 B<br><br>In signalling:<br>A3-offset = -15dB |
| 7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX | During T1:<br>SNR_SSB $q_0$: 5 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: -3 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20.2 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1<br><br>rsrp-ThresholdSSB: -92 dBm/240kHz for Config 2 | +8.70 dB<br>0 dB<br><br>+8.70 dB<br>0 dB<br><br>0 dB<br>-0.2 dB<br><br>-14 dB<br><br>-14 dB | During T1:<br>SNR_SSB $q_0$: 13.7 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_0$: 5.7 dB<br>SNR_SSB $q_1$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_0$: -12 dB<br>SNR_SSB $q_1$: 20 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1<br>srp-ThresholdSSB: -106 dBm/240kHz for Config 2 |
| 7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX | Same as 7.5.5.1 | Same as 7.5.5.1 | Same as 7.5.5.1 |
| 7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB<br><br>rsrp-ThresholdSSB: -95 dBm/SCS kHz | 0 dB<br><br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br><br>-14 dB | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB<br><br>rsrp-ThresholdSSB: -109.0 dBm/SCS kHz |
| 7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX | Same as 7.5.5.3 | Same as 7.5.5.3 | Same as 7.5.5.3 |
| 7.5.5.5 NR SA FR2 scheduling available restriction during SSB-based beam failure | Same as 7.5.5.1 | Same as 7.5.5.1 | Same as 7.5.5.1 |

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| detection and link recovery in non-DRX | | | |
| 7.5.5.6 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB<br><br>rsrp-ThresholdBFR: -95 dBm/SCS kHz | 0 dB<br><br><br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br><br>-14 dB | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_2$ / $N_{oc}$ for CSI-RS set q1<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB<br><br>rsrp-ThresholdBFR: -109.0 dBm/SCS kHz |
| 7.5.5.7 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX | Same as 7.5.5.6 | Same as 7.5.5.6 | Same as 7.5.5.6 |
| 7.5.5.9 NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0,0<br>T1: 5 dB<br>T2: -3 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0,1<br>T1-T5: 5 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q1,0<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20.2 dB<br>T4: 20.2 dB<br>T5: 20.2 dB<br><br>rsrp-ThresholdSSB: -95 dBm/SCS kHz | 0 dB<br><br><br>8.7 dB<br>8.7 dB<br>0 dB<br>0 dB<br>0 dB<br><br><br>8.7dB<br><br><br>0 dB<br>0 dB<br>-0.2 dB<br>-0.2 dB<br>-0.2 dB<br><br>-14 dB | Noc = -104.7 dBm/120 kHz<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0,0<br>T1: 13.7 dB<br>T2: 5.7 dB<br>T3: -12 dB<br>T4: -12 dB<br>T5: -12 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q0,1<br>T1-T5: 13.7 dB<br><br>$\hat{E}s_1$ / $N_{oc}$ for CSI-RS set q1,0<br>T1: 0.2 dB<br>T2: 0.2 dB<br>T3: 20 dB<br>T4: 20 dB<br>T5: 20 dB<br><br>rsrp-ThresholdSSB: -109.0 dBm/SCS kHz |
| 7.5.5.10 NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX | During T1:<br>SNR_SSB $q_{0,0}$: 5 dB<br>SNR_SSB $q_{0,1}$: 5 dB<br>SNR_SSB $q_{1,0}$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_{0,0}$: -3 dB<br>SNR_SSB $q_{0,1}$: 5 dB<br>SNR_SSB $q_{1,0}$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_{0,0}$: -12 dB<br>SNR_SSB $q_{0,1}$: 5 dB<br>SNR_SSB $q_{1,0}$: 20.2 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1<br>rsrp-ThresholdSSB: -92 dBm/240kHz for Config 2 | <br>+8.70 dB<br>+8.70 dB<br>0 dB<br><br><br>+8.50 dB<br>+8.70 dB<br>0 dB<br><br><br>0 dB<br>+8.70 dB<br>-0.2 dB<br><br><br>-14 dB<br>-14 dB | During T1:<br>SNR_SSB $q_{0,0}$: 13.7 dB<br>SNR_SSB $q_{0,1}$: 13.7 dB<br>SNR_SSB $q_{1,0}$: 0.2 dB<br><br>During T2:<br>SNR_SSB $q_{0,0}$: 5.5 dB<br>SNR_SSB $q_{0,1}$: 13.7 dB<br>SNR_SSB $q_{1,0}$: 0.2 dB<br><br>During T3-T5:<br>SNR_SSB $q_{0,0}$: -12 dB<br>SNR_SSB $q_{0,1}$: 13.7 dB<br>SNR_SSB $q_{1,0}$: 20 dB<br><br>In signalling:<br>rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1<br>srp-ThresholdSSB: -106 dBm/240kHz for Config 2 |

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| 7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX | During T1:<br>Noc2: -112dBm/15kHz<br>Ês2 / Iot2: +18dB | During T1:<br>0dB<br>0dB | During T1:<br>Noc2: -112dBm/15kHz<br>Ês2 / Iot2: +18dB |
| 7.5.6.3.1 Active BWP switch on multiple SCells with non-DRX in SA | During T1/T2/T3:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>Noc3: -111.7dBm/15kHz<br>Ês1 / Iot1: +7dB<br>Ês2 / Iot2: +7dB<br>Ês3 / Iot3: +7dB | During T1/T2/T3:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1/T2/T3:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>Noc3: -111.7dBm/15kHz<br>Ês1 / Iot1: +7dB<br>Ês2 / Iot2: +7dB<br>Ês3 / Iot3: +7dB |
| 7.5.6.5.1 Active BWP switch on multiple SCells with non-DRX in SA | During T1:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>Ês1 / Iot1: +18dB<br>Ês2 / Iot2: +18dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -111.7dBm/15kHz<br>Noc2: -111.7dBm/15kHz<br>Ês1 / Iot1: +18dB<br>Ês2 / Iot2: +18dB |
| 7.5.8.1.1 NR SA PCell FR2 MAC-CE based active TCI state switch for a known TCI state | During T1:<br>SSB#0: Ês / Iot, BB: +8.3dB<br>SSB#0: Ês: -80.6dB<br>SSB#1: Ês / Iot, BB: - infinity<br>SSB#1: Ês: - infinity<br><br>During T2:<br>SSB#0: Ês / Iot, BB: +8.3dB<br>SSB#0: Ês: -80.6dB<br>SSB#1: Ês / Iot, BB: +8.3dB<br>SSB#1: Ês: -80.6dB | During T1:<br>0dB<br>-0.3dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>-0.3FFSdB<br>0dB<br>-0.3FFSdB | During T1:<br>SSB#0: Ês / Iot, BB: +8.3dB<br>SSB#0: Ês: -80.9dB<br>SSB#1: Ês / Iot, BB: - infinity<br>SSB#1: Ês: - infinity<br><br>During T2:<br>SSB#0: Ês / Iot, BB: +8.3dB<br>SSB#0: Ês: -80.9dB<br>SSB#1: Ês / Iot, BB: +8.3dB<br>SSB#1: Ês: -80.9dB |
| 7.5.8.2.1 NR SA PCell FR2 RRC based active TCI state switch for a known TCI state | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 |
| 7.5.9.1.1 EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB | During T1:<br>0 dB<br><br>During T2:<br>0 dB<br><br>During T3:<br>0 dB<br><br>During T4:<br>0 dB | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB |
| 7.5.9.2.1 EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB | During T1:<br>0 dB<br><br>During T2:<br>0 dB<br><br>During T3:<br>0 dB<br><br>During T4:<br>0 dB | During T1:<br>Ês / $N_{oc}$: 1 dB<br><br>During T2:<br>Ês / $N_{oc}$: 1 dB<br><br>During T3:<br>Ês / $N_{oc}$: -infinity dB<br><br>During T4:<br>Ês / $N_{oc}$: 1 dB |
| 7.5.11.1 NR SA FR2 UE UL carrier RRC reconfiguration delay | During T1:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +7dB<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +7dB<br><br>During T3:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +7dB<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +7dB<br><br>During T3:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +7dB |

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| | Ês2 / Noc2: +7dB | 0dB | Ês2 / Noc2: +7dB |
| 7.5.12.1 Addition and Release Delay of PSCell | During T1:<br>Ês: -infinity<br><br>During T2~T4:<br>Ês: -81dBm/SCS | During T1:<br>0dB<br><br>During T2~T4:<br>0dB | During T1:<br>Ês: -infinity<br><br>During T2~T4:<br>Ês: -81dBm/SCS |
| 7.5.13.6.1 NR SA FR2 MAC-CE based active uplink TCI state switch for 2 known TCI states | During T1:<br>Noc: -83.10dBm/120kHz<br>Ês0 / Noc: 1 dB<br>Ês1/ Noc: -infinity<br>Ês2 / Noc: -infinity<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -83.10dBm/120kHz<br>Ês0 / Noc: 1 dB<br>Ês1/ Noc: 1 dB<br>Ês2 / Noc: 1 dB<br>Ês3 / Noc: 1 dB | During T1:<br>-3dB<br>2.4dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>-3dB<br>2.4dB<br>2.4dB<br>2.4dB<br>2.4dB | During T1:<br>Noc: -86.10dBm/120kHz<br>Ês0 / Noc: 3.4 dB<br>Ês1/ Noc: -infinity<br>Ês2 / Noc: -infinity<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -86.10dBm/120kHz<br>Ês0 / Noc: 3.4 dB<br>Ês1/ Noc: 3.4 dB<br>Ês2 / Noc: 3.4 dB<br>Ês3 / Noc: 3.4 dB |
| 7.5.14 NR SA FR2 PSCell RACH-less based Activation and deactivation for FR1+FR2 inter-band with target PSCell in FR2 | During T1~T4:<br>Noc: -104.7 dBm/15kHz<br>Ês / Noc: 7 dB | During T1~T4:<br>0.9dB<br>0dB | During T1~T4:<br>Noc: -103.8 dBm/15kHz<br>Ês / Noc: 7 dB |
| 7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX | During T1:<br>Ês1: -86dBm/120kHz<br>Ês2: -infinity<br><br>During T2:<br>Ês1: -86dBm/120kHz<br>Ês2: -86dBm/120kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Ês1: -86dBm/120kHz<br>Ês2: -infinity<br><br>During T2:<br>Ês1: -86dBm/120kHz<br>Ês2: -86dBm/120kHz |
| 7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB<br><br>Signalled A3-offset:<br>-6.0 | During T1:<br>-3.5dB<br>0dB<br>0dB<br><br>During T2:<br>-3.5dB<br>0dB<br>0dB<br><br>Signalled A3-offset:<br>-1.0 | During T1:<br>Noc: -101.5dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -101.5dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB<br><br>Signalled A3-offset:<br>-7.0 |
| 7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX | Same as 7.6.1.1 | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX | Same as 7.6.1.2 | Same as 7.6.1.2 | Same as 7.6.1.2 |
| 7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX | During T1:<br>Ês1: -87 dBm/120kHz<br>Ês2: - infinity<br><br>During T2:<br>Ês1: -87 dBm/120kHz<br>Ês2: -87 dBm/120kHz | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Ês1: -87 dBm/120kHz<br>Ês2: - infinity<br><br>During T2:<br>Ês1: -87 dBm/120kHz<br>Ês2: -87 dBm/120kHz |
| 7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX | During T1:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2: | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2: | During T1:<br>Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: -infinity<br><br>During T2: |

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| | Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +9.00dB<br><br>Signalled A3-offset:<br>-6.0 | 0dB<br>0dB<br>0dB<br><br>Signalled A3-offset:<br>-6.0 | Noc: -104.70dBm/15kHz<br>Ês1 / Noc: +6.00dB<br>Ês2 / Noc: +9.00dB<br><br>Signalled A3-offset:<br>-12.0 |
| 7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection | Same as 7.6.2.1 | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection | Same as 7.6.2.2 | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1) | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -87 dBm/120kHz | During T1:<br>0dB<br><br>During T2:<br>0dB | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -87 dBm/120kHz |
| 7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1) | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = - Infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = 9 dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = - Infinity<br><br>During T2:<br>Noc = -104.7 dBm/15 kHz<br>Ês2 / Noc = 9 dB |
| 7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1) | Same as 5.6.2.5 | Same as 5.6.2.5 | Same as 5.6.2.5 |
| 7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1) | Same as 5.6.2.6 | Same as 5.6.2.6 | Same as 5.6.2.6 |
| 7.6.2.10 | During T1:<br>Noc: -102dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -Infinity<br><br>During T2:<br>Noc: -102dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +8.00dB | During T1:<br>-0.7dB<br>0dB<br>0dB<br><br>During T2:<br>-0.7dB<br>0dB<br>0dB | During T1:<br>Noc: -102.7dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -Infinity<br><br>During T2:<br>Noc: -102.7dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +8.00dB |
| 7.6.2.11 | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -Infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB | During T1:<br>-1.2dB<br>0dB<br>0dB<br><br>During T2:<br>-1.2dB<br>0dB<br>0dB | During T1:<br>Noc: -99.2dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: -Infinity<br><br>During T2:<br>Noc: -99.2dBm/15kHz<br>$Ês_1$ / Noc: +4.00dB<br>$Ês_2$ / Noc: +4.00dB |
| 7.6.2.20 NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority | Same as 7.6.2.1 | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX | Same as 5.6.3.1 | Same as 5.6.3.1 | Same as 5.6.3.1 |

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| 7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX | Same as 5.6.3.1 | Same as 5.6.3.1 | Same as 5.6.3.1 |
| 7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>Reported CSI-RSRP values ± 29dB<br>Reported Differential CSI-RSRP values ± 7dB | 0dB<br>0dB<br>0dB<br><br>Via mapping | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>CSI-RS#1: RSRP_40 to RSRP_99<br>CSI-RS#0: DIFFRSRP_1 to DIFFRSRP_7 |
| 7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX | Same as 7.6.3.3 | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 7.6.3.6 NR SA FR2 Inter-cell SSB based L1-RSRP measurements on FR2 SCell when DRX is not used | Same as 7.6.6.2 | Same as 7.6.6.2 | Same as 7.6.62 |
| 7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX | Same as 5.6.4.1 | Same as 5.6.4.1 | Same as 5.6.4.1 |
| 7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Same as 5.6.6.1 | Same as 5.6.6.1 | Same as 5.6.6.1 |
| 7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | During T1:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +9.00dB<br><br>Reported SS-SINR values ± 4.5dB<br>Reported Differential SS-SINR values ± 3.5dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | During T1:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -105dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +9.00dB<br><br>SSB#1: SINR_53 to SINR_72<br>SSB#0: DIFFSINR_5 to DIFFSINR_12 |
| 7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>Reported CSI-SINR values ± 4.0dB<br>Reported Differential CSI-SINR values ± 3.0dB | 0dB<br>1.5dB<br>0dB<br><br>Via mapping | Noc: -105dBm/15kHz<br>$\hat{E}s_0$ / Noc: +1.50dB<br>$\hat{E}s_1$ / Noc: +9.00dB<br><br>CSI-RS#1: SINR_54 to SINR_71<br>CSI-RS#0: DIFFSINR_4 to DIFFSINR_10 |
| 7.6.13.1 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using PRS | During T1:<br>Noc : -98 dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98 dBm/15kHz<br>Ês / Noc: -2 dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB | During T1:<br>Noc : -98 dBm/15kHz<br>Ês / Noc: infinity<br><br>During T2:<br>Noc: -98 dBm/15kHz<br>Ês / Noc: -2 dB |
| 7.6.13.2 NR SA FR2 UE Rx-Tx time difference measurement for propagation delay compensation using TRS | Same as 7.6.13.1 | Same as 7.6.13.1 | Same as 7.6.13.1 |
| 7.6.14.1 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and | During T1 – T2:<br>Ês1: -89dBm/120kHz<br>Ês2: -infinity | During T1 - T2:<br>0dB<br>0dB | During T1 – T2:<br>Ês1: -89dBm/120kHz<br>Ês2: -infinity |

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| autonomous activation/deactivation | During T3:<br>Ês1: -89dBm/120kHz<br>Ês2: -89dBm/120kHz<br><br>Signalled A4-Thresholds:<br>-120 dBm/SCS | During T3:<br>0dB<br>0dB<br><br>0 dB | During T3:<br>Ês1: -89dBm/120kHz<br>Ês2: -89dBm/120kHz<br><br>Signalled A4-Thresholds:<br>-120 dBm/SCS |
| 7.6.14.2 NR SA FR2 event triggered reporting tests with pre-configured measurement gaps and network-controlled activation/deactivation | During T1 – T2:<br>Ês1: -89dBm/120kHz<br>Ês2: -infinity<br><br>During T3:<br>Ês1: -89dBm/120kHz<br>Ês2: -89dBm/120kHz<br><br>Signalled A3-Offset:<br>-11 dB | During T1 – T2:<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br><br>0 dB | During T1 – T2:<br>Ês1: -89dBm/120kHz<br>Ês2: -infinity<br><br>During T3:<br>Ês1: -89dBm/120kHz<br>Ês2: -89dBm/120kHz<br><br>Signalled A3-Offset:<br>-11 dB |
| 7.6.15.1 NR SA FR2 SA event triggered reporting tests with fully non-overlapping concurrent MGs for SSB-based inter-frequency measurements | During T1:<br>Ês1: -87dBm/120kHz<br>Ês2: -infinity<br>Ês3: -infinity<br><br>During T2:<br>Ês1: -87dBm/120kHz<br>Ês2: -87dBm/120kHz<br>Ês3: -87dBm/120kHz<br><br>Signalled offsetMO:<br>16 dB<br><br>Signalled A3-Offset:<br>-11 dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>Signalled offsetMO:<br>0dB<br>Signalled A3-offset:<br>0 dB | During T1:<br>Ês1: -87dBm/120kHz<br>Ês2: -infinity<br>Ês3: -infinity<br><br>During T2:<br>Ês1: -87dBm/120kHz<br>Ês2: -87dBm/120kHz<br>Ês3: -87dBm/120kHz<br><br>Signalled offsetMO:<br>16dB<br><br>Signalled A3-offset:<br>-11dB |
| 7.6.15.2 NR SA FR2 event triggered reporting tests with concurrent measurement gaps without SSB time index detection when DRX is not used (PCell in FR2) | Same as 7.6.15.1 | Same as 7.6.15.1 | Same as 7.6.15.1 |
| 7.6.15.3 NR SA FR2 event triggered reporting tests with concurrent measurement gaps with partially partial overlapping scenario for SSB-based measurements and PRS-based measurement | During T1:<br>Noc1: -102.0dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Noc3: -102.0dBm/15kHz<br>SSB Ês1: -89.7dBm/120kHz<br>SSB Ês2: -infinity<br>SSB Ês3: -infinity<br>PRS Ês1: -infinity<br>PRS Ês3: -infinity<br><br>During T2:<br>Noc1: -102.0dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Noc3: -102.0dBm/15kHz<br>SSB Ês1: -89.7dBm/120kHz<br>SSB Ês2: -86.7dBm/120kHz<br>SSB Ês3: -86.7dBm/120kHz<br>PRS Ês1: -96dBm/120kHz<br>PRS Ês3: -103dBm/120kHz<br><br>Signalled A3-Offset:<br>-6 dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br>-0.6dB<br>0dB<br>0.2dB<br><br>Signalled A3-offset: -6 dB | During T1:<br>Noc1: -102.0dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Noc3: -102.0dBm/15kHz<br>SSB Ês1: -89.7dBm/120kHz<br>SSB Ês2: -infinity<br>SSB Ês3: -infinity<br>PRS Ês1: -infinity<br>PRS Ês3: -infinity<br><br>During T2:<br>Noc1: -102.0dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Noc3: -102.0dBm/15kHz<br>SSB Ês1: -89.7dBm/120kHz<br>SSB Ês2: -86.7dBm/120kHz<br>SSB Ês3: -87.3dBm/120kHz<br>PRS Ês1: -96dBm/120kHz<br>PRS Ês3: -102.8dBm/120kHz<br><br>Signalled A3-offset: -12dB |
| 7.6.16.1 NR SA FR2 event triggered reporting tests with per-UE NCSG under non-DRX | Same as 7.6.1.1 | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 7.6.16.2 NR SA FR2 event triggered reporting | During T1:<br>Noc1: -104.7dBm/15kHz | During T1:<br>0 dB | During T1:<br>Noc1: -104.7dBm/15kHz |

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| tests on inter-frequency measurement with NCSG when DRX is not used(PCell in FR2) | Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +6 dB<br>Ês2 / Noc2: -infinity dB<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +6 dB<br>Ês2 / Noc2: +9 dB<br><br>Signalled offsetMO: 16 dB<br>Signalled A3-Offset: -11 dB | 0 dB<br>2.7 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB<br>2.7 dB<br>0 dB<br><br>0 dB<br>0 dB | Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +8.7 dB<br>Ês2 / Noc2: -infinity dB<br><br>During T2:<br>Noc1: -104.7dBm/15kHz<br>Noc2: -104.7dBm/15kHz<br>Ês1 / Noc1: +8.7 dB<br>Ês2 / Noc2: +9 dB<br><br>Signalled offsetMO: 16 dB<br>Signalled A3-Offset: -11 dB |
| 7.6.16.3 NR SA FR2 event triggered reporting tests on deactivated SCell measurement via NCSG in non-DRX | During T1:<br>Ês2: -89dBm/120kHz<br>Ês3: -infinity<br><br>During T2:<br>Ês2: -89dBm/120kHz<br>Ês3: -89dBm/120kHz<br><br>Signalled A3-Offset: -11 dB | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0 dB<br><br>0 dB | During T1:<br>Ês2: -89dBm/120kHz<br>Ês3: -infinity<br><br>During T2:<br>Ês2: -89dBm/120kHz<br>Ês3: -89dBm/120kHz<br><br>Signalled A3-Offset: -11 dB |
| 7.6.20.1 NR SA FR2 Intra-frequency SSB based L1-RSRP measurement | Signalled A3-Offset: -15dB<br><br>During T1:<br>Ês/Iot$_{BB1}$: -1.5dB<br>Ês/Iot$_{BB2}$: -1.5dB<br><br>During T2:<br>Ês/Iot$_{BB1}$: +16.5dB<br>Ês/Iot$_{BB2}$: +16.5dB | 0dB<br><br>During T1:<br>1.35dB<br>1.35dB<br><br>During T2:<br>0dB<br>0dB | Signalled A3-Offset: -15dB<br><br>During T1:<br>Ês/Iot$_{BB1}$: -0.15dB<br>Ês/Iot$_{BB2}$: -0.15dB<br><br>During T2:<br>Ês/Iot$_{BB1}$: +16.5dB<br>Ês/Iot$_{BB2}$: +16.5dB |
| 7.6.21.1 NR SA FR2 Inter-frequency SSB-based L1-RSRP measurement with measurement gap for LTM | Signalled A3-Offset: -15dB<br>Signalled Cell 2 offsetMO: 16dB<br><br>During T1:<br>Ês/Iot$_{BB1}$: 16.5dB<br>Ês/Iot$_{BB2}$: -1.5dB<br><br>During T2:<br>Ês/Iot$_{BB1}$: +16.5dB<br>Ês/Iot$_{BB2}$: +16.5dB | 0dB<br>0dB<br><br>During T1:<br>0dB<br>6dB<br><br>During T2:<br>0dB<br>0dB | Signalled A3-Offset: -15dB<br>Signalled Cell 2 offsetMO: 16dB<br><br>During T1:<br>Ês/Iot$_{BB1}$: 16.5dB<br>Ês/Iot$_{BB2}$: 4.5dB<br><br>During T2:<br>Ês/Iot$_{BB1}$: +16.5dB<br>Ês/Iot$_{BB2}$: +16.5dB |
| 7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy | UE PC1 | | |
| | Test 1:<br>Noc: -91.60dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.0dB<br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês2: -108.2dBm/120kHz<br>n257 Ês3: -108.2dBm/120kHz<br>n260 Ês2: -105.2dBm/120kHz<br>n260 Ês3: -105.2dBm/120kHz<br><br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.80dB<br>0dB<br>0.4dB<br>Via Mapping<br><br>Test 2:<br>6dB<br>6dB<br>6dB<br>6dB<br><br>Via Mapping | Test 1:<br>Noc: -97.40dBm/15kHz<br>Ês2 / Noc: +6.0dB<br>Ês3 / Noc: +1.4dB<br>Cell 2: RSRP_61 to RSRP_126<br>Cell 3: RSRP_56 to RSRP_126<br>Cell 3: RSRP_x-12 to RSRP_X+2<br><br>Test 2:<br>n257 Ês2: -102.2dBm/120kHz<br>n257 Ês3: -102.2dBm/120kHz<br>n260 Ês2: -99.2dBm/120kHz<br>n260 Ês3: -99.2dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.1.1.5 |
| | UE PC3 | | |
| | Test 1:<br>Noc: -91.60dBm/15kHz<br>Ês1 / Noc: +6.0dB | Test 1:<br>-5.80dB<br>0dB | Test 1:<br>Noc: -97.40dBm/15kHz<br>Ês1 / Noc: +6.0dB |

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| | Ês2 / Noc: +1.0dB<br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês1: -110.0dBm/120kHz<br>n257 Ês2: -110.0dBm/120kHz<br>n260 Ês1: -107.4dBm/120kHz<br>n260 Ês2: -107.4dBm/120kHz<br><br>Reported absolute RSRP values: ±8dB<br>Reported relative RSRP values: ±6dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | 0.4dB<br>Via Mapping<br><br><br><br>Test 2:<br>7.70dB<br>7.70dB<br>7.70dB<br>7.70dB<br><br>Via Mapping | Ês2 / Noc: +1.4dB<br>Cell 1: RSRP_50 to RSRP_108<br>Cell 2: RSRP_46 to RSRP_103<br>Cell 2: RSRP_x-12 to RSRP_X+2<br><br>Test 2:<br>n257 Ês1: -102.3dBm/120kHz<br>n257 Ês2: -102.3dBm/120kHz<br>n260 Ês1: -99.7dBm/120kHz<br>n260 Ês2: -99.7dBm/120kHz<br><br>Band dependent. See test case tables in clause 5.7.1.1.5 |
| 7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy | Test 1 Config 1:<br>Noc1: -90.60dBm/15kHz<br>Noc2: -90.60dBm/15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Test 2 Config 1:<br>n257 Noc1: -108.13dBm/15kHz<br>n257 Noc2: -113.13dBm/15kHz<br>n260 Noc1: -105.53dBm/15kHz<br>n260 Noc2: -110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: -1.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Test 1 Config 2:<br>Noc1: -93.70dBm/15kHz<br>Noc2: -93.70dBm/15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1 Config 1:<br>-5.70dB<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Via Mapping<br><br><br><br><br>Test 2 Config 1:<br>-6.60dB<br>0dB<br>-6.60dB<br>0dB<br>0dB<br>2dB<br>Via Mapping<br><br><br><br><br><br>Via Mapping<br><br><br><br><br>Test 1 Config 2:<br>-5.60dB<br>-5.60dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Via Mapping | Test 1 Config 1:<br>Noc1: -96.30dBm/15kHz<br>Noc2: -96.30dBm /15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Cell 1<br>n257: RSRP_41 to RSRP_109<br>n260: RSRP_39 to RSRP_109<br>Cell 2:<br>RSRP_52 to RSRP_109<br><br>Cell 2:<br>n257: RSRP_x-23 to RSRP_x+26<br>n260: RSRP_x-23 to RSRP_x+27<br><br>Test 2 Config 1:<br>-114.73dBm/15kHz<br>-113.13dBm/15kHz<br>-112.13dBm/15kHz<br>-110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: 1.0dB<br>Cell 1<br>n257: RSRP_33 to RSRP_101<br>n260: RSRP_34 to RSRP_104<br>Cell 2:<br>n257: RSRP_32 to RSRP_87<br>n260: RSRP_34 to RSRP_90<br><br>Cell 2:<br>n257: RSRP_x-37 to RSRP_x+17<br>n260: RSRP_x-37 to RSRP_x+19<br><br>Test 1 Config 2:<br>Noc1: -99.30dBm/15kHz<br>Noc2: -99.30dBm /15kHz<br>Ês1 / Noc1: +6.0dB<br>Ês2 / Noc2: +6.0dB<br>Cell 1<br>n257: RSRP_41 to RSRP_109<br>n260: RSRP_39 to RSRP_109 |

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| | | | Cell 2:<br>RSRP_52 to RSRP_109 |
| | Test 2 Config 2:<br>n257 Noc1: -108.13dBm/15kHz<br>n257 Noc2: -113.13dBm/15kHz<br>n260 Noc1: -105.53dBm/15kHz<br>n260 Noc2: -110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: -1.0dB<br>Reported absolute RSRP values: ±8.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally<br><br>Reported relative RSRP values: ±6.0dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 2 Config 2:<br>-6.60dB<br>0dB<br>-6.60dB<br>0dB<br>0dB<br>2dB<br>Via Mapping<br><br>Via Mapping | Cell 2:<br>n257: RSRP_x-23 to RSRP_x+26<br>n260: RSRP_x-23 to RSRP_x+27<br><br>Test 2 Config 2:<br>-114.73dBm/15kHz<br>-113.13dBm/15kHz<br>-112.13dBm/15kHz<br>-110.53dBm/15kHz<br>Ês1 / Noc1: 17.0dB<br>Ês2 / Noc2: 1.0dB<br>Cell 1<br>n257: RSRP_36 to RSRP_104<br>n260: RSRP_37 to RSRP_107<br>Cell 2:<br>n257: RSRP_35 to RSRP_90<br>n260: RSRP_37 to RSRP_93<br><br>Cell 2:<br>n257: RSRP_x-37 to RSRP_x+17<br>n260: RSRP_x-37 to RSRP_x+19 |
| 7.7.1.3 NR SA FR1-FR2 SS-RSRP measurement accuracy | Test 1:<br>Noc: -90dBm/15kHz<br>Ês2 / Noc: +5.0dB<br>Reported absolute RSRP values: ±8dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 Ês2: -98.2dBm/120kHz<br>n260 Ês2: -93.9dBm/120kHz<br><br>Reported absolute RSRP values: ±8dBFor extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-5.50dB<br>0dB<br>Via Mapping<br><br>Test 2:<br>5.50dB<br>5.50dB<br><br>Via Mapping | Test 1:<br>Noc: -95.50dBm/15kHz<br>Ês2 / Noc: +5dB<br>Band dependent. See test case tables in clause 7.7.1.3.5<br><br>Test 2:<br>n257 Ês2: -92.7dBm/120kHz<br>n260 Ês2: -88.4dBm/120kHz<br><br>Band dependent. See test case tables in clause 7.7.1.3.5 |
| 7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy | Test 1:<br>Noc: -95.0dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Reported absolute RSRQ values: ±2.5dB<br>For extreme conditions allow ±1.5dB+ FFS MU additionally<br><br>Test 2:<br>Noc: -95.0dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally | Test 1:<br>-5.70dB<br>0dB<br>0dB<br>Via Mapping<br><br>Test 2:<br>-1.70dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc: -100.70dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Cell 2:<br>All bands: RSRQ_41 to RSRQ_73<br><br>Test 2:<br>Noc: -96.70dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Cell 2:<br>n257, n258, n261: RSRQ_35 to RSRQ_71<br>n260: RSRQ_34 to RSRQ_71 |
| 7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy | Test 1:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Reported absolute RSRQ values: ±2.5dB | Test 1:<br>-1.90dB<br>-1.90dB<br>0dB<br>0dB<br>Via Mapping | Test 1:<br>Noc1: -95.93dBm/15kHz<br>Noc2: -95.93dBm /15kHz<br>Ês1 / Noc1: -1.75dB<br>Ês2 / Noc2: -1.75dB<br>Cell 1 and Cell 2:<br>RSRQ_41 to RSRQ_73 |

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| | For extreme conditions allow ±1.5dB+ FFS MU additionally<br>Reported relative RSRQ values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally<br><br>Test 2:<br>Noc1: -94.03dBm/15kHz<br>Noc2: -94.03dBm/15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Reported absolute RSRQ values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br>Reported relative RSRQ values: ±4.0dB<br>For extreme conditions allow ±0.0dB+ FFS MU additionally | Via Mapping<br><br><br><br>Test 2:<br>-1.41dB<br>-1.41dB<br>0dB<br>0dB<br>Via Mapping<br><br><br>Via Mapping | Cell 2: RSRQ_x-7 to RSRQ_x+7<br><br><br><br>Test 2:<br>Noc1: -95.44dBm/15kHz<br>Noc2: -95.44dBm /15kHz<br>Ês1 / Noc1: -3.0dB<br>Ês2 / Noc2: -3.0dB<br>Cell 1 and Cell 2:<br>RSRQ_37 to RSRQ_74<br><br>Cell 2: RSRQ_x-9 to RSRQ_x+9 |
| 7.7.3.1 NR SA FR2 SS-SINR measurement accuracy | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: +4.54dB<br>Ês2 / Noc: +2.66dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br><br><br>Test 2:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: -3.0dB<br>Ês2 / Noc: -3.0dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally | Test 1:<br>0dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Test 2:<br>0dB<br>0.2dB<br>0.2dB<br>Via Mapping | Test 1:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: +4.54dB<br>Ês2 / Noc: +2.66dB<br>Cell 2:<br>n257, n258, n261:<br>SINR_22 to RSRQ_58<br>n260: SINR_21 to RSRQ_58<br><br><br>Test 2:<br>Noc: -105.0dBm/15kHz<br>Ês1 / Noc: -2.8dB<br>Ês2 / Noc: -2.8dB<br>Cell 2:<br>n257, n258, n261:<br>SINR_18 to RSRQ_55<br>n260: SINR_18 to RSRQ_54 |
| 7.7.3.2 NR SA FR2-FR2 SS-SINR measurement accuracy | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Reported absolute SINR values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally<br><br><br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br><br><br>Test 2:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: +11.0dB<br>Ês2 / Noc2: +11.0dB<br>Reported absolute SINR values: ±3.0dB<br>For extreme conditions allow ±1.0dB+ FFS MU additionally<br><br><br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br>Test 3:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -3.0dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Via Mapping<br><br><br><br><br>Test 2:<br>-0.1dB<br>-0.1dB<br>0dB<br>0dB<br>Via Mapping<br><br><br><br><br>Via Mapping<br><br><br><br>Test 3:<br>0dB<br>0dB<br>0.9dB | Test 1:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -0.5dB<br>Ês2 / Noc2: -0.5dB<br>Cell 1 and Cell 2:<br>n257, n258, n261:<br>SINR_27 to SINR_62<br>n260: SINR_27 to SINR_61<br><br>Cell 2: SINR_x-8 to SINR_x+8<br><br><br><br>Test 2:<br>Noc1: -105.1dBm/15kHz<br>Noc2: -105.1dBm/15kHz<br>Ês1 / Noc1: +11.0dB<br>Ês2 / Noc2: +11.0dB<br>Cell 1 and Cell 2:<br>n257, n258, n261:<br>SINR_48 to SINR_87<br>n260: SINR_48 to SINR_86<br><br>Cell 2: SINR_x-17 to SINR_x+17<br><br><br>Test 3:<br>Noc1: -105.0dBm/15kHz<br>Noc2: -105.0dBm/15kHz<br>Ês1 / Noc1: -2.1dB |

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| | Ês2 / Noc2: -3.0dB<br>Reported absolute SINR values: ±3.5dB<br>For extreme conditions allow ±0.5dB+ FFS MU additionally<br><br>Reported absolute SINR values: ±4.0dB<br>For extreme conditions allow ±0.0dB+ FFS MU additionally | 0.9dB<br>Via Mapping<br><br>Via Mapping | Ês2 / Noc2: -2.1dB<br>Cell 1 and Cell 2:<br>n257, n258, n261:<br>SINR_23 to SINR_60<br>n260: SINR_22 to SINR_59<br><br>Cell 2: SINR_x-9 to SINR_x+9 |
| 7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: -2.0dB<br>Reported absolute RSRP values: ±8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 SSB#0 Ês: -108.1dBm/120kHz<br><br>n257 SSB#1 Ês: -105.5dBm/120kHz<br><br>n260 SSB#0 Ês: -108.1dBm/120kHz<br><br>n260 SSB#1 Ês: -105.5dBm/120kHz<br><br>Reported absolute RSRP values: -6.5 +8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.4dB<br><br>Test 2:<br>5.7dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>SSB#0 Ês / Noc: +10.0dB<br>SSB#1 Ês / Noc: -1.6dB<br>SSB#0: RSRP_42 to RSRP_101<br>SSB#1: RSRP_31 to RSRP_89<br>SSB#1-SSB#0: -9 to -2<br><br>Test 2:<br>n257 SSB#0 Ês: -102.4dBm/120kHz<br>n257 SSB#1 Ês: -99.8dBm/120kHz<br>n260 SSB#0 Ês: -102.4dBm/120kHz<br>n260 SSB#1 Ês: -99.8dBm/120kHz<br><br>SSB#0 and SSB#1<br>n257: RSRP_27 to RSRP_83<br>n260: RSRP_30 to RSRP_86<br>SSB#1-SSB#0: -4 to +4 |
| 7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy | Test 1:<br>Noc: -100dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -2.0dB<br>Reported absolute RSRP values: ±8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB + FFS MU additionally<br><br>Test 2:<br>n257 CSI-RS#0 Ês: -108.1dBm/120kHz<br><br>n257 CSI-RS#1 Ês: -105.5dBm/120kHz<br><br>n260 CSI-RS#0 Ês: -108.1dBm/120kHz<br><br>n260 CSI-RS#1 Ês: -105.5dBm/120kHz<br><br>Reported absolute RSRP values: -6.5 +8.5dB<br>Reported relative RSRP values: ±6.5dB<br>For extreme conditions allow ±3dB+ FFS MU additionally | Test 1:<br>-4.1dB<br>0dB<br>0.2dB<br><br>Test 2:<br>5.7dB | Test 1:<br>Noc: -104.1dBm/15kHz<br>CSI-RS#0 Ês / Noc: +10.0dB<br>CSI-RS#1 Ês / Noc: -1.8dB<br>CSI-RS#0: RSRP_42 to RSRP_101<br>CSI-RS#1: RSRP_30 to RSRP_89<br>CSI-RS#1-CSI-RS#0: -9 to -2<br><br>Test 2:<br>n257 CSI-RS#0 Ês: -102.4dBm/120kHz<br>n257 CSI-RS#1 Ês: -99.8dBm/120kHz<br>n260 CSI-RS#0 Ês: -102.4dBm/120kHz<br>n260 CSI-RS#1 Ês: -99.8dBm/120kHz<br><br>CSI-RS#0 and CSI-RS#1<br>n257: RSRP_27 to RSRP_83<br>n260: RSRP_30 to RSRP_86<br>CSI-RS#1-CSI-RS#0: -4 to +4 |
| 7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy | Same as 5.7.5.1 | Same as 5.7.5.1 | Same as 5.7.5.1 |
| 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | Noc: -100dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: -2.00dB<br><br>Reported CSI-SINR values ± 5.5dB<br>Reported Differential CSI-SINR values ± 4.5dB | -4.1dB<br>0dB<br>0.2dB<br><br>Via mapping | Noc: -104.1dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: -1.8dB<br><br>CSI-RS#0: SINR_53 to SINR_76<br>CSI-RS#0: DIFFSINR_6 to DIFFSINR_15 |

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| 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | Noc: -100dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: -2.00dB<br><br>Reported SS-SINR values ± 4.5dB<br>Reported Differential SS-SINR values ± 3.5dB | -4.1dB<br>0dB<br>0.2dB<br><br>Via mapping | Noc: -104.1dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: -1.8dB<br><br>SSB#0: SINR_55 to SINR_74<br>SSB#0: DIFFSINR_7 to DIFFSINR_15 |
| 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | Noc: -100dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: 0.00dB<br><br>Reported CSI-SINR values ± 4.5dB<br>Reported Differential CSI-SINR values ± 3.5dB | -4.1dB<br>0dB<br>0.2dB<br><br>Via mapping | Noc: -104.1dBm/15kHz<br>Ês0 / Noc: 10.00dB<br>Ês1 / Noc: 0.2dB<br><br>CSI-RS#0: SINR_55 to SINR_74<br>CSI-RS#0: DIFFSINR_5 to DIFFSINR_13 |
| 7.7.8.1 NR SA intra-frequency FR2 CSI-RSRQ measurement accuracy | Same as 5.7.8.1 | Same as 5.7.8.1 | Same as 5.7.8.1 |
| 7.7.8.2 NR SA inter-frequency FR2 CSI-RSRQ measurement accuracy | Same as 5.7.8.2 | Same as 5.7.8.2 | Same as 5.7.8.2 |
| 7.7.9.1 NR SA intra-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.9.1 | Same as 5.7.9.1 | Same as 5.7.9.1 |
| 7.7.9.2 NR SA inter-frequency FR2 CSI-SINR measurement accuracy | Same as 5.7.9.2 | Same as 5.7.9.2 | Same as 5.7.9.2 |
| 7.7.15.1 NR SA FR2 SSB based inter-frequency L1-RSRP measurement | **Test configuration 1**<br><br>Signalled a4-Threshold: -120dBm<br><br>Signalled offsetMO: 16dB<br><br>Test 1:<br>$Noc_1$: -100dBm/15kHz<br>$Noc_2$: -100dBm/15kHz<br>$Ês_1/Noc_1$ : +10.0dB<br>$Ês_2/Noc_2$: -2.0dB<br><br>Reported absolute L1-RSRP values:<br>Normal condition: ±8.5dB<br>Extreme condition: ±11.5dB+FFS MU<br><br>Test 2:<br>n257 $Ês_1$: -109.1dBm/120kHz<br>n259 $Ês_1$: -105.5dBm/120kHz<br>n260 $Ês_1$: -106.5dBm/120kHz<br>n257 $Ês_2$: -109.1dBm/120kHz<br>n259 $Ês_2$: -105.5dBm/120kHz<br>n260 $Ês_2$: -106.5dBm/120kHz<br><br>Reported absolute L1-RSRP values:<br>Normal condition: ±6.5dB/±8.5dB<br>Extreme condition: (±9.5dB/±11.5dB) + FFS MU | **Test configuraiton 1**<br>0dB<br><br>0dB<br><br>Test 1:<br>-4.1dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 2:<br>3.65dB<br>3.65dB<br>3.65dB<br>6.65dB<br>6.65dB<br>6.65dB<br><br>Via mapping | **Test configuaiton 1**<br><br>Signalled a4-Threshold: -120dBm<br>Signalled offsetMO: 16dB<br><br>Test 1:<br>$Noc_1$: -104.1dBm/15kHz<br>$Noc_2$: -100dBm/15kHz<br>$Ês_1/Noc_1$: +10.0dB<br>$Ês_2/Noc_2$: -2dB<br><br>Normal condition:<br>RSRP_39 to RSRP_98<br><br>Test 2:<br>n257 $Ês_1$:<br>-105.45dBm/120kHz<br>n259 $Ês_1$:<br>-101.85dBm/120kHz<br>n260 $Ês_1$:<br>-102.85dBm/120kHz<br>n257 $Ês_2$:<br>-102.45dBm/120kHz<br>n259 $Ês_2$: -98.85dBm/120kHz<br>n260 $Ês_2$: -99.85dBm/120kHz<br><br>Normal condition:<br>n257: RSRP_32 to RSRP_88<br>n259: RSRP_36 to RSRP_92<br>n260: RSRP_35 to RSRP_91 |
| | **Test configuration 2**<br><br>Signalled a4-Threshold: -120dBm | **Test configuraiton 2**<br>0dB | **Test configuaiton 2**<br><br>Signalled a4-Threshold: -120dBm |

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| | Signalled offsetMO: 16dB<br><br>Test 1:<br>$Noc_1$: -100dBm/15kHz<br>$Noc_2$: -100dBm/15kHz<br>$\hat{E}s_1/Noc_1$: +10.0dB<br>$\hat{E}s_2/Noc_2$: -2.0dB<br><br>Reported absolute L1-RSRP values:<br>Normal condition: ±8.5dB<br>Extreme condition: ±11.5dB+FFS MU<br><br>Test 2:<br>n257 $\hat{E}s_1$: -106.1dBm/240kHz<br>n259 $\hat{E}s_1$: -102.5dBm/240kHz<br>n260 $\hat{E}s_1$: -103.5dBm/240kHz<br>n257 $\hat{E}s_2$: -106.1dBm/240kHz<br>n259 $\hat{E}s_2$: -102.5dBm/240kHz<br>n260 $\hat{E}s_2$: -103.5dBm/240kHz<br><br>Reported absolute L1-RSRP values:<br>Normal condition: ±6.5dB/±8.5dB<br>Extreme condition: (±9.5dB/±11.5dB) + FFS MU | 0dB<br><br>Test 1:<br>-4.1dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 2:<br>3.65dB<br>3.65dB<br>3.65dB<br>6.65dB<br>6.65dB<br>6.65dB<br><br>Via mapping | Signalled offsetMO: 16dB<br><br>Test 1:<br>$Noc_1$: -104.1dBm/15kHz<br>$Noc_2$: -100dBm/15kHz<br>$\hat{E}s_1/Noc_1$: +10.0dB<br>$\hat{E}s_2/Noc_2$: -2dB<br><br>Normal condition:<br>RSRP_42 to RSRP_101<br><br>Test 2:<br>n257 $\hat{E}s_1$:<br>-102.45dBm/240kHz<br>n259 $\hat{E}s_1$: -98.85dBm/240kHz<br>n260 $\hat{E}s_1$: -99.85dBm/240kHz<br>n257 $\hat{E}s_2$: -99.45dBm/240kHz<br>n259 $\hat{E}s_2$: -95.85dBm/240kHz<br>n260 $\hat{E}s_2$: -96.85dBm/240kHz<br><br>Normal condition:<br>n257: RSRP_35 to RSRP_91<br>n259: RSRP_39 to RSRP_95<br>n260: RSRP_38 to RSRP_94 |

**Table F.1.3.2-5: Derivation of test requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 8.2.1.1 E-UTRA – NR FR1 cell re-selection to higher priority NR target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-1.90dB<br>0dB<br>0.35dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.55dB<br>1.55dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -99.90dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -3.65dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.55dB<br>Ês2 / Noc2: +13.55dB |
| 8.2.1.2 E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16 | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: 14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14dB | During T1:<br>-1.90dB<br>-1.90dB<br>0.35dB<br>3.45dB<br><br>During T2:<br>-1.90dB<br>-1.90dB<br>3.45dB<br>0dB | During T1:<br>Noc1: -99.9dBm/15kHz<br>Noc2: -99.9dBm/15kHz<br>Ês1 / Noc1: -3.65dB<br>Ês2 / Noc2: 17.45dB<br><br>During T2:<br>Noc1: -99.9dBm/15kHz<br>Noc2: -99.9dBm/15kHz<br>Ês1 / Noc1: +15.45dB<br>Ês2 / Noc2: +14dB |
| 8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2: | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2: | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2: |

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| | $Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -4dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -4dB<br><br>Reported SS-RSRP and SS-RSRQ for NR Cell 2 | 0dB<br>0dB<br>0dB<br>+0.3dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>+0.3dB<br><br>Via mapping | $Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -3.7dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -3.7dB<br><br>**Configuration 1 and 2:**<br><br>RSRP_44 to RSRP_66<br>RSRQ_44 to RSRQ_65<br><br>**Configuration 3:**<br><br>RSRP_47 to RSRP_69<br>RSRQ_44 to RSRQ_65 |
| 8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -107dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -4dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -4dB<br><br>Signalled Thresh_X_HighP: 48dB<br><br>Reported SS-RSRP and SS-RSRQ for NR Cell 2 | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>+2.6dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>+2.6dB<br><br>+3dB<br><br>Via mapping | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -107dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -1.4dB<br><br>During T3:<br>$Noc_1$: -98dBm/15kHz<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$\hat{E}s_2$ / $Noc_2$: -1.4dB<br><br>51dB<br><br>RSRP_28 to RSRP_86<br>RSRQ_44 to RSRQ_65 |
| 8.3.1.1 E-UTRA – NR FR1 handover with known target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: 0dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1.55dB<br>+1.55dB<br><br>During T3:<br>0dB<br>0dB<br>-1.55dB<br>+1.55dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +5.45dB<br>Ês2 / Noc2: +1.55dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +5.45dB<br>Ês2 / Noc2: +1.55dB |
| 8.4.1.1 E-UTRA – NR FR1 SFTD measurement delay in non-DRX | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +4dB |

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| 8.4.1.2 E-UTRA – NR FR1 SFTD measurement delay in DRX | Same as 8.4.1.1 | Same as 8.4.1.1 | Same as 8.4.1.1 |
| 8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB | During T1:<br>0dB0dB0dB0dB<br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB |
| 8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -80.6 dBm/120kHz<br><br>In signalling:<br>b1-ThresholdNR: -112 dBm/SCS | During T1:<br>0dB<br><br>During T2:<br>0dB<br><br>In signalling:<br>-6dB | During T1:<br>Ês2: - Infinity<br><br>During T2:<br>Ês2: -80.6 dBm/120kHz<br><br>In signalling:<br>b1-ThresholdNR: -118 dBm/SCS |
| 8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX | During T1:<br>Noc: -104.7dBm/15kHz<br>Ês / Noc: -infinity<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês / Noc: +8dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>Noc: -104.7dBm/15kHz<br>Ês / Noc: -infinity<br><br>During T2:<br>Noc: -104.7dBm/15kHz<br>Ês / Noc: +8dB |
| 8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX | Same as 8.4.2.6 | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX | Same as 8.4.2.6 | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 8.4.2.9 E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16 | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB |

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| 8.5.1.1 E-UTRA – NR FR1 SFTD measurement accuracy | Test 1<br>Ês1 / Noc1: -3dB<br>Ês2 / Noc2: -3dB | Test 1:<br>+0.8dB<br>+0.3dB | Test 1:<br>Ês1 / Noc1: -2.2dB<br>Ês2 / Noc2: -2.7dB |
| 8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>Ês1 / $N_{oc1}$: +10.0dB<br>Reported RSRP values: ±8dB<br>(±3.0dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>Ês1 / $N_{oc1}$: -4.0dB<br>Reported RSRP values: ±4.5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>Ês1 / $N_{oc1}$: +10.0dB<br>RSRP_62 to RSRP_82<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: -3.2dB<br>RSRP_30 to RSRP_43<br>RSRP_31 to RSRP_43<br>RSRP_31 to RSRP_44<br>RSRP_32 to RSRP_44<br>RSRP_32 to RSRP_45<br>RSRP_33 to RSRP_45<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_46<br>depending on operating band |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>Ês1 / $N_{oc1}$: +10.0dB<br>Reported RSRP values: ±8dB<br>(±3.0dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>Ês1 / $N_{oc1}$: -4.0dB<br>Reported RSRP values: ±4.5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -96.00dBm/15kHz<br>Ês1 / $N_{oc1}$: +10.0dB<br>RSRP_64 to RSRP_83<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: -3.2dB<br>RSRP_33 to RSRP_46<br>RSRP_34 to RSRP_46<br>RSRP_34 to RSRP_47<br>RSRP_35 to RSRP_47<br>RSRP_35 to RSRP_48<br>RSRP_36 to RSRP_48<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_49<br>depending on operating band |
| 8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell | Test 1:<br>$N_{oc}$: -105dBm/15kHz<br>Ês / $N_{oc}$ 11dB<br>Reported RSRP values: ±8dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>Ês FR2a PC3: -109.1dBm/SCS<br>Reported RSRP values: ±8dB<br><br>Ês FR2b PC3: -106.5dBm/SCS<br>Reported RSRP values: ±8dB<br><br>Ês FR2c PC3: -105.5dBm/SCS<br>Reported RSRP values: ±8dB<br><br>(±3dB additionally for extreme conditions in all frequency ranges) | Test 1:<br>-0.1dB<br>0dB<br>Via mapping<br><br>Test 2:<br>+5.65dB<br>Via mapping<br><br>+5.65dB<br>Via mapping<br><br>+5.65dB<br>Via mapping | Test 1:<br>$N_{oc}$: -105.1dBm/15kHz<br>Ês / $N_{oc}$: +11.0dB<br>RSRP_48 to RSRP_105<br><br>Test 2:<br>Ês: -103.45dBm/SCS<br>RSRP_29 to RSRP_87<br><br>Ês: -100.85dBm/SCS<br>RSRP_32 to RSRP_89<br><br>Ês: -99.85dBm/SCS<br>RSRP_33 to RSRP_90 |
| 8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell | | | |
| Test Configuration 1,2,4,5 | Test 1:<br>$N_{oc1}$: -80.18 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions) | Test 1:<br>-1.5dB<br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -81.68dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63 |

| | | | |
|---|---|---|---|
| | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions)<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br><br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions) | Test 2:<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br>Via mapping | Test 2:<br>$N_{oc1}$: -106dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63 |
| Test Configuration 3,6 | Test 1:<br>$N_{oc1}$: -86.27 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions)<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br><br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions) | Test 1:<br>-1.53dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br>Via mapping | Test 1:<br>$N_{oc1}$: -87.80dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63<br><br>Test 3:<br>$N_{oc1}$: -116dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: -1.75dB<br>RSRQ_51 to RSRQ_63 |
| 8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cell | Test 1:<br>$N_{oc1}$: -105dBm/15kHz<br>Ês1 / $N_{oc1}$: -0.5dB<br>Reported RSRQ values: ±2.5dB<br>(±1.5dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$ FR2a PC3: -115.1dBm/15kHz<br>$N_{oc1}$ FR2b PC3: -112.5dBm/15kHz<br>$N_{oc1}$ FR2c PC3: -111.5dBm/15kHz<br><br>Ês1 / $N_{oc1}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB<br><br>(±1.5dB additionally for extreme conditions in all frequency ranges) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br><br>5.3dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -105dBm/15kHz<br>Ês1 / $N_{oc1}$: -0.5dB<br>RSRQ_23 to RSRQ_95<br><br>Test 2:<br>$N_{oc1}$: -115.1dBm/15kHz<br>$N_{oc1}$: -112.5dBm/15kHz<br>$N_{oc1}$: -111.5dBm/SCS<br><br>Ês1 / $N_{oc1}$: 3.55dB<br><br>RSRQ_26 to RSRQ_98 |
| 8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Reported SINR values: ±3dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 20dB<br><br>Reported SINR values: ±3dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br><br>Ês1 / $N_{oc1}$: -4dB | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0.8dB | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>SINR_35 to SINR_51<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 20dB<br><br>SINR_79 to SINR_94<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: -3.2dB |

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|---|---|---|---|
| | Reported SINR values: ±3.5dB | Via mapping | SINR_32 to SINR_49 |
| 8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell | Test 1:<br>$N_{oc1}$: -105dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -0.5dB<br>Reported SINR values: ±3dB<br>(±1dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -105dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 11dB<br>Reported SINR values: ±3dB<br>(±1dB additionally for extreme conditions)<br><br>Test 3:<br>$N_{oc1}$ FR2a PC3: -115.1dBm/15kHz<br>$N_{oc1}$ FR2b PC3: -112.5dBm/15kHz<br>$N_{oc1}$ FR2c PC3: -111.5dBm/15kHz<br><br>$\hat{E}s1 / N_{oc1}$: -1dB<br><br>Reported SINR values: ±3dB<br><br>(±1dB additionally for extreme conditions in all frequency ranges) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>-0.1dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>4.6dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -105dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -0.5dB<br>SINR_9 to SINR_82<br><br>Test 2:<br>$N_{oc1}$: -105.1dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: 11dB<br>SINR_32 to SINR_105<br><br>Test 3:<br>$N_{oc1}$: -115.1dBm/15kHz<br>$N_{oc1}$: -112.5dBm/15kHz<br>$N_{oc1}$: -111.5dBm/SCS<br><br>$\hat{E}s1 / N_{oc1}$: 3.6dB<br><br>SINR_17 to SINR_90 |

**Table F.1.3.2-6: Derivation of test requirements for FR1 NR sidelink RRM tests**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source | Sidelink transmit timing error limit:<br>±12*64 Tc | ±3*64 Tc | ±15*64 Tc |
| 9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source | Sidelink transmit timing error limit:<br>±8*64 Tc<br><br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 3 dB | ±2*64 Tc<br><br>0dB<br>0dB | ±10*64 Tc<br><br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 3 dB |
| 9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source | **Uu Test Configuration 1, 2** | | |
| | Sidelink transmit timing error limit:<br>±12*64 Tc<br><br>Noc = -98 dBm/15 kHz<br>$Es_1$/Noc = 3 dB | ±3*64 Tc<br><br>0dB<br>0dB | ±15*64 Tc<br><br>Noc = -98 dBm/15 kHz<br>$Es_1$/Noc = 3 dB |
| | **Uu Test Configuration 3** | | |
| | Sidelink transmit timing error limit:<br>±10*64 Tc<br><br>Noc = -98 dBm/15 kHz<br>$Es_1$/Noc = 3 dB | ±3*64 Tc<br><br>0dB<br>0dB | ±13*64 Tc<br><br>Noc = -98 dBm/15 kHz<br>$Es_1$/Noc = 3 dB |
| 9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source | **Uu Test Configuration 1, 2** | | |
| | During T1:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = 4.50 dB<br><br>During T2:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = -4.50 dB<br><br>During T3:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = 4.50 dB<br><br>In signalling: | -1.55dB<br>3.10dB<br><br>-1.55dB<br>0dB<br><br>-1.55dB<br>3.10dB | During T1:<br>Noc = -111.55 dBm/15 kHz<br>$Es_1$/Noc = 7.60 dB<br><br>During T2:<br>Noc = -111.55 dBm/15 kHz<br>$Es_1$/Noc = -4.50 dB<br><br>During T3:<br>Noc = -111.55 dBm/15 kHz<br>$Es_1$/Noc = 7.60 dB |

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|---|---|---|---|
| | syncTxThreshIC = -110.00 dBm/SCS | 0dB | syncTxThreshIC = -110.00 dBm/SCS |
| | **Uu Test Configuration 3** | | |
| | During T1:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = 4.50 dB<br><br>During T2:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = -4.50 dB<br><br>During T3:<br>Noc = -110 dBm/15 kHz<br>$Es_1$/Noc = 4.50 dB<br><br>In signalling:<br>syncTxThreshIC = -110.00 dBm/SCS | <br>-4.55dB<br>3.10dB<br><br><br>-4.55dB<br>0dB<br><br><br>-4.55dB<br>3.10dB<br><br><br>0dB | During T1:<br>Noc = -114.55 dBm/15 kHz<br>$Es_1$/Noc = 7.60 dB<br><br>During T2:<br>Noc = -114.55 dBm/15 kHz<br>$Es_1$/Noc = -4.50 dB<br><br>During T3:<br>Noc = -114.55 dBm/15 kHz<br>$Es_1$/Noc = 7.60 dB<br><br><br>syncTxThreshIC = -110.00 dBm/SCS |
| 9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source | During T1:<br>Noc = -98 dBm/30 kHz<br>$Es_1$/Noc = 5.50 dB<br><br>During T2:<br>Noc = -98 dBm/30 kHz<br>$Es_1$/Noc = -3.50 dB<br><br>During T3:<br>Noc = -98 dBm/30 kHz<br>$Es_1$/Noc = 5.50 dB<br><br>In signalling:<br>syncTxThreshOoC = -100.00 dBm/SCS | <br>-1.35dB<br>0dB<br><br><br>-4.55dB<br>0dB<br><br><br>-1.35dB<br>0dB<br><br><br>0dB | During T1:<br>Noc = -99.35 dBm/30 kHz<br>$Es_1$/Noc = 5.50 dB<br><br>During T2:<br>Noc = -102.55 dBm/30 kHz<br>$Es_1$/Noc = -3.50 dB<br><br>During T3:<br>Noc = -99.35 dBm/30 kHz<br>$Es_1$/Noc = 5.50 dB<br><br><br>syncTxThreshOoC = -100.00 dBm/SCS |
| 9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source | During T1:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = -infinity<br>$Es_3$/Noc = -infinity<br><br>During T2:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0 dB<br>$Es_3$/Noc = -infinity<br><br>During T3:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0 dB<br>$Es_3$/Noc = 3 dB | <br>0dB<br>0.35dB<br>N/A<br>N/A<br><br><br>0dB<br>0dB<br>0.35dB<br>N/A<br><br><br>0dB<br>0dB<br>0dB<br>0.35dB | During T1:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0.35 dB<br>$Es_2$/Noc = -infinity<br>$Es_3$/Noc = -infinity<br><br>During T2:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0.35 dB<br>$Es_3$/Noc = -infinity<br><br>During T3:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0 dB<br>$Es_3$/Noc = 3.35 dB |
| 9.1.3.2 NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source | During T1:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = -infinity<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = -infinity<br><br>During T3:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0 dB | <br>0dB<br>N/A<br>N/A<br><br><br>0dB<br>0.35dB<br>N/A<br><br><br>0dB<br>0dB<br>0.35dB | During T1:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = -infinity<br>$Es_2$/Noc = -infinity<br><br>During T2:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0.35 dB<br>$Es_2$/Noc = -infinity<br><br>During T3:<br>Noc = -95 dBm/30 kHz<br>$Es_1$/Noc = 0 dB<br>$Es_2$/Noc = 0.35 dB |
| 9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for | During T1:<br>Noc = -110 dBm/30 kHz<br>$Es_i$/Noc = 10 dB, i = 20~29 | <br>0dB<br>10.55dB | During T1:<br>Noc = -110 dBm/30 kHz<br>$Es_i$/Noc = 20.55 dB, i = 20~29 |

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| autonomous resource selection/reselection | $Es_i/Noc$ = 0 dB, i = 0~19, 30~49<br><br>During T2:<br>Noc = -121 dBm/30 kHz<br>$Es_i/Noc$ = 10 dB, i = 20~29<br>$Es_i/Noc$ = 20 dB, i = 0~19, 30~49<br><br>In signalling:<br>SL-Thres-RSRP = -106 dBm/SCS | 0.35dB<br><br>0dB<br>0dB<br>10.55dB<br><br>6dB | $Es_i/Noc$ = 0.35 dB, i = 0~19, 30~49<br><br>During T2:<br>Noc = -121 dBm/30 kHz<br>$Es_i/Noc$ = 10 dB, i = 20~29<br>$Es_i/Noc$ = 30.55 dB, i = 0~19, 30~49<br><br>In signalling:<br>SL-Thres-RSRP = -100 dBm/SCS |
| 9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption | During T1:<br>Noc = -infinity<br>$Es_1/Noc$ = -infinity<br><br>During T2:<br>Noc = -100 dBm/30 kHz<br>$Es_1/Noc$ = 5 dB<br><br>In signalling:<br>SL-Thres-RSRP = -106 dBm/SCS | <br>N/A<br>N/A<br><br>0dB<br>0dB<br><br>0dB | During T1:<br>Noc = -infinity<br>$Es_1/Noc$ = -infinity<br><br>During T2:<br>Noc = -100 dBm/30 kHz<br>$Es_1/Noc$ = 5 dB<br><br>In signalling:<br>SL-Thres-RSRP = -106 dBm/SCS |
| 9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation | During T1:<br>Noc = -103 dBm/30 kHz<br>$Es_i/Noc$ = 12dB, i = 0~29<br>$Es_i/Noc$ = 2 dB, i = 30~49<br>$Es_i/Noc$ = 25.50 dB, i = 50~64, 85~99<br><br>$Es_i/Noc$ = 12 dB, i = 65~84<br><br>$Es_i/Noc$ = -infinity, i = 100~129<br><br>During T2:<br>Noc = -103 dBm/30 kHz<br>$Es_i/Noc$ = -infinity, i = 0~29<br>$Es_i/Noc$ = 2 dB, i = 30~49<br>$Es_i/Noc$ = 25.5 dB, i = 50~64, 85~99<br><br>$Es_i/Noc$ = 12 dB, i = 65~84<br><br>$Es_i/Noc$ = 25.5dB, i = 100~129<br><br>In signalling:<br>SL-Thres-RSRP = -96 dBm/SCS | <br>-7.05dB<br>2.1dB<br>0dB<br>7.1dB<br><br>2.1dB<br><br>N/A<br><br><br>-7.05dB<br>N/A<br>0dB<br>7.1dB<br><br>2.1dB<br><br>7.55dB<br><br><br>-6dB | During T1:<br>Noc = -110.05 dBm/30 kHz<br>$Es_i/Noc$ = 14.1 dB, i = 0~29<br>$Es_i/Noc$ = 2 dB, i = 30~49<br>$Es_i/Noc$ = 32.60 dB, i = 50~64, 85~99<br>$Es_i/Noc$ = 14.1 dB, i = 65~84<br>$Es_i/Noc$ = -infinity, i = 100~129<br><br>During T2:<br>Noc = -110.05 dBm/30 kHz<br>$Es_i/Noc$ = -infinity, i = 0~29<br>$Es_i/Noc$ = 2 dB, i = 30~49<br>$Es_i/Noc$ = 32.60 dB, i = 50~64, 85~99<br>$Es_i/Noc$ = 14.1 dB, i = 65~84<br>$Es_i/Noc$ = 33.05dB, i = 100~129<br><br>In signalling:<br>SL-Thres-RSRP = -102 dBm/SCS |
| 9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation | During T1:<br>Noc = -103 dBm/30kHz<br>$Es_i/Noc$ = 4.35 dB, i = 0,1,2,3<br><br>During T2:<br>Noc = -103 dBm/30kHz<br>$Es_i/Noc$ = 10.32 dB, i = 0,1,2,3<br><br>In signalling:<br>threshS-RSSI-CBR = -74 dBm/subchannel | <br>-1.55dB<br>0dB<br><br><br>-1.55dB<br>3.30dB<br><br><br>0dB | During T1:<br>Noc = -104.55 dBm/30kHz<br>$Es_i/Noc$ = 4.35 dB, i = 0,1,2,3<br><br>During T2:<br>Noc = -104.55 dBm/30kHz<br>$Es_i/Noc$ = 13.62 dB, i = 0,1,2,3<br><br>In signalling:<br>threshS-RSSI-CBR = -74 dBm/subchannel |
| 9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation | Same as 9.1.5.1 | Same as 9.1.5.1 | Same as 9.1.5.1 |
| 9.1.6.1 NR SA FR1 interruption to WAN | N/A | N/A | N/A |

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| due to NR sidelink communication | | | |

**Table F.1.3.2-7: Derivation of test requirements for NR SA FR1 RRM tests for RedCap**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB<br><br>$Qoffset_{s,n}$ = 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB<br>In signalling<br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB<br><br>$Qoffset_{s,n}$ = -1dB |
| 16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE | Same as 6.1.1.1 | Same as 6.1.1.1 | Same as 6.1.1.1 |
| 16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-4dB<br>1.6dB<br>0.3dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -102dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.7dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE | Same as 6.1.1.2 | Same as 6.1.1.2 | Same as 6.1.1.2 |
| 16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB<br><br>In signalling:<br>$Qoffset_{s,n}$ = 0dB<br>SintrasearchP = 60dB<br>SSearchDeltaP = 3dB | During T1:<br>0dB<br>0dB<br>0.45dB<br><br>During T2:<br>0dB<br>0.45dB<br>0dB<br><br>-1dB<br>2dB<br>3dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB<br><br>In signalling:<br>$Qoffset_{s,n}$ = -1dB<br>SintrasearchP = 62dB<br>SSearchDeltaP = 6dB |
| 16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.1.4 | Same as 6.1.1.4 | Same as 6.1.1.4 |
| 16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz | During T1:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz |

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| measurement criterion for 1 Rx UE | Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: +12dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 48dB<br>Thresh_X_LowP of Cell 1 = 50dB<br>Thresh_X_LowP of Cell 2 = 50dB<br>Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 44dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 3dB | 0.3dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-2.25dB<br><br>In signalling:<br>0dB<br>-4dB<br>-2dB<br>0dB<br>0dB<br>2dB<br>0dB<br>12dB | Ês2 / Noc2: -3.7dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc1: -98dBm/15kHz<br>Ês2 / Noc2: +9.75dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 44dB<br>Thresh_X_LowP of Cell 1 = 48dB<br>Thresh_X_LowP of Cell 2 = 50dB<br>Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 46dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 15dB |
| 16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.1.5 | Same as 6.1.1.5 | Same as 6.1.1.5 |
| 16.1.2.1 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1 RX UE | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: +12dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -4dB<br><br>Qrxlevmin of Cell 2: -141 | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>1.6dB<br><br>During T2:<br>0dB<br>1.6dB<br>-2dB<br>0.4dB<br><br>In signalling:<br>+1dB | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Noc2: -98dBm/15kHz<br>Ês2 / Noc2: +13.6dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Noc2: -100dBm/15kHz<br>Ês2 / Noc2: -3.6dB<br><br>Qrxlevmin of Cell 2: -140 |
| 16.1.2.2 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX UE | Same as 6.1.2.1 | Same as 6.1.2.1 | Same as 6.1.2.1 |
| 16.1.2.3 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1 RX UE | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14Db<br><br>Qrxlevmin of Cell 1: 140 (137) | During T1:<br>-2dB<br>0dB<br>0.4dB<br>1.6dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>In signalling:<br>+1dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -3.6dB<br>Ês2 / Noc2: +15.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.6dB<br>Ês2 / Noc2: +14dB<br><br>Qrxlevmin of Cell 1: 139 (136) |

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| 16.1.2.4 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2 RX UE | Same as 6.1.2.2 | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.1.2.5 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE | Same as 16.1.2.5 | Same as 16.1.2.5 | Same as 16.1.2.5 |
| 16.1.2.6 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 6.1.2.2 | Same as 6.1.2.2 | Same as 6.1.2.2 |
| 16.2.1.1 NR SA FR1 CG-SDT for 1 Rx UE | During T1:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br>During T2:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 12dB<br><br>During T3:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br>During T4:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14dB<br><br>During T5:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14dB<br><br>During T6:<br>Noc =-100 dBm/15kHz<br>Es/Noc = 0dB<br><br>In Signalling<br>cg-SDT-RSRP-ChangeThreshold = 8dB<br><br>cg-SDT-RSRP-ThresholdSSB = -110 dBm/SCS | During T1:<br>0 dB<br>0 dB<br><br>During T2:<br>0 dB<br>0.43 dB<br><br>During T3:<br>0 dB<br>0 dB<br><br>During T4:<br>0 dB<br>0 dB<br><br>During T5:<br>0 dB<br>0 dB<br><br>During T6:<br>0 dB<br>-0.43 dB<br><br>In Signalling<br>0 dB<br><br>-5 dB for Config 1,2,4<br>-2 dB for Config 3 | During T1:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br>During T2:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 12.43dB<br><br>During T3:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 0dB<br><br>During T4:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14dB<br><br>During T5:<br>Noc = -100 dBm/15kHz<br>Es/Noc = 14dB<br><br>During T6:<br>Noc = -100 dBm/15kHz<br>Es/Noc = -0.43dB<br><br>In Signalling<br>cg-SDT-RSRP-ChangeThreshold = 8dB<br><br>cg-SDT-RSRP-ThresholdSSB =<br>-115 dBm/SCS for config 1,2 & 4<br>-112 dBm/SCS for config 3 |
| 16.2.1.2 NR SA FR1 CG-SDT for 2 Rx UE | Same as 6.2.1 | Same as 6.2.1 | Same as 6.2.1 |
| 16.3.1.1 NR SA FR1 handover with known target cell for 1 Rx UE | During T1<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: -infinity<br><br>During T2<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 11 dB<br><br>During T3<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 11 dB<br><br>In signalling<br>A3-Offset 0 dB | 0 dB<br>0 dB<br>0 dB<br><br>0 dB<br>0 dB<br>-1.85dB<br><br>0 dB<br>0 dB<br>-1.85dB<br><br>-2.5dB | During T1<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: -infinity<br><br>During T2<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 9.15 dB<br><br>During T3<br>Noc: -98 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 19.15 dB<br><br>In signalling<br>A3-Offset -2.5 dB |

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| 16.3.1.2 NR SA FR1 handover with known target cell for 2 Rx UE | Same as 6.3.1.1 | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 16.3.1.3 NR SA FR1 handover with unknown target cell for 1 Rx UE | Same as 6.3.1.2 | Same as 6.3.1.2 | Same as 6.3.1.2 |
| 16.3.1.4 NR SA FR1 handover with unknown target cell for 2 Rx UE | Same as 6.3.1.2 | Same as 6.3.1.2 | Same as 6.3.1.2 |
| 16.3.1.5 NR SA FR1-FR1 handover with unknown target cell for 1 Rx UE | Same as 6.3.1.3 | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 16.3.1.6 NR SA FR1-FR1 handover with unknown target cell for 2 Rx UE | Same as 6.3.1.3 | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 16.3.1.7 NR SA FR1 - E-UTRA handover with known target cell for 1 Rx UE | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +8dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +8dB<br><br>In Signalling<br>b2-Threshold1: -96dBm for NR SCS 15kHz and -93dBm for NR SCS 30kHz | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>2.55dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>3dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +10.55dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +8dB<br><br>In Signalling<br>b2-Threshold1: -93dBm for NR SCS 15kHz and -90dBm for NR SCS 30kHz |
| 16.3.1.8 NR SA FR1 - E-UTRA handover with known target cell for 2Rx UE | Same as 6.3.1.4 | Same as 6.3.1.4 | Same as 6.3.1.4 |
| 16.3.1.9 NR - E-UTRA handover with unknown target cell for 1 Rx UE | Same as 6.3.1.5 | Same as 6.3.1.5 | Same as 6.3.1.5 |
| 16.3.1.10 NR - E-UTRA handover with unknown target cell for 2 Rx UE | Same as 6.3.1.5 | Same as 6.3.1.5 | Same as 6.3.1.5 |
| 16.3.2.1.1 NR SA FR1 RRC Re-establishment for 1 Rx UE | Same as 6.3.2.1.1 | Same as 6.3.2.1.1 | Same as 6.3.2.1.1 |
| 16.3.2.1.2 NR SA FR1 RRC Re-establishment for 2 Rx UE | Same as 6.3.2.1.1 | Same as 6.3.2.1.1 | Same as 6.3.2.1.1 |
| 16.3.2.1.3 NR SA FR1-FR1 RRC Re-establishment for 1 Rx UE | Same as 6.3.2.1.2 | Same as 6.3.2.1.2 | Same as 6.3.2.1.2 |
| 16.3.2.1.4 NR SA FR1-FR1 RRC Re-establishment for 2 Rx UE | Same as 6.3.2.1.2 | Same as 6.3.2.1.2 | Same as 6.3.2.1.2 |
| 16.3.2.1.5 NR SA FR1 RRC Re-establishment for 1 Rx UE without serving cell timing | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 |
| 16.3.2.1.6 NR SA FR1 RRC Re-establishment for 2 Rx UE without serving cell timing | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 | Same as 6.3.2.1.3 |
| 16.3.2.2.1 NR SA FR1 4-step RA type contention based random access test in | TEST CONFIGURATION 1,4<br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 3dB | <br><br>0dB<br>1.55dB | <br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 4.55dB |

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| FR1 for NR standalone for 1 Rx UE | Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | 0dB<br><br>Via calculating<br><br><br>± 11.1dB<br><br>±0.7dB<br><br>±112Tc<br><br>0dB | Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 880*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| | TEST CONFIGURATION 2<br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -25dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br><br>± 11.1dB<br><br>±0.7dB<br><br>±112Tc<br><br>0dB | <br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -26.55dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 880*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| | TEST CONFIGURATION 3<br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br><br>± 11.1dB<br><br>±0.7dB<br><br>±112Tc<br><br>0 dB | <br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 624*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| 16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.3 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE | Same as 16.3.2.2.1 | Same as 16.3.2.2.1 | Same as 16.3.2.2.1 |
| 16.3.2.2.4 NR SA FR1 4-step RA type non-contention based | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |

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| random access test in FR1 for NR standalone for 2 Rx UE | | | |
| 16.3.2.2.5 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE | TEST CONFIGURATION 1,4<br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br>Via calculating<br>0dB<br><br><br>± 11.1dB<br><br><br>±0.7dB<br><br><br>±112Tc<br><br><br>0dB | <br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 880*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| | TEST CONFIGURATION 2<br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -25dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br>± 11.1dB<br><br>Via calculating<br>0 dB<br><br><br>± 11.1dB<br><br><br>±0.7dB<br><br><br>±112Tc<br><br><br>0dB | <br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -26.55dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 880*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| | TEST CONFIGURATION 3<br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>First MsgA PUSCH transmit power: 9.6 dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br><br>Via calculating<br><br><br>± 11.1dB<br><br><br>±0.7dB<br><br><br>±112Tc | <br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>First MsgA PUSCH transmit power: 9.6 dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 624*Tc |

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| | In signalling<br>rsrp-ThresholdSSB: -105dB | 0 dB | In signalling<br>rsrp-ThresholdSSB: -105dB |
| 16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.2.7 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE | TEST CONFIGURATION 1<br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>First MsgA PUSCH transmit power: 9.6 dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br>Via calculating<br><br>± 11.1dB<br><br>±0.7dB<br><br>±112Tc<br><br>0 dB | <br><br>Noc: -101dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>First MsgA PUSCH transmit power: 9.6 dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 624*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| | TEST CONFIGURATION 2<br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 3dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -22dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 9dB<br><br>Relative power tolerance:<br>± 2.5dB<br><br>PRACH transmit timing error<br>± 768*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB | <br><br>0dB<br>1.55dB<br>0dB<br><br>Via calculating<br><br>Via calculating<br>0dB<br><br>± 11.1dB<br><br>±0.7dB<br><br>±112Tc<br><br>0dB | <br><br>Noc: -98dBm/15kHz<br>Es0/Noc: 4.55dB<br>Es1/Noc:-17dB<br><br>First PRACH preamble transmit power: -23.55dBm<br><br>First MsgA PUSCH transmit power: 6.6 dBm<br><br>Absolute power tolerance<br>± 20.1dB<br><br>Relative power tolerance:<br>± 3.2dB<br><br>PRACH transmit timing error<br>± 880*Tc<br><br>In signalling<br>rsrp-ThresholdSSB: -105dB |
| 16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 | Same as 6.3.2.2.1 |
| 16.3.2.3.1 NR SA FR1-FR1 RRC connection release with redirection for 1 Rx UE | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 |
| 16.3.2.3.2 NR SA FR1-FR1 RRC connection release with redirection for 2 Rx UE | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 |
| 16.3.2.3.3 NR SA FR1 - E-UTRA RRC connection release with redirection for 1 Rx UE | Same as 6.3.2.3.2 | Same as 6.3.2.3.2 | Same as 6.3.2.3.2 |

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| 16.3.2.3.4 NR SA FR1 - E-UTRA RRC connection release with redirection for 2 Rx UE | Same as 6.3.2.3.2 | Same as 6.3.2.3.2 | Same as 6.3.2.3.2 |
| 16.4.1.1 NR SA FR1 NR UE Transmit Timing accuracy for 1 Rx UE | Same as 6.4.1.1 | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 16.4.1.2 NR SA FR1 NR UE Transmit Timing accuracy for 2 Rx UE | Same as 6.4.1.1 | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 16.4.3.1 NR SA FR1 timing advance adjustment accuracy for 1 Rx UE | Same as 6.4.3.1 | Same as 6.4.3.1 | Same as 6.4.3.1 |
| 16.4.3.2 NR SA FR1 timing advance adjustment accuracy for 2 Rx UE | Same as 6.4.3.1 | Same as 6.4.3.1 | Same as 6.4.3.1 |
| 16.5.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.3 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 1 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.6 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.7 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 1 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.9 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |

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| 16.5.1.11 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.13 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.1 with the exception:<br>- 4Rx is not considered |
| 16.5.1.15 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered | Same as 6.5.1.2 with the exception:<br>- 4Rx is not considered |
| 16.5.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE | Same ad 16.5.2.3 | Same ad 16.5.2.3 | Same ad 16.5.2.3 |
| 16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered |
| 16.5.2.3 NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 1 Rx UE | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB at T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10dB<br><br>q1 SSB at T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10dB<br><br>q1 SSB at T3-5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB at T1:<br>0dB<br>-3.25dB<br><br>q1 SSB at T2:<br>0dB<br>-3.25dB<br><br>q1 SSB at T3-5:<br>0dB<br>+3.25dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br><br>q1 SSB at T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -13.25dB<br><br>q1 SSB at T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -13.25dB<br><br>q1 SSB at T3-5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: +13.25dB |
| 16.5.2.4 NR SA FR1 SSB-based beam failure detection and link recovery in DRX mode for 2 Rx UE | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.1 with the exception:<br>- 4Rx is not considered |
| 16.5.2.5 NR SA FR1 Beam Failure Detection and Link | q0 CSI-RS SNR during:<br>T1: 5dB | Offset during:<br>T1: +0.8dB | SNR during:<br>T1: +5.8dB |

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| Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE | T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T3-5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 CSI-RS during T1:<br>0dB<br>-3.25dB<br><br>q1 CSI-RS during T2:<br>0dB<br>-3.25dB<br><br>q1 CSI-RS during T3-5:<br>0dB<br>+3.25dB | T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -13.25dB<br><br>q1 CSI-RS during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -13.25dB<br><br>q1 CSI-RS during T3-5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +13.25dB |
| 16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered |
| 16.5.2.7 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE | Same ad 16.5.2.5 | Same as 16.5.2.5 | Same ad 16.5.2.5 |
| 16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered | Same as 6.5.5.3 with the exception:<br>- 4Rx is not considered |
| 16.5.3.1.1 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 1 Rx UE | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 |
| 16.5.3.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX for 2 Rx UE | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 | Same as 6.5.6.1.2 |
| 16.5.3.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 1 Rx UE | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 16.5.3.2.2 NR SA FR1 RRC-based DL active BWP switch in non-DRX for 2 Rx UE | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 | Same as 6.5.6.2.1 |
| 16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE | Same as 6.5.8.1 | Same as 6.5.8.1 | Same as 6.5.8.1 |
| 16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE | Same as 6.5.8.1 | Same as 6.5.8.1 | Same as 6.5.8.1 |
| 16.6.1.1 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.3 NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |

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| 16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.5 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.7 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.8 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.9 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.11 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.1.12 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 16.6.2.1 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -98dBm/15kHz<br>Freq 2 Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / Noc: +7.00dB |
| 16.6.2.2 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.3 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE | Same as 16.6.2.1 | Same as 16.6.2.1 | Same as 16.6.2.1 |
| 16.6.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.5 NR SA FR1-FR1 Event triggered reporting tests | Same as 16.6.2.1 | Same as 16.6.2.1 | Same as 16.6.2.1 |

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| for FR1 with SSB time index detection when DRX is not used for 1 Rx UE | | | |
| 16.6.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.7 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 1 Rx UE | Same as 16.6.2.1 | Same as 16.6.2.1 | Same as 16.6.2.1 |
| 16.6.2.8 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.9 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 1 Rx UE | Same as 16.6.2.1 | Same as 16.6.2.1 | Same as 16.6.2.1 |
| 16.6.2.10 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.2.11 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 1 Rx UE | Same as 16.6.2.1 | Same as 16.6.2.1 | Same as 16.6.2.1 |
| 16.6.2.12 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 2 Rx UE | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 16.6.3.1 NR - E-UTRA event-triggered reporting in non-DRX for 1 Rx UE | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +16.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: 0dB<br>Ês2 / Noc: +17.00dB<br><br>In signalling:<br>Configs 1,2,4,5:<br>b2-Threshold1 = -96dBm<br>b2-Threshold2EUTRAN = -95dBm<br><br>Configs 3,6:<br>b2-Threshold1 = -93dBm<br>b2-Threshold2EUTRAN = -95dBm | During T1:<br>0dB<br>0dB<br>+3.55dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1.55dB<br>+1.55dB<br><br>In signalling:<br>Configs 1,2,4,5:<br>+1dB<br>-1dB<br><br>Configs 3,6:<br>+1dB<br>-1dB | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +19.55dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: -1.55dB<br>Ês2 / Noc: +18.55dB<br><br>In signalling:<br>Configs 1,2,4,5:<br>b2-Threshold1 = -95dBm<br>b2-Threshold2EUTRAN = -96dBm<br><br>Configs 3,6:<br>b2-Threshold1 = -92dBm<br>b2-Threshold2EUTRAN = -96dBm |
| 16.6.3.2 NR - E-UTRA event-triggered reporting in non-DRX for 2 Rx UE | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +16.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: 0dB<br>Ês2 / Noc: +17.00dB | During T1:<br>0dB<br>0dB<br>+1.55dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1.55dB<br>+1.55dB | During T1:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: +17.55dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Freq 1 Noc: -104dBm/15kHz<br>Freq 2 Noc: -104dBm/15kHz<br>Ês1 / Noc: -1.55dB<br>Ês2 / Noc: +18.55dB |

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| 16.6.3.3 NR - E-UTRA event-triggered reporting in DRX for 1 Rx UE | Same as 16.6.3.1 | Same as 16.6.3.1 | Same as 16.6.3.1 |
| 16.6.3.4 NR - E-UTRA event-triggered reporting in DRX for 2 Rx UE | Same as 16.6.3.2 | Same as 16.6.3.2 | Same as 16.6.3.2 |
| 16.6.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE | During T1:<br>Noc: -94.65 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: -infinity<br><br>During T2:<br>Noc: -94.65 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 3 dB<br><br>Test Configuration 1,2,4<br>Reported SSB#1 absolute L1-RSRP values: -88.15 ± 13.03 dBm/SCS<br>Reported SSB#0 differential L1-RSRP values: -6.5 ± 6.42 dB<br><br>Test Configuration 3<br>Reported SSB#1 absolute L1-RSRP values: -85.15 ± 13.03 dBm/SCS<br>Reported SSB#0 differential L1-RSRP values: -6.5 ± 6.42 dB | <br>0 dB<br>0 dB<br>0 dB<br><br><br>0 dB<br>0 dB<br>3.5 dB<br><br><br>Via mapping | During T1:<br>Noc: -94.65 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: -infinity<br><br>During T2:<br>Noc: -94.65 dBm/15kHz<br>Es1/Noc: 0 dB<br>Es2/Noc: 6.5 dB<br><br>Test Configuration 1,2,4<br>Reported SSB#1 absolute L1-RSRP Range: RSRP_55 to RSRP_81<br>Reported SSB#0 differential L1-RSRP range: DIFFRSRP_0 to DIFFRSRP_6<br><br>Test Configuration 3<br>Reported SSB#1 absolute L1-RSRP Range: RSRP_58 to RSRP_84<br>Reported SSB#0 differential L1-RSRP range: DIFFRSRP_0 to DIFFRSRP_6 |
| 16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 | Same as 6.6.4.1 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.6.4.3 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE | Same as 16.6.4.1 | Same as 16.6.4.1 | Same as 16.6.4.1 |
| 16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE | Same as 6.6.4.1 | Same as 6.6.4.1 | Same as 6.6.4.1 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.6.4.5 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +3.00dB<br><br>Reported CSI-RSRP values ± 13.03dB<br>Reported Differential CSI-RSRP values ± 6.42dB<br>Same as 6.6.4.3 | 0dB<br>0dB<br>3.5dB<br><br>Via mapping<br>Same as 6.6.4.3 | Noc: -94.65dBm/15kHz<br>$\hat{E}s_0$ / Noc: 0.00dB<br>$\hat{E}s_1$ / Noc: +6.50dB<br><br>**For configuration 1,2,4**<br>CSI-RS#1: RSRP_55 to RSRP_81<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_6<br><br>**For configuration 3**<br>CSI-RS#1: RSRP_58 to RSRP_84<br>CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_6<br>Same as 6.6.4.3 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |

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| 16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 | Same as 6.6.4.3 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.6.4.7 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 1 Rx UE | Same as 6.6.4.3 Same as 16.6.4.5 | Same as 16.6.4.5Same as 6.6.4.3 | Same as 16.6.4.5Same as 6.6.4.3 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE | Same as 6.6.4.3 | Same as 6.6.4.3 | Same as 6.6.4.3 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.6.5.3 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 1 Rx UE | During T1<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB<br><br>During T3<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB | During T1<br>-0.55dB<br>0dB<br>0dB<br>0dB<br><br>During T2<br>-0.55dB<br>0dB<br>0dB<br>0.55dB<br><br>During T3<br>-0.55dB<br>0dB<br>0dB<br>0.55dB | During T1<br>Noc1: -106.55dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106.55dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7.55dB<br><br>During T3<br>Noc1: -106.55dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7.55dB |
| 16.6.5.4 NR SA FR1 - E-UTRA CGI Identification of E-UTRA cell for 2 Rx UE | During T1<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB<br><br>During T3<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB | During T1<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3<br>0dB<br>0dB<br>0dB<br>0dB | During T1<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: 18dB<br>Es2/Noc2: -infinity<br><br>During T2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB<br><br>During T3<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -2dB<br>Es2/Noc2: 7dB |
| 16.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | TEST CONFIGURATION 1, 2, 4<br><br>Test 1:<br>Noc: -106dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported RSRP values: ±5.5dB<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported RSRP values: ±9dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: 0dB | <br>Test 1:<br>-1.5dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB | <br>Test 1:<br>Noc: -107.5dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.4dB<br>RSRP_43 to RSRP_57<br><br>Test 2:<br>Noc: -88dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.4dB<br>RSRP_59 to RSRP_80<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: -0dB |

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| | Reported RSRP values: ±5.5dB | Via mapping | RSRP_35 to RSRP_50<br>RSRP_36 to RSRP_50<br>RSRP_36 to RSRP_51<br>RSRP_37 to RSRP_51<br>RSRP_37 to RSRP_52<br>RSRP_38 to RSRP_52<br>RSRP_38 to RSRP_53<br>RSRP_39 to RSRP_53<br>depending on operating band |
| | TEST CONFIGURATION 3 | | |
| | Test 1:<br>N/A<br><br>Test 2:<br>Noc: -94dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported RSRP values: ±9dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: 0dB<br><br>Reported RSRP values: ±5.5dB | Test 1:<br>N/A<br><br>Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 3:<br>-1.2dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>N/A<br><br>Test 2:<br>Noc: -94dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.4dB<br>RSRP_56 to RSRP_77<br><br>Test 3:<br>Noc: -115.2dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: -0dB<br><br>RSRP_37 to RSRP_51<br>RSRP_38 to RSRP_52<br>RSRP_38 to RSRP_52<br>RSRP_39 to RSRP_53<br>RSRP_39 to RSRP_53<br>RSRP_40 to RSRP_54<br>RSRP_40 to RSRP_54<br>RSRP_41 to RSRP_55<br>depending on operating band |
| 16.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | Test 1:<br>Noc:<br>Test configuration 1, 2, 4: -106dBm/15kHz<br>Test configuration 3: N/A<br><br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported rel. SS-RSRP values: ±3dB<br><br>Test 2:<br>Noc:<br>Test configuration 1, 2, 4: -88dBm/15kHz<br>Test configuration 3 -94dBm/15kHz<br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +1.0dB<br>Reported rel. SS-RSRP values: ±3dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br><br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: 0dB<br>Reported re. SS-RSRP values: ±3dB | Test 1:<br><br>0 dB<br><br>N/A<br><br>0 dB<br>+1.0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br><br>+1.0dB<br><br>Via mapping<br><br>Test 3:<br>0dB<br><br>0dB<br>0dB<br>Via mapping | Test 1:<br><br>Noc: -106 dBm/15kHz<br><br>N/A<br><br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 2:<br>Noc:<br>-88dBm/15kHz<br>-94dBm/15kHz<br><br>Ês1 / Noc: +6.0dB<br>Ês2 / Noc: +2.0dB<br>RSRP_x-8 to RSRP_x-1<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: 0dB<br>RSRP_x-7 to RSRP_x+1 |

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| 16.7.1.2.1 NR SA FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.7.1.2.2 NR SA FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.1.1.2 | Same as 6.7.1.1.2 | Same as 6.7.1.1.2 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.7.1.3.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 1 Rx UE | TEST CONFIGURATION 1, 2, 4 | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_61 to RSRP_82<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_31 to RSRP_46<br>RSRP_32 to RSRP_46<br>RSRP_32 to RSRP_47<br>RSRP_33 to RSRP_47<br>RSRP_33 to RSRP_48<br>RSRP_34 to RSRP_49<br>RSRP_35 to RSRP_49<br>depending on operating band |
| | TEST CONFIGURATION 3 | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_64 to RSRP_85<br><br>Test 2:<br>$N_{oc}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc1}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_34 to RSRP_49<br>RSRP_35 to RSRP_49<br>RSRP_36 to RSRP_50<br>RSRP_36 to RSRP_50<br>RSRP_36 to RSRP_51<br>RSRP_37 to RSRP_52<br>RSRP_38 to RSRP_52<br>depending on operating band |
| 16.7.1.3.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 1 Rx UE | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$N_{oc2}$: -94.65dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB |

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| | Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: +13.0dB<br>Ês2 / $N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | RSRP_x-8 to RSRP_x+8<br><br>Test 2:<br>$N_{oc1}$: -107dBm/15kHz + $\Delta_{BG_offset}$<br>$N_{oc2}$: -115dBm/15kHz + $\Delta_{BG_offset}$<br>Ês1 / $N_{oc1}$: +13.0dB<br>Ês2 / $N_{oc2}$: -3.0dB<br><br>RSRP_x-34 to RSRP_x-15 |
| 16.7.1.4.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.7.1.4.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.1.2.2 | Same as 6.7.1.2.2 | Same as 6.7.1.2.2 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |
| 16.7.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | TEST CONFIGURATION 1, 2, 4 | | |
| | Test 1:<br>Noc: -85dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Reported RSRQ values: ±3.5dB<br><br>Test 2:<br>Noc: -101dBm/15kHz<br>Ês1 / Noc: -2.9dB<br>Ês2 / Noc: -2.9dB<br>Reported RSRQ values: ±4.5dB<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: -4.0dB<br>Ês2 / Noc: -4.0dB<br><br>Reported RSRQ values: ±4.5dB | Test 1:<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>Noc: -86.5dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>RSRQ_50 to RSRQ_64<br><br>Test 2:<br>Noc: -101dBm/15kHz<br>Ês1 / Noc: -2.9dB<br>Ês2 / Noc: -2.9dB<br>RSRQ_44 to RSRQ_62<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: -4.0dB<br>Ês2 / Noc: -4.0dB<br><br>RSRQ_42 to RSRQ_61 |
| | TEST CONFIGURATION 3 | | |
| | Test 1:<br>Noc: -91dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>N/A<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: -4.0dB<br>Ês2 / Noc: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.6dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>N/A<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>Noc: -86.5dBm/15kHz<br>Ês1 / Noc: +3.0dB<br>Ês2 / Noc: +3.0dB<br>RSRQ_50 to RSRQ_64<br><br>Test 2:<br>N/A<br><br>Test 3:<br>Noc: -114dBm/15kHz + ΔBG_offset<br>Ês1 / Noc: -4.0dB<br>Ês2 / Noc: -4.0dB<br><br>RSRQ_42 to RSRQ_61 |
| 16.7.2.2 NR SA FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | Same as 6.7.2.1 | Same as 6.7.2.1 | Same as 6.7.2.1 with following exceptions:<br>- Test requirements for configuration 1,2 also apply to configuration 4 |

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| 16.7.2.3.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 1 Rx UE | Test configuration 1,2,4:<br><br>Test 1<br>Noc1: -80.18dBm/15kHz<br>Noc2: -80.18dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB | <br><br>Test 1<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 3<br>0dB<br><br>0dB<br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc1: -81.68dBm/15kHz<br>Noc2: -81.68dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67 |
| | Test configuration 3:<br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB | <br><br>Test 1<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 3<br>0dB<br><br>0dB<br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67 |

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| | Extreme condition, Reported RSRQ values: ±5.18dB | | |
| 16.7.2.3.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 1 Rx UE | Test configuration 1,2,4:<br><br>Test 1<br>Noc1: -80.18dBm/15kHz<br>Noc2: -80.18dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±4.25dB<br>Extreme condition, Reported RSRQ values: ±5.25dB<br><br>Test 2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±4.25dB<br>Extreme condition, Reported RSRQ values: ±5.25dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±4.21dB<br>Extreme condition, Reported RSRQ values: ±5.21dB | <br><br>Test 1<br>-1.5dB<br>-1.5dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br>Test 3<br>0dB<br><br>0dB<br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc1: -81.68dBm/15kHz<br>Noc2: -81.68dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-9 to RSRQ_x+9<br>Extreme condition, RSRQ_x-11 to RSRQ_x+11<br><br>Test 2<br>Noc1: -106dBm/15kHz<br>Noc2: -106dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-9 to RSRQ_x+9<br>Extreme condition, RSRQ_x-11 to RSRQ_x+11<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-13 to RSRQ_x+4<br>Extreme condition, RSRQ_x-15 to RSRQ_x+6 |
| | Test configuration 3:<br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB | <br><br>Test 1<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br>Test 3<br>0dB<br><br>0dB<br><br>0dB<br>0dB<br>Via mapping | <br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-9 to RSRQ_x+9<br>Extreme condition, RSRQ_x-11 to RSRQ_x+11<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-9 to RSRQ_x+9<br>Extreme condition, RSRQ_x-11 to RSRQ_x+11<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-13 to RSRQ_x+4 |

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| | Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB | Via mapping | Extreme condition, RSRQ_x-15 to RSRQ_x+6 |
| 16.7.2.4.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for 2 Rx UE | Test configuration 1,2,4:<br><br>Same as 6.7.2.2.2 test configuration 1,2 | Same as 6.7.2.2.2 test configuration 1,2 | Same as 6.7.2.2.2 test configuration 1,2 |
| | Test configuration 3:<br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB | <br><br>Test 1<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 3<br>0dB<br><br>0dB<br><br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_50 to RSRQ_64<br>Extreme condition, RSRQ_47 to RSRQ_67 |
| 16.7.2.4.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for 2 Rx UE | Test configuration 1,2,4:<br><br>Same as 6.7.2.2.2 test configuration 1, 2 | Same as 6.7.2.2.2 test configuration 1, 2 | Same as 6.7.2.2.2 test configuration 1, 2 |
| | Test configuration 3:<br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB | <br><br>Test 1<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br>Test 2<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping | <br><br>Test 1<br>Noc1: -86.27dBm/15kHz<br>Noc2: -86.27dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-7 to RSRQ_x+7<br>Extreme condition, RSRQ_x-9 to RSRQ_x+9<br><br>Test 2<br>Noc1: -113dBm/15kHz<br>Noc2: -113dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB |

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| | Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br><br>Noc2: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported RSRQ values: ±3.68dB<br>Extreme condition, Reported RSRQ values: ±5.18dB | Via mapping<br><br>Test 3<br>0dB<br><br>0dB<br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | Normal condition, RSRQ_x-7 to RSRQ_x+7<br>Extreme condition, RSRQ_x-9 to RSRQ_x+9<br><br>Test 3<br>Noc1: -116dBm/15kHz + ΔBG_offset<br>Noc2: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc1: 3dB<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_x-11 to RSRQ_x+2<br>Extreme condition, RSRQ_x-13 to RSRQ_x+4 |
| 16.7.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | Test configuration 1, 2, 4:<br><br>Same as 6.7.3.1 test configuration 1, 2 | Same as 6.7.3.1 test configuration 1, 2 | Same as 6.7.3.1 test configuration 1, 2 |
| | Test configuration 3:<br><br>Test 1<br>Noc: -93dBm/15kHz<br>Es1/Noc: 4.54dB<br>Es2/Noc: 2.66dB<br>Normal condition, Reported SINR values: ±4.40dB<br>Extreme condition, Reported SINR values: ±4.90dB<br><br>Test 2<br>Noc: -116dBm/15kHz + ΔBG_offset<br><br>Es1/Noc: -4dB<br>Es2/Noc: -4dB<br>Normal condition, Reported SINR values: ±4.17dB<br>Extreme condition, Reported SINR values: ±4.67dB | <br><br><br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br><br>0.5dB<br>0.5dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc: -93dBm/15kHz<br>Es1/Noc: 4.54dB<br>Es2/Noc: 2.66dB<br>Normal condition, SINR_29 to SINR_51<br><br>Extreme condition, SINR_28 to SINR_52<br><br>Test 2<br>Noc: -116dBm/15kHz + ΔBG_offset<br>Es1/Noc: -3.5dB<br>Es2/Noc: -3.5dB<br>Normal condition, SINR_26 to SINR_47<br><br>Extreme condition, SINR_25 to SINR_48 |
| 16.7.3.2 NR SA FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | Same as 16.7.3.1 | Same as 16.7.3.1 | Same as 16.7.3.1 |
| 16.7.3.3.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 1 Rx UE | Test 1<br>Noc1: -88dBm/15kHz<br>Noc2: -88dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported SINR values: ±4.30dB<br>Extreme condition, Reported SINR values: ±5.30dB<br><br>Test 2<br>Noc1: -108.5dBm/15kHz<br>Noc2: -108.5dBm/15kHz<br>Es1/Noc1: 20dB<br>Es2/Noc2: 20dB<br>Normal condition, Reported SINR values: ±4.30dB | <br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping | Test 1<br>Noc1: -88dBm/15kHz<br>Noc2: -88dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, SINR_34 to SINR_52<br>Extreme condition, SINR_32 to SINR_54<br><br>Test 2<br>Noc1: -108.5dBm/15kHz<br>Noc2: -108.5dBm/15kHz<br>Es1/Noc1: 20dB<br>Es2/Noc2: 20dB<br>Normal condition, SINR_78 to SINR_95 |

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| | Extreme condition, Reported SINR values: ±5.30dB<br><br>Test 3<br>Noc1: -119.5dBm/15kHz + ΔBG_offset<br><br>Noc2: -119.5dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: -4dB<br>Es2/Noc2: -4dB<br>Normal condition, Reported SINR values: ±4.80dB<br>Extreme condition, Reported SINR values: ±5.30dB | Via mapping<br><br><br><br>0dB<br><br>0dB<br><br>0.35dB<br>0.35dB<br>Via mapping<br><br>Via mapping | Extreme condition, SINR_76 to SINR_97<br><br>Test 3<br>Noc1: -119.5dBm/15kHz + ΔBG_offset<br>Noc2: -119.5dBm/15kHz + ΔBG_offset<br>Es1/Noc1: -3.65dB<br>Es2/Noc2: -3.65dB<br>Normal condition, SINR_30 to SINR_49<br>Extreme condition, SINR_29 to SINR_50 |
| 16.7.3.3.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 1 Rx UE | Test 1<br>Noc1: -88dBm/15kHz<br>Noc2: -88dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported SINR values: ±4.92dB<br>Extreme condition, Reported SINR values: ±5.42dB<br><br>Test 2<br>Noc1: -108.5dBm/15kHz<br>Noc2: -108.5dBm/15kHz<br>Es1/Noc1: 20dB<br>Es2/Noc2: 20dB<br>Normal condition, Reported SINR values: ±4.92dB<br>Extreme condition, Reported SINR values: ±5.42dB<br><br>Test 3<br>Noc1: -119.5dBm/15kHz + ΔBG_offset<br><br>Noc2: -119.5dBm/15kHz + ΔBG_offset<br><br>Es1/Noc1: -4dB<br>Es2/Noc2: -4dB<br>Normal condition, Reported SINR values: ±5.42dB<br>Extreme condition, Reported SINR values: ±5.42dB | <br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br><br>0dB<br><br>0.35dB<br>0.35dB<br>Via mapping<br><br>Via mapping | Test 1<br>Noc1: -88dBm/15kHz<br>Noc2: -88dBm/15kHz<br>Es1/Noc1: -1.75dB<br>Es2/Noc2: -1.75dB<br>Normal condition, SINR_x-10 to SINR_x+10<br>Extreme condition, SINR_x-11 to SINR_x+11<br><br>Test 2<br>Noc1: -108.5dBm/15kHz<br>Noc2: -108.5dBm/15kHz<br>Es1/Noc1: 20dB<br>Es2/Noc2: 20dB<br>Normal condition, SINR_x-10 to SINR_x+10<br>Extreme condition, SINR_x-11 to SINR_x+11<br><br>Test 3<br>Noc1: -119.5dBm/15kHz + ΔBG_offset<br>Noc2: -119.5dBm/15kHz + ΔBG_offset<br>Es1/Noc1: -3.65dB<br>Es2/Noc2: -3.65dB<br>Normal condition, SINR_x-11 to SINR_x+11<br>Extreme condition, SINR_x-11 to SINR_x+11 |
| 16.7.3.4.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for 2 Rx UE | Same as 6.7.3.2.1 | Same as 6.7.3.2.1 | Same as 6.7.3.2.1 |
| 16.7.3.4.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for 2 Rx UE | Same as 6.7.3.2.2 | Same as 6.7.3.2.2 | Same as 6.7.3.2.2 |
| 16.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 1 Rx UE | Test configuration 1, 2, 4:<br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, Reported L1-RSRP values: ±13.03dB<br>Extreme condition, Reported L1-RSRP values: ±16.03dB<br><br>Test 2 | <br><br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping | <br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, RSRP_59 to RSRP_85<br>Extreme condition, RSRP_56 to RSRP_88<br><br>Test 2 |

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| | Noc: -117dBm/15kHz + ΔBG_offset<br><br>Es/Noc: -3dB<br>Normal condition, Reported L1-RSRP values: ±13.03dB<br><br><br><br><br><br><br><br><br>Extreme condition, Reported L1-RSRP values: ±16.03dB | 0dB<br><br>0.35dB<br>Via mapping<br><br><br><br><br><br><br><br><br>Via mapping | Noc: -117dBm/15kHz + ΔBG_offset<br>Es/Noc: -2.65dB<br>Normal condition:<br>RSRP_27 to RSRP_46<br>RSRP_28 to RSRP_47<br>RSRP_28 to RSRP_47<br>RSRP_29 to RSRP_48<br>RSRP_29 to RSRP_48<br>RSRP_30 to RSRP_49<br>RSRP_30 to RSRP_49<br>RSRP_31 to RSRP_50<br>Depending on band groups<br><br>Extreme condition:<br>RSRP_23 to RSRP_51<br>RSRP_23 to RSRP_51<br>RSRP_24 to RSRP_52<br>RSRP_24 to RSRP_52<br>RSRP_25 to RSRP_53<br>RSRP_25 to RSRP_53<br>RSRP_26 to RSRP_54<br>RSRP_26 to RSRP_54<br>Depending on band groups |
| | Test configuration 3:<br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, Reported L1-RSRP values: ±13.03dB<br>Extreme condition, Reported L1-RSRP values: ±16.03dB<br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br><br>Es/Noc: -3dB<br>Normal condition, Reported L1-RSRP values: ±13.03dB<br><br><br><br><br><br><br><br><br>Extreme condition, Reported L1-RSRP values: ±16.03dB | <br><br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br>0dB<br><br>0.35dB<br>Via mapping<br><br><br><br><br><br><br><br><br>Via mapping | <br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, RSRP_62 to RSRP_88<br>Extreme condition, RSRP_59 to RSRP_91<br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br>Es/Noc: -2.65dB<br>Normal condition:<br>RSRP_30 to RSRP_49<br>RSRP_31 to RSRP_50<br>RSRP_31 to RSRP_50<br>RSRP_32 to RSRP_51<br>RSRP_32 to RSRP_51<br>RSRP_33 to RSRP_52<br>RSRP_33 to RSRP_52<br>RSRP_34 to RSRP_53<br>Depending on band groups<br><br>Extreme condition:<br>RSRP_26 to RSRP_54<br>RSRP_26 to RSRP_54<br>RSRP_27 to RSRP_55<br>RSRP_27 to RSRP_55<br>RSRP_28 to RSRP_56<br>RSRP_28 to RSRP_56<br>RSRP_29 to RSRP_57<br>RSRP_29 to RSRP_57<br>Depending on band groups |
| 16.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 1 Rx UE | Test configuration 1, 2, 4:<br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, Reported differential L1-RSRP values: ±6.6dB | <br><br><br>0dB<br>0dB<br>Via mapping<br><br><br>Via mapping | <br><br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, DIFFRSRP_0 to DIFFRSRP_3 |

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|---|---|---|---|
| | Extreme condition, Reported differential L1-RSRP values: ±7.6dB<br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br><br>Es/Noc: -3dB<br>Normal condition, Reported differential L1-RSRP values: ±6.6dB<br><br>Extreme condition, Reported differential L1-RSRP values: ±7.6dB | <br><br><br><br>0dB<br><br>0.35dB<br>Via mapping<br><br><br>Via mapping | Extreme condition, DIFFRSRP_0 to DIFFRSRP_3<br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br>Es/Noc: -2.65dB<br>Normal condition, DIFFRSRP_0 to DIFFRSRP_3<br>Extreme condition, DIFFRSRP_0 to DIFFRSRP_3 |
| | Test configuration 3:<br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, Reported differential L1-RSRP values: ±6.6dB<br><br>Extreme condition, Reported differential L1-RSRP values: ±7.6dB<br><br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br><br>Es/Noc: -3dB<br>Normal condition, Reported differential L1-RSRP values: ±6.6dB<br><br>Extreme condition, Reported differential L1-RSRP values: ±7.6dB | <br><br>0dB<br>0dB<br>Via mapping<br><br><br>Via mapping<br><br><br><br><br>0dB<br><br>0.35dB<br>Via mapping<br><br><br>Via mapping | <br><br>Test 1<br>Noc: -94.65dBm/15kHz<br>Es/Noc: 10dB<br>Normal condition, DIFFRSRP_0 to DIFFRSRP_3<br>Extreme condition, DIFFRSRP_0 to DIFFRSRP_3<br><br>Test 2<br>Noc: -117dBm/15kHz + ΔBG_offset<br>Es/Noc: -2.65dB<br>Normal condition, DIFFRSRP_0 to DIFFRSRP_3<br>Extreme condition, DIFFRSRP_0 to DIFFRSRP_3 |
| 16.7.4.2.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy for 2 Rx UE | Test configuration 1, 2, 4:<br>Same as 6.7.4.1.1 | Same as 6.7.4.1.1 | Same as 6.7.4.1.1 |
| | Test configuration 3:<br><br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB (±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br><br>$\hat{E}s_1 / N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB (±4.5dB additionally for extreme conditions) | Test 1:<br>0dB<br>0dB<br>Via mapping<br><br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br><br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>RSRP_65 to RSRP_85<br><br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz + $\Delta_{BG_offset}$<br>$\hat{E}s_1 / N_{oc1}$: -2.2dB<br><br>RSRP_34 to RSRP_47<br>RSRP_34 to RSRP_48<br>RSRP_35 to RSRP_48<br>RSRP_35 to RSRP_49<br>RSRP_36 to RSRP_49<br>RSRP_37 to RSRP_50<br>RSRP_37 to RSRP_51<br>depending on operating band |
| 16.7.4.2.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 |
| 16.7.4.3.1 NR SA FR1 CSI-RS based L1-RSRP absolute | Same as 16.7.4.1.1 | Same as 16.7.4.1.1 | Same as 16.7.4.1.1 |

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|---|---|---|---|
| measurement accuracy for 1 Rx UE | | | |
| 16.7.4.3.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 1 Rx UE | Same as 16.7.4.1.2 | Same as 16.7.4.1.2 | Same as 16.7.4.1.2 |
| 16.7.4.4.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy for 2 Rx UE | Same as 16.7.4.2.1 | Same as 16.7.4.2.1 | Same as 16.7.4.2.1 |
| 16.7.4.4.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy for 2 Rx UE | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 | Same as 6.7.4.1.2 |
| 16.7.5.1 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 1 Rx UE | Test 1<br>Noc2: -91.65dBm/15kHz<br>Es2/Noc2: 10dB<br>Normal condition, Reported LTE RSRP values: ±10.53dB<br>Extreme condition, Reported LTE RSRP values: ±13.53dB<br><br>Test 2<br>Noc2: -117dBm/15kHz + ΔBG_offset<br><br>Es2/Noc2: -4dB<br>Normal condition, Reported LTE RSRP values: ±7.03dB<br><br><br><br><br><br><br><br>Extreme condition, Reported LTE RSRP values: ±11.53dB | <br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br><br>0dB<br><br>0.35dB<br>Via mapping<br><br><br><br><br><br><br><br><br><br><br>Via mapping | <br>Noc2: -91.65dBm/15kHz<br>Es2/Noc2: 10dB<br>Normal condition, RSRP_48 to RSRP_69<br>Extreme condition, RSRP_45 to RSRP_72<br><br><br>Noc2: -117dBm/15kHz + ΔBG_offset<br>Es2/Noc2: -3.65dB<br>Normal condition, RSRP_13 to RSRP_27<br>RSRP_13 to RSRP_27<br>RSRP_14 to RSRP_28<br>RSRP_14 to RSRP_28<br>RSRP_15 to RSRP_29<br>RSRP_16 to RSRP_30<br>RSRP_16 to RSRP_30<br>Depending on band groups<br>Extreme condition, RSRP_8 to RSRP_31<br>RSRP_9 to RSRP_32<br>RSRP_9 to RSRP_32<br>RSRP_10 to RSRP_33<br>RSRP_10 to RSRP_33<br>RSRP_11 to RSRP_34<br>RSRP_12 to RSRP_35<br>Depending on band groups |
| 16.7.5.2 NR SA FR1 - E-UTRA RSRP absolute measurement accuracy for 2 Rx UE | Same as 6.7.5.1 | Same as 6.7.5.1 | Same as 6.7.5.1 |
| 16.7.6.1 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 1 Rx UE | Test 1<br>Noc2: -83dBm/15kHz<br>Es2/Noc2: -1.75dB<br>Normal condition, Reported LTE RSRQ values: ±3.68dB<br>Extreme condition, Reported LTE RSRQ values: ±5.18dB<br><br>Test 2<br>Noc2: -104.7dBm/15kHz<br>Es2/Noc2: -4dB<br>Normal condition, Reported LTE RSRQ values: ±4.72dB<br>Extreme condition, Reported LTE RSRQ values: ±5.22dB<br><br>Test 3<br>Noc2: -119.5dBm/15kHz + ΔBG_offset | <br>0dB<br>0dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br>0.35dB<br>Via mapping<br><br>Via mapping<br><br><br><br>0dB<br><br>0.35dB | <br>Noc2: -83dBm/15kHz<br>Es2/Noc2: -1.75dB<br>Normal condition, RSRQ_3 to RSRQ_17<br>Extreme condition, RSRP_0 to RSRP_20<br><br><br>Noc2: -104.7dBm/15kHz<br>Es2/Noc2: -3.65dB<br>Normal condition, RSRQ_0 to RSRQ_17<br>Extreme condition, RSRP_0 to RSRP_18<br><br><br>Noc2: -119.5dBm/15kHz + ΔBG_offset<br>Es2/Noc2: -3.65dB |

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| | Es2/Noc2: -4dB<br>Normal condition, Reported LTE RSRQ values: ±4.72dB<br>Extreme condition, Reported LTE RSRQ values: ±5.22dB | Via mapping<br><br>Via mapping | Normal condition, RSRQ_0 to RSRQ_17<br>Extreme condition, RSRP_0 to RSRP_18 |
| 16.7.6.2 NR SA FR1 - E-UTRA RSRQ absolute measurement accuracy for 2 Rx UE | Same as 6.7.6.1 | Same as 6.7.6.1 | Same as 6.7.6.1 |

**Table F.1.3.2-8: Derivation of test requirements for NR SA FR2 RRM tests for RedCap**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 17.1.1.1 NR SA FR2 Cell reselection for 2 Rx UE | Same as 7.1.1.1 | Same as 7.1.1.1 | Same as 7.1.1.1 |
| 17.1.1.2 NR SA FR2-FR2 Cell reselection for 2 Rx UE | Same as 7.1.1.2 | Same as 7.1.1.2 | Same as 7.1.1.2 |
| 17.1.1.3 NR SA FR2 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE | Same as 7.1.1.3 | Same as 7.1.1.3 | Same as 7.1.1.3 |
| 17.1.1.4 NR SA FR2-FR2 Cell reselection for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE | Same as 7.1.1.5 | Same as 7.1.1.5 | Same as 7.1.1.5 |
| 17.3.1.1 NR SA FR2 handover with unknown target cell for 2 Rx | Same as 7.3.1.2 | Same as 7.3.1.2 | Same as 7.3.1.2 |
| 17.3.1.2 NR SA FR2-FR2 handover with unknown target cell for 2 Rx UE | Same as 7.3.1.3 | Same as 7.3.1.3 | Same as 7.3.1.3 |
| 17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2 | Same as 7.3.2.1.1 | Same as 7.3.2.1.1 | Same as 7.3.2.1.1 |
| 17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2 | Same as 7.3.2.1.2 | Same as 7.3.2.1.2 | Same as 7.3.2.1.2 |
| 17.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing | Same as 7.3.2.1.3 | Same as 7.3.2.1.3 | Same as 7.3.2.1.3 |
| 17.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection for 2 Rx UE | Same as 7.3.2.3 | Same as 7.3.2.3 | Same as 7.3.2.3 |
| 17.4.1.1 NR SA FR2 NR UE Transmit Timing accuracy for 2 Rx UE | Same as 7.4.1.1 | Same as 7.4.1.1 | Same as 7.4.1.1 |
| 17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 7.5.1.1 | Same as 7.5.1.1 | Same as 7.5.1.1 |
| 17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 | Same as 7.5.1.2 | Same as 7.5.1.2 | Same as 7.5.1.2 |

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| PCell configured with SSB-based RLM-RS in non-DRX mode for 2 Rx UE | | | |
| 17.5.1.3 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 7.5.1.1 | Same as 7.5.1.1 | Same as 7.5.1.1 |
| 17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM-RS in DRX mode for 2 Rx UE | Same as 7.5.1.4 | Same as 7.5.1.4 | Same as 7.5.1.4 |
| 17.5.1.5 NR SA FR2 Radio Link Monitoring Out-of-sync Test for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for 2 Rx UE | Same as 7.5.1.5 | Same as 7.5.1.5 | Same as 7.5.1.5 |
| 17.5.1.6 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE | Same as 7.5.1.6 | Same as 7.5.1.6 | Same as 7.5.1.6 |
| 17.5.1.7 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 7.5.1.7 | Same as 7.5.1.7 | Same as 7.5.1.7 |
| 17.5.1.8 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE | Same as 7.5.1.8 | Same as 7.5.1.8 | Same as 7.5.1.8 |
| 17.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions | Same as 7.5.1.9 | Same as 7.5.1.9 | Same as 7.5.1.9 |
| 17.5.2.1 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.1 | Same as 7.5.5.1 | Same as 7.5.5.1 |
| 17.5.2.2 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode for 2 Rx UE | Same as 7.5.5.2 | Same as 7.5.5.2 | Same as 7.5.5.2 |
| 17.5.2.3 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.3 | Same as 7.5.5.3 | Same as 7.5.5.3 |

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| 17.5.2.4 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE | Same as 7.5.5.4 | Same as 7.5.5.4 | Same as 7.5.5.4 |
| 17.5.2.5 NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE | Same as 7.5.5.1 | Same as 7.5.5.1 | Same as 7.5.5.1 |
| 17.5.3.1.1 NR SA FR2 DCI-based and Timer-based DL active BWP switch for 2 Rx UE | T1 to T3<br>Noc: -112 dBm/15kHz<br>Ês / Noc: 18dB | <br>0dB<br>0dB | T1 to T3<br>Noc: -112 dBm/15kHz<br>Ês / Noc: 18dB |
| 17.5.3.2.1 NR SA FR2 RRC-based DL active BWP switch for 2 Rx UE | Same as 17.5.3.1.1 | Same as 17.5.3.1.1 | Same as 17.5.3.1.1 |
| 17.5.4.1.1 NR SA FR2 MAC-CE based active TCI state switch for a known TCI state for 2 Rx UE | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 | Same as 7.5.8.1.1 |
| 17.5.4.2.1 NR SA FR2 RRC-CE based active TCI state switch for a known TCI state for 2 Rx UE | Same as 7.5.8.2.1 | Same as 7.5.8.2.1 | Same as 7.5.8.2.1 |
| 17.5.5.1.1 NR SA FR2 MAC-CE based spatial relation switch associated with known DL-RS for 2 Rx UE | Same as 7.5.9.1.1 | Same as 7.5.9.1.1 | Same as 7.5.9.1.1 |
| 17.5.5.2.1 NR SA FR2 RRC-based spatial relation switch associated with a known DL-RS for 2 Rx UE | Same as 7.5.9.2.1 | Same as 7.5.9.2.1 | Same as 7.5.9.2.1 |
| 17.6.1.1 NR SA FR2 event triggered reporting without gap in non-DRX for 2 Rx UE | Same as 7.6.1.1 | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 17.6.1.2 NR SA FR2 event triggered reporting without gap in DRX for 2 Rx UE | Same as 7.6.1.2 | Same as 7.6.1.2 | Same as 7.6.1.2 |
| 17.6.1.3 NR SA FR2 event triggered reporting with gap in non-DRX for 2 Rx UE | Same as 7.6.1.1 | Same as 7.6.1.1 | Same as 7.6.1.1 |
| 17.6.1.4 NR SA FR2 event triggered reporting with gap in DRX for 2 Rx UE | Same as 7.6.1.2 | Same as 7.6.1.2 | Same as 7.6.1.2 |
| 17.6.2.1 NR SA FR2-FR2 event triggered reporting in non-DRX for 2 Rx UE | Same as 7.6.2.1 | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 17.6.2.2 NR SA FR2-FR2 event triggered reporting in DRX for 2 Rx UE | Same as 7.6.2.2 | Same as 7.6.2.2 | Same as 7.6.2.2 |

| | | | |
|---|---|---|---|
| 17.6.2.3 NR SA FR2-FR2 event triggered reporting with SSB time index detection in non-DRX for 2 Rx UE | Same as 7.6.2.1 | Same as 7.6.2.1 | Same as 7.6.2.1 |
| 17.6.2.4 NR SA FR2-FR2 event triggered reporting with SSB time index detection in DRX for 2 Rx UE | Same as 7.6.2.2 | Same as 7.6.2.2 | Same as 7.6.2.2 |
| 17.6.3.1 NR SA FR2 SSB based L1-R SRP measurement in non-DRX for 2 Rx UE | Same as 7.6.3.1 | Same as 7.6.3.1 | Same as 7.6.3.1 |
| 17.6.3.2 NR SA FR2 SSB based L1-RSRP measurement in DRX for 2 Rx UE | Same as 7.6.3.1 | Same as 7.6.3.1 | Same as 7.6.3.1 |
| 17.6.3.3 NR SA FR2 CSI-RS based L1-RSRP measurement in non-DRX for 2 Rx UE | Same as 7.6.3.3 | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 17.6.3.4 R SA FR2 CSI-RS based L1-RSRP measurement in DRX for 2 Rx UE | Same as 7.6.3.3 | Same as 7.6.3.3 | Same as 7.6.3.3 |
| 17.7.1.1 NR SA FR2 SS-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.1.1 | Same as 7.7.1.1 | Same as 7.7.1.1 |
| 17.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.1.2 | Same as 7.7.1.2 | Same as 7.7.1.2 |
| 17.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy for 2 Rx UE | Same as 7.7.2.1 | Same as 7.7.2.1 | Same as 7.7.2.1 |
| 17.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy for 2 Rx UE | Same as 7.7.2.2 | Same as 7.7.2.2 | Same as 7.7.2.2 |
| 17.7.3.1 NR SA FR2 SSB based L1-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.4.1 | Same as 7.7.4.1 | Same as 7.7.4.1 |
| 17.7.3.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy for 2 Rx UE | Same as 7.7.4.2 | Same as 7.7.4.2 | Same as 7.7.4.2 |
| 17.7.4.1 NR SA FR2 SS-SINR measurement accuracy for 2 Rx UE | Same as 7.7.3.1 | Same as 7.7.3.1 | Same as 7.7.3.1 |
| 17.7.4.2 NR SA FR2-FR2 SS-SINR measurement accuracy for 2 Rx UE | Same as 7.7.3.2 | Same as 7.7.3.2 | Same as 7.7.3.2 |

**Table F.1.3.2-9: Derivation of test requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell RRM tests for RedCap**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 18.1.1.1 E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 | Same as 8.2.1.1 | Same as 8.2.1.1 | Same as 8.2.1.1 |

| | | | |
|---|---|---|---|
| 18.2.1.1 E-UTRA - NR SA FR1 handover for 2 Rx UE | Same as 8.3.1.1 | Same as 8.3.1.1 | Same as 8.3.1.1 |
| 18.2.2.1 E-UTRA - NR SA FR1 RRC connection release with redirection for 2 Rx UE | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 | Same as 6.3.2.3.1 |
| 18.3.1.1 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.2 E-UTRA - NR SA FR1 event triggered reporting without SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.3 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in non-DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.4 E-UTRA - NR SA FR1 event triggered reporting with SSB time index detection in DRX | Same as 8.4.2.1 | Same as 8.4.2.1 | Same as 8.4.2.1 |
| 18.3.1.5 E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in non-DRX | Same as 8.4.2.5 | Same as 8.4.2.5 | Same as 8.4.2.5 |
| 18.3.1.6 E-UTRA - NR SA FR2 event triggered reporting without SSB time index detection in DRX | Same as 8.4.2.6 | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 18.3.1.7 E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in non-DRX | Same as 8.4.2.6 | Same as 8.4.2.6 | Same as 8.4.2.6 |
| 18.3.1.8 E-UTRA - NR SA FR2 event triggered reporting with SSB time index detection in DRX | Same as 8.4.2.6 | Same as 8.4.2.6 | Same as 8.4.2.6 |

**Table F.1.3.2-10: Derivation of test requirements for EN-DC FR1 RRM tests for shared spectrum**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 10.1.1.1.1 EN-DC FR1 4-step RA type contention-based random access for NR PSCell with CCA | Absolute uplink power:<br>Normal conditions ±17dB<br><br>Relative uplink power step:<br>Normal conditions ±2.5dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±12*64*$T_c$<br>30kHz SCS $T_e$ ±8*64*$T_c$ | <br>2.1dB<br><br><br>0.7dB<br><br><br>112$T_c$<br>112$T_c$ | Absolute uplink power:<br>Normal conditions ±19.1dB<br><br>Relative uplink power step:<br>Normal conditions ±3.2dB<br><br>Uplink timing:<br>15kHz SCS $T_e$ ±880*$T_c$<br>30kHz SCS $T_e$ ±624*$T_c$ |
| 10.1.1.1.2 EN-DC FR1 4-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 10.1.1.1.3 EN-DC FR1 2-step RA type contention- | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |

| | | | |
|---|---|---|---|
| based random access for NR PSCell with CCA | | | |
| 10.1.1.1.4 EN-DC FR1 2-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 10.1.2 EN-DC FR1 Handover with PSCell from EN-DC to EN-DC with known target PSCell using CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc: +8.00dB<br>Ês2 / Noc: +8.00dB<br><br>Noc2: -98dBm/15kHz<br>Ês3 / Noc: -infinity<br>Ês4 / Noc: -infinity<br><br>During T2 and T3:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc: +8.00dB<br>Ês2 / Noc: +8.00dB<br><br>Noc2: -98dBm/15kHz<br>Ês3 / Noc: +11.00dB<br>Ês4 / Noc: +11.00dB<br><br>In signalling:<br>E-UTRAN_A3-offset = 0dB<br>NR_A3-offset = 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>0dB<br>0dB<br>0dB<br><br>During T2 and T3:<br>0dB<br>0dB<br>0dB<br><br>0dB<br>-1.00dB<br>-1.00dB<br><br>In signalling:<br>-1.00dB<br>-1.00dB | During T1:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc: +8.00dB<br>Ês2 / Noc: +8.00dB<br><br>Noc2: -98dBm/15kHz<br>Ês3 / Noc: -infinity<br>Ês4 / Noc: -infinity<br><br>During T2 and T3:<br>Noc1: -98dBm/15kHz<br>Ês1 / Noc: +8.00dB<br>Ês2 / Noc: +8.00dB<br><br>Noc2: -98dBm/15kHz<br>Ês3 / Noc: +10.00dB<br>Ês4 / Noc: +10.00dB<br><br>In signalling:<br>E-UTRAN_A3-offset = -1dB<br>NR_A3-offset = -1dB |
| 10.2.1.1 EN-DC FR1 UE Transmit Timing Test with PSCell under DL CCA | Same as 4.4.1.1 | Same as 4.4.1.1 | Same as 4.4.1.1 |
| 10.2.2.1 EN-DC FR1 UE Timing Advance Adjustment Accuracy with PSCell under DL CCA | Same as 4.4.1.1 | Same as 4.4.1.1 | Same as 4.4.1.1 |
| 10.3.1.2 EN-DC FR1 Radio link monitoring out-of-sync test for PSCell under CCA configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB |
| 10.3.1.3 EN-DC FR1 Radio link monitoring in-sync test for PSCell under CCA configured with SSB-based RLM-RS in non-DRX mode | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB<br>T4: -4.5dB<br>T5: 1dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: +0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB<br>T4: -5.3dB<br>T5: 1.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4A.2.1 |
| 10.3.3.1 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 160 ms SCell measurement cycle | During T1 to T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Ês_2$ / $Noc_2$: +17dB<br>$Ês_3$ / $Noc_3$: +17dB | During T1 to T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1 to T3:<br>$Noc_2$: -104dBm/15kHz<br>$Noc_3$: -104dBm/15kHz<br>$Ês_2$ / $Noc_2$: +17dB<br>$Ês_3$ / $Noc_3$: +17dB |
| 10.3.3.2 EN-DC FR1 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |

| | | | |
|---|---|---|---|
| 10.3.3.3 EN-DC FR1 SCell Activation and Deactivation of unknown NR SCell with NR PSCell and NR SCell under CCA | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 10.3.4.1 EN-DC FR1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell under CCA configured with SSB-based BFD and LR in non-DRX mode | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: -10dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br>For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4A.2.1<br><br>q1 SSB during T1:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: -10.2dB<br><br>q1 SSB during T2:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +10.2dB |
| 10.3.4.2 EN-DC FR1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell under CCA configured with SSB-based BFD and LR in DRX mode | Same as 10.3.4.1 | Same as 10.3.4.1 | Same as 10.3.4.1 |
| 10.3.5.1 EN-DC FR1 UL active BWP switch delay with consistent UL LBT failure on PSCell subject to UL CCA | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB |
| 10.3.5.2.1 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB | During T1:<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T2:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB<br><br>During T3:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB |
| 10.3.5.2.2 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 |
| 10.3.5.3.1 EN-DC FR1 E-UTRAN – NR PSCell under CCA FR1 DL active BWP switch in non-DRX in synchronous EN-DC | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>$Noc_2$: -104dBm/15kHz<br>$\hat{E}s_2 / Noc_2$: +17dB |

| | | | |
|---|---|---|---|
| 10.3.6.1 EN-DC FR1 Addition and Release Delay of known NR PSCell on the carrier under CCA | Noc: -85dBm/15kHz<br>Ês / Noc: 0.0dB<br>B1-Threshold: -93 dBm/SCS | -3.6dB<br>0dB<br>-3dB | Noc: -88.6dBm/15kHz<br>Ês / Noc: 0.0dB<br>B1-Threshold: -96 dBm/SCS |
| 10.4.1.1 EN-DC FR1 Event-triggered reporting tests on PSCC under CCA without gaps under non-DRX | During T1:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>1.2dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês2 / Noc: +5.20dB<br>Ês3 / Noc: +7.00dB |
| 10.4.1.4 EN-DC FR1 Event-triggered reporting tests on PSCC under CCA with per-UE gaps under DRX | Same as 10.4.1.1 | Same as 10.4.1.1 | Same as 10.4.1.1 |
| 10.4.2.3 EN-DC FR1 event triggered reporting tests for FR1 with CCA cell without SSB time index detection when DRX is not used | During T1:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: -infinity<br><br>During T2:<br>Freq 2 Noc: -98dBm/15kHz<br>Freq 3 Noc: -98dBm/15kHz<br>Ês2 / Noc: +4.00dB<br>Ês3 / Noc: +7.00dB |
| 10.4.2.4 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA without SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.5 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.6 EN-DC FR1 event triggered reporting tests for FR1 cell with CCA with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.7 EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.8 EN-DC FR1 event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.9 EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 10.4.2.10 EN-DC FR1 event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |

| | | | |
|---|---|---|---|
| 10.4.3.1 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is not used | During T1:<br>Noc: -94.65dBm/15kHz<br>Ês0 / Noc: +0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -94.65dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +3.00dB<br><br>Reported SSB#0 SS-RSRP values ± 10dB<br>Reported SSB#1 SS-RSRP values ± 10dB<br>Reported Differential SS-RSRP values ± 3dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.5dB<br><br>Via mapping | During T1:<br>Noc: -94.65dBm/15kHz<br>Ês0 / Noc: +0.00dB<br>Ês1 / Noc: -infinity<br><br>During T2:<br>Noc: -94.65dBm/15kHz<br>Ês0 / Noc: 0.00dB<br>Ês1 / Noc: +3.50dB<br><br>SSB#1: RSRP_58 to RSRP_78<br>SSB#0: DIFFRSRP_0 to DIFFRSRP_3 |
| 10.4.3.2 EN-DC FR1 SSB based L1-RSRP measurement on PSCC under CCA when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 10.4.3.3 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 10.4.3.4 EN-DC FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 10.4.4.1 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.2 EN-DC FR1 E-UTRA-NR inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.3 EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.4.4.4 EN-DC FR1 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 10.5.1.1 EN-DC FR1 Intra-frequency measurement accuracy on a CCA serving cell | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc}$: -107dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_3$ / $N_{oc}$: 0dB<br><br>Reported RSRP values: ±6dB | Test 1:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 2:<br>-1.0dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +1.4dB<br>RSRP_57 to RSRP_76<br><br>Test 2:<br>$N_{oc}$: -118dBm/30kHz<br>$\hat{E}s_2$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_3$ / $N_{oc}$: +0.2dB<br><br>RSRP_43 to RSRP_55 |

| | | | |
|---|---|---|---|
| | | | RSRP_43 to RSRP_55<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 3 SS-RSRP from $N_{oc}$ and $\hat{E}s_3 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions. | | | |
| 10.5.1.2 EN-DC FR1 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$N_{oc2}$: -94.65 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>Reported RSRP values: ±8dB<br><br>Test 2:<br>$N_{oc1}$: -103dBm/15kHz<br>$N_{oc2}$: -111dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>Reported RSRP values: ±4.5dB | Test 1:<br>-1.35dB<br>-1.35dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$N_{oc2}$: -96dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +10.0dB<br>$\hat{E}s2 / N_{oc2}$: +10.0dB<br>RSRP_64 to RSRP_83<br><br>Test 2:<br>$N_{oc}$: -103dBm/15kHz<br>$N_{oc1}$: -111dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: +13.0dB<br>$\hat{E}s2 / N_{oc2}$: -3.0dB<br><br>RSRP_47 to RSRP_60<br>RSRP_40 to RSRP_52<br>depending on operating band |
| The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from $N_{oc2}$ and $\hat{E}s2 / N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0 dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2. | | | |
| 10.5.2.1 EN-DC FR1 Intra-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc}$: -91dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -110dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: -4.0dB<br>$\hat{E}s2 / N_{oc}$: -4.0dB<br><br>Reported RSRQ values: ±3.5dB | Test 1:<br>-1.6dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>N/A<br><br>Test 3:<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -92.6dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: +3.0dB<br>$\hat{E}s2 / N_{oc}$: +3.0dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>N/A<br><br>Test 3:<br>$N_{oc}$: -110dBm/15kHz<br>$\hat{E}s1 / N_{oc}$: -4.0dB<br>$\hat{E}s2 / N_{oc}$: -4.0dB<br><br>RSRQ_44 to RSRQ_59 |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the SS-RSRQ values are 1.5dB wider at each end for Test 1, and 0.5 dB wider at each for Tests 2 and 3. | | | |
| 10.5.2.2 EN-DC FR1 Inter-frequency measurement accuracy with FR1 CCA serving cell and FR1 CCA target cell | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc1}$: -86.27 dBm/15kHz<br>$N_{oc2}$: -86.27 dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB | Test 1:<br>-1.53dB<br>-1.53dB<br>0dB | Test 1:<br>$N_{oc1}$: -87.8dBm/15kHz<br>$N_{oc2}$: -87.8dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -1.75dB |

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| | Ês2 / $N_{oc2}$: -1.75dB<br>Reported RSRQ values: ±2.5dB<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br>$N_{oc2}$: -113dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB<br><br>Test 3:<br>NR_CCA_FR1_I:<br>$N_{oc1}$: -112dBm/15kHz<br>$N_{oc2}$: -112dBm/15kHz<br>Ês1 / $N_{oc1}$: 3dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>NR_CCA_FR1_J:<br>$N_{oc1}$: -111.5dBm/15kHz<br>$N_{oc2}$: -111.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 3dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>Reported RSRQ values: ±2.5dB | 0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br><br>Test 3:<br>NR_CCA_FR1_I:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>NR_CCA_FR1_J:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Ês2 / $N_{oc2}$: -1.75dB<br>RSRQ_52 to RSRQ_62<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br>$N_{oc2}$: -113dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62<br><br>Test 3:<br>NR_CCA_FR1_I:<br>$N_{oc1}$: -112dBm/15kHz<br>$N_{oc2}$: -112dBm/15kHz<br>Ês1 / $N_{oc1}$: 3dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>NR_CCA_FR1_J:<br>$N_{oc1}$: -111.5dBm/15kHz<br>$N_{oc2}$: -111.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 3dB<br>Ês2 / $N_{oc2}$: -1.75dB<br><br>RSRQ_52 to RSRQ_62<br>RSRQ_52 to RSRQ_62 depending on operating band |
| The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from $N_{oc2}$ and Ês2 / $N_{oc2}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1.5dB wider at each end. | | | |
| 10.5.3.1 EN-DC FR1 Intra-frequency measurement accuracy on PSCC under CCA | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>Ês1 / $N_{oc}$: +4.54dB<br>Ês2 / $N_{oc}$: +2.66dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc}$: -112dBm/15kHz<br>Ês1 / $N_{oc}$: -4dB<br>Ês2 / $N_{oc}$: -4dB<br>Reported SINR values: ±3.5dB | Test 1:<br>-0.2dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.5dB<br>0.5dB<br>Via mapping | Test 1:<br>$N_{oc}$: -93.2dBm/15kHz<br>Ês1 / $N_{oc}$: +4.54dB<br>Ês2 / $N_{oc}$: +2.66dB<br>SINR_31 to SINR_49<br><br>Test 2:<br>$N_{oc}$: -112dBm/15kHz<br>Ês1 / $N_{oc}$: -3.5dB<br>Ês2 / $N_{oc}$: -3.5dB<br>SINR_28 to SINR_45 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and Ês2 / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end. | | | |
| 10.5.3.2 EN-DC FR1 Inter-frequency measurement accuracy on PSCC under CCA | **TEST CONFIGURATION 1, 2** | | |
| | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Ês2 / $N_{oc2}$: -1.75dB<br>Reported SINR values: ±3dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 20dB<br>Ês2 / $N_{oc2}$: 20dB<br><br>Reported SINR values: ±3dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>Ês1 / $N_{oc1}$: -1.75dB<br>Ês2 / $N_{oc2}$: -1.75dB<br>SINR_35 to SINR_51<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>Ês1 / $N_{oc1}$: 20dB<br>Ês2 / $N_{oc2}$: 20dB<br><br>SINR_79 to SINR_94 |

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| | Test 3:<br>$N_{oc1}$: -115.5dBm/15kHz<br><br>$N_{oc2}$: -115.5dBm/15kHz<br><br>$\hat{E}s1 / N_{oc1}$: -4dB<br>$\hat{E}s2 / N_{oc2}$: -4dB<br><br>Reported SINR values: ±3.5dB | Test 3:<br>0dB<br><br>0dB<br><br>0.8dB<br>0.8dB<br><br>Via mapping | Test 3:<br>$N_{oc1}$: -115.5dBm/15kHz<br>$N_{oc2}$: -115.5dBm/15kHz<br>$\hat{E}s1 / N_{oc1}$: -3.2dB<br>$\hat{E}s2 / N_{oc2}$: -3.2dB<br><br>SINR_32 to SINR_49 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3. | | | |
| 10.5.3.3 EN-DC FR1 Intra-frequency measurement accuracy on SCC under CCA | Same as 10.5.3.1 | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 10.5.4.1 EN-DC FR1 SSB based L1-RSRP measurement accuracy with CCA | | | |
| Test Configuration 1,2 | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions)<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br><br>$\hat{E}s_1 / N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions) | Test 1:<br>-1.35dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br><br>0.8dB<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -96dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br>RSRP_63 to RSRP_84<br><br>Test 2:<br>$N_{oc1}$: -113dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -2.2dB<br><br>RSRP_38 to RSRP_51 |
| 10.5.5.1 EN-DC FR1 RSSI measurement accuracy on PSCC with CCA | Slots where RSSI is measured:<br><br>Noc: -87.00dBm/SCS<br>Ês / Noc: -infinity<br><br>Slots where RSSI is not measured:<br><br>Noc: -106.00dBm/SCS<br>Ês / Noc: +2.50dB<br><br>Normal conditions:<br>Reported RSSI values: ±5.5dB<br><br>Extreme conditions:<br>Reported RSSI values: ±8.5dB | Slots where RSSI is measured:<br>0dB<br>0dB<br><br>Slots where RSSI is not measured:<br>0dB<br>0dB<br><br>Via mapping | Slots where RSSI is measured:<br><br>Noc: -87.00dBm/SCS<br>Ês / Noc: -infinity<br><br>Slots where RSSI is not measured:<br>Noc: -106.00dBm/SCS<br>Ês / Noc: +2.50dB<br><br>RSSI_35 to RSSI_49<br><br>RSSI_32 to RSSI_52 |
| 10.5.5.2 EN-DC FR1 RSSI measurement accuracy on SCC with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 10.5.5.3 EN-DC FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | Slots where RSSI is measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -87.00dBm/SCS<br>Ês2 / Noc2: -infinity<br><br>Slots where RSSI is not measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -106.00dBm/SCS<br>Ês2 / Noc2: +2.50dB<br><br>Normal conditions:<br>Reported RSSI values: ±5.5dB | Slots where RSSI is measured:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Slots where RSSI is not measured:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping | Slots where RSSI is measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -87.00dBm/SCS<br>Ês2 / Noc2: -infinity<br><br>Slots where RSSI is not measured:<br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -106.00dBm/SCS<br>Ês2 / Noc2: +2.50dB<br><br>RSSI_35 to RSSI_49 |

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| | Extreme conditions:<br>Reported RSSI values: ±8.5dB | | RSSI_32 to RSSI_52 |
| 10.5.6.1 EN-DC FR1 Channel occupancy measurement accuracy on PSCC with CCA | Slots where RSSI is measured:<br><br>Noc: -87.00dBm/SCS<br>Ês / Noc: -infinity<br><br>Slots where RSSI is not measured:<br><br>Noc: -106.00dBm/SCS<br>Ês / Noc: +2.50dB<br><br>channelOccupancyThreshold = -83dBm | Slots where RSSI is measured:<br><br>0dB<br>0dB<br><br>Slots where RSSI is not measured:<br><br>0dB<br>0dB<br><br>0dB | Slots where RSSI is measured:<br><br>Noc: -87.00dBm/SCS<br>Ês / Noc: - infinity<br><br>Slots where RSSI is not measured:<br>Noc: -106.00dBm/SCS<br>Ês / Noc: +2.50dB<br><br>channelOccupancyThreshold = -83dBm |
| 10.5.6.2 EN-DC FR1 Channel occupancy measurement accuracy on SCC with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 10.5.6.3 EN-DC FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | Slots where RSSI is measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -87.00dBm/SCS<br>Ês2 / Noc2: -infinity<br><br>Slots where RSSI is not measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -106.00dBm/SCS<br>Ês2 / Noc2: +2.50dB<br><br>channelOccupancyThreshold = -83dBm | Slots where RSSI is measured:<br><br>0dB<br>0dB<br>0dB<br>0dB<br><br>Slots where RSSI is not measured:<br><br>0dB<br>0dB<br>0dB<br>0dB<br><br>0dB | Slots where RSSI is measured:<br><br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -87.00dBm/SCS<br>Ês2 / Noc2: -infinity<br><br>Slots where RSSI is not measured:<br>Noc1: -106.00dBm/SCS<br>Ês1 / Noc1: +2.50dB<br>Noc2: -106.00dBm/SCS<br>Ês2 / Noc2: +2.50dB<br><br>channelOccupancyThreshold = -83dBm |

**Table F.1.3.2-11: Derivation of test requirements for SA FR1 RRM tests for shared spectrum**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 11.1.1.1 NR SA FR1 Cell reselection to FR1 intra-frequency NR cells when subject to CCA on the serving and target cell | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB |
| 11.1.1.2 NR SA FR1 Cell reselection to FR1 inter-frequency NR case when subject to CCA on the serving and target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity | During T1:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity |

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| | During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 11.1.2.1 Cell re-selection to NR with source NR carrier frequency under CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 11.1.3.1 NR SA FR1 Cell re-selection to NR with source NR carrier frequency under CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 11.1.4.1 NR SA FR1 Cell reselection to higher priority E-UTRAN when serving cell is subject to CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>1.6dB<br><br>During T3:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB |
| 11.1.4.2 NR SA FR1 Cell reselection to lower priority E-UTRAN when serving cell is subject to CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -4dB<br>Ês2 / Noc2: +14dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: +14dB | During T1:<br>-2dB<br>0dB<br>0.4dB<br>1.6dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -3.6dB<br>Ês2 / Noc2: +15.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13.6dB<br>Ês2 / Noc2: +14dB |

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| 11.2.1.1 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; known target cell | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1dB<br><br>During T3:<br>0dB<br>0dB<br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB |
| 11.2.1.2 NR SA FR1 Intra-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: 8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: 8dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +8dB<br>Ês2 / Noc: +8dB |
| 11.2.1.3 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1 carrier under CCA; unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB |
| 11.2.1.4 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; known target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +11dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-1dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>-1dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 8dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +8dB<br>Ês2 / Noc2: +10dB |
| 11.2.1.5 NR SA FR1 Inter-frequency handover from FR1 carrier under CCA to FR1; unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB |
| 11.2.1.6 NR SA FR1 Inter-frequency handover from FR1 to FR1 carrier under CCA; unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity | During T1:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 4dB<br>Ês2 / Noc2: -infinity |

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|---|---|---|---|
| | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB | During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +5dB |
| 11.2.1.7 NR SA FR1 carrier under CCA - E-UTRAN handover with known target cell | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +8dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +8dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>1.55dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>1.55dB | During T1:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +12dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +9.55dB<br><br>During T3:<br>Noc1: -100dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +9.55dB |
| 11.2.1.8 NR SA FR1 carrier under CCA - E-UTRAN handover with unknown target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: 0dB<br>Ês2 / Noc2: +7dB |
| 11.2.2.1.1 NR SA FR1 Intra-frequency RRC Re-establishment with CCA in FR1 | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB |
| 11.2.2.1.2 NR SA FR1 Inter-frequency RRC Re-establishment with CCA in FR1 | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +4dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: +4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +4dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +4dB |
| 11.2.2.1.3 NR SA FR1 Intra-frequency RRC Re-establishment with CCA without serving cell timing | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4dB<br>$Ês_2$ / Noc: -infinity | During T1:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>$Ês_1$ / Noc: +4dB<br>$Ês_2$ / Noc: -infinity |

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| | During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: +4dB | During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: -infinity<br>$\hat{E}s_2$ / Noc: +4dB |
| 11.2.2.1.4 NR SA FR1 Inter-frequency RRC Re-establishment from NR FR1 carrier without CCA to NR FR1 carrier under CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB |
| 11.2.2.2.1 NR SA FR1 4-step RA type contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.2 NR SA FR1 4-step RA type non-contention based random access for NR PSCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.3 NR SA FR1 2-step RA type contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.2.4 NR SA FR1 2-step RA type non-contention-based random access for NR PCell with CCA | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 | Same as 10.1.1.1.1 |
| 11.2.2.3.1 NR SA FR1 Redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA | Same as 11.2.2.3.2 | Same as 11.2.2.3.2 | Same as 11.2.2.3.2 |
| 11.2.2.3.2 NR SA FR1 Redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4 dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: +4 dB |
| 11.3.1.1 NR SA FR1 UE Transmit Timing Test with PCell under DL CCA | Same as 6.4.1.1 | Same as 6.4.1.1 | Same as 6.4.1.1 |
| 11.3.2.1 NR SA FR1 UE Timing Advance Adjustment Accuracy with PCell under DL CCA | Same as 6.4.3.1 | Same as 6.4.3.1 | Same as 6.4.3.1 |

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| 11.4.1.2 NR SA FR1 Radio link monitoring out-of-sync test for PCell under CCA configured with SSB-based RLM-RS in non-DRX mode | Same as 10.3.1.2 | Same as 10.3.1.2 | Same as 10.3.1.2 |
| 11.4.1.3 NR SA FR1 Radio link monitoring in-sync test for PCell under CCA configured with SSB-based RLM-RS in non-DRX mode | Same as 10.3.1.3 | Same as 10.3.1.3 | Same as 10.3.1.3 |
| 11.4.3.1 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 160 ms SCell measurement cycle | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 11.4.3.2 NR SA FR1 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 11.4.3.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell with PCell and SCell under CCA | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 11.4.4.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell under CCA configured with SSB-based BFD and LR in non-DRX mode | Same as 10.3.4.1 | Same as 10.3.4.1 | Same as 10.3.4.1 |
| 11.4.4.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell under CCA configured with SSB-based BFD and LR in DRX mode | Same as 10.3.4.1 | Same as 10.3.4.1 | Same as 10.3.4.1 |
| 11.4.5.1 NR SA FR1 UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA | Same as 10.3.5.1 | Same as 10.3.5.1 | Same as 10.3.5.1 |
| 11.4.5.2.1 NR SA FR1 - NR FR1 DL active BWP switch of PCell under CCA with non-DRX | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 |
| 11.4.5.2.2 NR SA FR1 DCI-based DL active BWP switch with non-DRX under CCA | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 | Same as 10.3.5.2.1 |
| 11.4.5.3.1 NR SA FR1 DL active BWP switch of Cell with non-DRX | Same as 10.3.5.3.1 | Same as 10.3.5.3.1 | Same as 10.3.5.3.1 |
| 11.5.1.1 SA FR1 Event-triggered reporting tests on PCC without gaps under non-DRX | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |
| 11.5.1.2 SA FR1 Event-triggered reporting tests | Same as 6.6.1.1 | Same as 6.6.1.1 | Same as 6.6.1.1 |

| | | | |
|---|---|---|---|
| on PCC without gaps under DRX | | | |
| 11.5.2.3 NR SA FR1-FR1 Event triggered reporting tests with CCA without SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA without SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with CCA with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.7 NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.8 NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.9 NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.2.10 NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used | Same as 10.4.2.3 | Same as 10.4.2.3 | Same as 10.4.2.3 |
| 11.5.3.1 NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX | During T1:<br>Noc1: -106dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +18dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -2dB<br>Ês2 / Noc2: +17 dB | During T1:<br>0dB<br>0dB<br>+1.55dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>+1.55dB | During T1:<br>Noc1: -106dBm/15kHz<br>Noc2: -104dBm/15kHz<br>Ês1 / Noc1: +19.55dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -2dB<br>Ês2 / Noc2: +18.55 dB |
| 11.5.3.2 NR SA FR1 - E-UTRAN event-triggered reporting in DRX | Same as 11.5.3.1 | Same as 11.5.3.1 | Same as 11.5.3.1 |
| 11.5.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 11.5.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |

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| 11.5.4.3 NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 11.5.4.4 NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 11.6.1.1 NR SA FR1 intra-frequency SS-RSRP measurement accuracy on a carrier frequency with CCA | Same as 10.5.1.1 | Same as 10.5.1.1 | Same as 10.5.1.1 |
| 11.6.1.2 NR SA FR1 Intra-frequency measurement accuracy on SCC on a carrier frequency with CCA | Test 2:<br>$N_{oc}$: -94.00dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +1.0dB<br>Reported RSRP values: ±8dB<br><br>Test 3:<br>NR_CCA_FR1_I:<br>$N_{oc}$: -110.00dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +0.0dB<br><br>NR_CCA_FR1_J:<br>$N_{oc}$: -109.50dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +0.0dB<br><br>Normal conditions:<br>Reported RSRP values: ±4.5dB | Test 2:<br>0dB<br>0dB<br>+0.4dB<br>Via mapping<br><br>Test 2:<br>NR_CCA_FR1_I:<br>-1.0dB<br>0dB<br>+0.2dB<br><br>NR_CCA_FR1_J:<br>-1.5dB<br>0dB<br>+0.2dB<br><br>Via mapping | Test 1:<br>$N_{oc}$: -91dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +6.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +1.4dB<br>RSRP_57 to RSRP_76<br><br>Test 2:<br>NR_CCA_FR1_I:<br>$N_{oc}$: -111dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +0.2dB<br><br>NR_CCA_FR1_J:<br>$N_{oc}$: -111dBm/30kHz<br>$\hat{E}s_1$ / $N_{oc}$: +1.0dB<br>$\hat{E}s_2$ / $N_{oc}$: +0.2dB<br><br>NR_CCA_FR1_I:<br>RSRP_43 to RSRP_55<br>NR_CCA_FR1_J:<br>RSRP_43 to RSRP_55 |
| The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from $N_{oc}$ and $\hat{E}s_2$ / $N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions. | | | |
| 11.6.2.1 NR SA FR1 intra-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | Same as 10.5.2.1 | Same as 10.5.2.1 | Same as 10.5.2.1 |
| 11.6.2.2 NR SA FR1 inter-frequency SS-RSRQ measurement accuracy on a carrier frequency with CCA | Same as 10.5.2.2 | Same as 10.5.2.2 | Same as 10.5.2.2 |
| 11.6.2.3 NR SA FR1 Intra-frequency measurement accuracy on SCC | Same as 10.5.2.1 | Same as 10.5.2.1 | Same as 10.5.2.1 |
| 11.6.2.4 NR SA FR1 Inter-frequency measurement accuracy | FFS | FFS | FFS |
| 11.6.3.1 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 11.6.3.2 NR SA FR1 Inter-frequency SS-SINR measurement accuracy on a carrier frequency with CCA | Same as 10.5.3.2 | Same as 10.5.3.2 | Same as 10.5.3.2 |

| | | | |
|---|---|---|---|
| 11.6.3.3 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 11.6.3.4 NR SA FR1 Intra-frequency SS-SINR measurement accuracy on SCC on a carrier frequency with CCA | FFS | FFS | FFS |
| 11.6.4.1 NR SA FR1 SSB based L1-RSRP measurement accuracy with CCA | Same as 10.5.4.1 | Same as 10.5.4.1 | Same as 10.5.4.1 |
| 11.6.5.1 NR SA FR1 Intra-frequency RSSI measurement accuracy on PCC with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 11.6.5.2 NR SA FR1 Intra-frequency RSSI measurement accuracy on SCC with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 11.6.5.3 NR SA FR1 Inter-frequency RSSI measurement accuracy on a carrier with CCA | Same as 10.5.5.3 | Same as 10.5.5.3 | Same as 10.5.5.3 |
| 11.6.6.1 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on PCC with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 11.6.6.2 NR SA FR1 Intra-frequency channel occupancy measurement accuracy on SCC with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 11.6.6.3 NR SA FR1 Inter-frequency channel occupancy measurement accuracy on a carrier with CCA | Same as 10.5.6.3 | Same as 10.5.6.3 | Same as 10.5.6.3 |

**Table F.1.3.2-12: Derivation of test requirements for E-UTRAN – SA FR1 Shared Spectrum** test cases

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 12.1.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 when target cell is subject to CCA | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-1.90dB<br>0dB<br>0.35dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.55dB<br>1.55dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -99.90dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -3.65dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.55dB<br>Ês2 / Noc2: +13.55dB |
| 12.2.1.1 E-UTRAN - NR with CCA handover with known target cell | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB | During T1:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB |

| | | | |
|---|---|---|---|
| | Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: 0dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +7dB<br>Ês2 / Noc2: 0dB | 0dB<br><br>During T2:<br>0dB<br>0dB<br>-2.55dB<br>0.55dB<br><br>During T3:<br>0dB<br>0dB<br>-2.55dB<br>0.55dB | Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4.45dB<br>Ês2 / Noc2: +0.55dB<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4.45dB<br>Ês2 / Noc2: +0.55dB |
| 12.4.2.1 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is not used under CCA | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -104dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +17dB<br>Ês2 / Noc2: +7dB |
| 12.4.2.2 E-UTRAN-NR FR1 inter-RAT event triggered reporting without SSB time index detection when DRX is used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.4.2.3 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is not used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |
| 12.4.2.4 E-UTRAN-NR FR1 inter-RAT event triggered reporting with SSB time index detection when DRX is used under CCA | Same as 12.4.2.1 | Same as 12.4.2.1 | Same as 12.4.2.1 |

**Table F.1.3.2-13: Derivation of test requirements for SA FR1 with SCell in Shared Spectrum** test cases

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 13.2.2.1 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 160 ms SCell measurement cycle | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 13.2.2.2 NR SA FR1 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 13.2.2.3 NR SA FR1 SCell Activation and Deactivation of unknown SCell under CCA | Same as 10.3.3.1 | Same as 10.3.3.1 | Same as 10.3.3.1 |
| 13.3.1.1 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under non-DRX | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br>Ês3 / Noc: -infinity | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br>Ês3 / Noc: -infinity |

| | | | |
|---|---|---|---|
| | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br>Ês3 / Noc: +7dB | During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc: +4dB<br>Ês2 / Noc: +4dB<br>Ês3 / Noc: +7dB |
| 13.3.1.2 NR SA FR1 Event-triggered reporting tests on SCC under CCA without gaps under DRX | Same as 13.3.1.1 | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.1.3 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under non-DRX | Same as 13.3.1.1 | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.1.4 NR SA FR1 Event-triggered reporting tests on SCC under CCA with per-UE gaps under DRX | Same as 13.3.1.1 | Same as 13.3.1.1 | Same as 13.3.1.1 |
| 13.3.2.3 NR SA FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is not used | During T1:<br>Noc1: -98dBm/15kHz<br>Noc3: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês3 / Noc3: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc3: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês3 / Noc3: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | D During T1:<br>Noc1: -98dBm/15kHz<br>Noc3: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês3 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc3: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês3 / Noc3: +7dB |
| 13.3.2.4 NR SA FR1 Event triggered reporting tests on a carrier with CCA without SSB time index detection when DRX is used | Same as 13.3.2.3 | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.2.5 NR SA FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is not used | Same as 13.3.2.3 | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.2.6 NR SA FR1 Event triggered reporting tests on a carrier with CCA with SSB time index detection when DRX is used | Same as 13.3.2.3 | Same as 13.3.2.3 | Same as 13.3.2.3 |
| 13.3.3.1 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is not used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 13.3.3.2 NR SA FR1 SSB based L1-RSRP measurement for SCell under CCA when DRX is used | Same as 10.4.3.1 | Same as 10.4.3.1 | Same as 10.4.3.1 |
| 13.4.1.1 NR SA FR1 SS-RSRP measurement accuracy on a carrier with CCA | Same as 10.5.1.1 | Same as 10.5.1.1 | Same as 10.5.1.1 |
| 13.4.2.1 NR SA FR1 SS-RSRQ measurement accuracy on a carrier with CCA | Same as 10.5.2.1 | Same as 10.5.2.1 | Same as 10.5.2.1 |

| | | | |
|---|---|---|---|
| 13.4.3.1 NR SA FR1 SS-SINR measurement accuracy on a carrier with CCA | Same as 10.5.3.1 | Same as 10.5.3.1 | Same as 10.5.3.1 |
| 13.4.4.1 NR SA FR1 L1-RSRP measurement accuracy for beam reporting on a carrier with CCA | Same as 10.5.4.1 | Same as 10.5.4.1 | Same as 10.5.4.1 |
| 13.4.5.1 NR SA FR1 RSSI measurement accuracy on a carrier with CCA | Same as 10.5.5.1 | Same as 10.5.5.1 | Same as 10.5.5.1 |
| 13.4.5.2 NR SA FR1-FR1 RSSI measurement accuracy on a carrier with CCA | Same as 10.5.5.3 | Same as 10.5.5.3 | Same as 10.5.5.3 |
| 13.4.6.1 NR SA FR1 channel occupancy measurement accuracy on a carrier with CCA | Same as 10.5.6.1 | Same as 10.5.6.1 | Same as 10.5.6.1 |
| 13.4.6.2 NR SA FR1-FR1 channel occupancy measurement accuracy on a carrier with CCA | Same as 10.5.6.3 | Same as 10.5.6.3 | Same as 10.5.6.3 |

**Table F.1.3.2-14: Derivation of test requirements for SA FR1 Satellite Access test cases**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 14.1.1 NR SA FR1 Cell Reselection for Satellite Access | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB<br><br>During T3:<br>0dB<br>0.45dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +13dB<br>Ês2 / Noc: +16.45dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16.45dB<br>Ês2 / Noc: +13dB |
| 14.1.2 NR SA FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access | Same as 14.1.1 | Same as 14.1.1 | Same as 14.1.1 |
| 14.1.3 NR SA FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +16dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0.45dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +16dB<br>Ês2 / Noc: +13dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +16.45dB |
| 14.1.4 NR SA FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.3 | Same as 14.1.3 | Same as 14.1.3 |
| 14.1.5 NR SA FR1-FR1 Cell Reselection for Satellite Access | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz | During T1:<br>0dB<br>-2dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz |

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| | Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | 1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 14.1.6 NR SA FR1-FR1 Cell Reselection for UE configured with the feature for enhanced requirements for Satellite Access | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -4dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +14dB<br>Ês2 / Noc2: +12dB | During T1:<br>0dB<br>-2dB<br>1.6dB<br>0.4dB<br><br>During T2:<br>0dB<br>0dB<br>1.6dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>1.6dB<br>1.6dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -100dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -3.6dB<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +15.6dB<br>Ês2 / Noc2: 13.6dB |
| 14.1.7 NR SA FR1-FR1 Time-based Measurement Initiation Cell Reselection for Satellite Access | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +16dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13dB<br>Ês2 / Noc2: +16dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +16dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +13dB<br>Ês2 / Noc2: +16dB |
| 14.1.8 NR SA FR1-FR1 Location-based Measurement Initiation Cell Reselection for Satellite Access | Same as 14.1.7 | Same as 14.1.7 | Same as 14.1.7 |
| 14.1.9 NR SA FR1-FR1 Cell reselection for UE fulfilling low mobility relaxed measurement criterion for Satellite Access | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -4dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: +12dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 48dB<br>Thresh_X_LowP of Cell 1 = 50dB<br>Thresh_X_LowP of Cell 2 = 50dB<br>Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 44dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 3dB | During T1:<br>0dB<br>0dB<br>0dB<br>0.3dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>-2.25dB<br><br>In signalling:<br>0dB<br>-4dB<br>-2dB<br>0dB<br>0dB<br>2dB<br>0dB<br>12dB | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: -3.7dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$Ês_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$Ês_2$ / $Noc_2$: +9.75dB<br><br>In signalling:<br>Thresh_X_HighP of Cell 1 = 48dB<br>Thresh_X_HighP of Cell 2 = 44dB<br>Thresh_X_LowP of Cell 1 = 48dB<br>Thresh_X_LowP of Cell 2 = 50dB |

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| | | | Thresh_Serving_LowP of Cell 1 = 44dB<br>Thresh_Serving_LowP of Cell 2 = 46dB<br>SSearchDeltaP of Cell 1 = 3dB<br>SSearchDeltaP of Cell 2 = 15dB |
| 14.1.10 NR SA FR1-FR1 Cell reselection for UE fulfilling not-at-cell edge relaxed measurement criterion for Satellite Access | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -4dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$Noc_2$: -98dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +12dB<br><br>In signalling:<br>SSearchThresholdP of Cell 1 = 50dB<br>SSearchThresholdP of Cell 2 = 50dB | During T1:<br>0dB<br>2dB<br>-2dB<br>0.35dB<br><br>During T2:<br>0dB<br>0dB<br>-2dB<br>4dB<br><br>In signalling:<br>0dB<br>-16dB | During T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +16dB<br>$Noc_2$: -100dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: -3.65dB<br><br>During T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +14dB<br>$Noc_2$: -100dBm/15kHz<br>$\hat{E}s_2$ / $Noc_2$: +16dB<br><br>In signalling:<br>SSearchThresholdP of Cell 1 = 50dB<br>SSearchThresholdP of Cell 2 = 34dB |
| 14.2.1.1 NR SA FR1 Handover for Satellite Access | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +11.00dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +11.00dB<br><br>Signaled A3-Offset: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1dB<br><br>During T3:<br>0dB<br>0dB<br>-1dB<br><br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +10.00dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +10.00dB<br><br>Signaled A3-Offset: -1dB |
| 14.2.1.2 NR SA FR1-FR1 Handover for Satellite Access | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB<br><br>During T3:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB<br><br>During T3:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB |
| 14.2.1.3 NR SA FR1 Time-based Conditional Handover for NR Satellite Access | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +11.00dB<br><br>Signaled A3-Offset: 0dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>-1dB<br><br>-1dB | During T1:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +8.00dB<br>$\hat{E}s_2$ / Noc: +10.00dB<br><br>Signaled A3-Offset: -1dB |

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| 14.2.1.4 NR SA FR1-FR1 Time-based Conditional Handover for NR Satellite Access | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / Noc: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +9.00dB |
| 14.2.1.5 NR SA FR1 Distance-based Conditional Handover for Satellite Access | Same as 14.2.1.3 | Same as 14.2.1.3 | Same as 14.2.1.3 |
| 14.2.1.6 NR SA FR1-FR1 Distance-based Conditional Handover for Satellite Access | Same as 14.2.1.4 | Same as 14.2.1.4 | Same as 14.2.1.4 |
| 14.2.2.1.1 NR SA FR1 RRC Re-establishment for Satellite Access | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +7dB<br>Ês2 / Noc: +4dB<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB<br><br>During T3:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: -infinity<br>Ês2 / Noc: +4dB |
| 14.2.2.1.2 NR SA FR1-FR1 RRC Re-establishment for Satellite Access | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T3:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: +4dB<br>Ês2 / Noc2: -infinity<br><br>During T2:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: -infinity<br><br>During T3:<br>Noc1: -98dBm/15kHz<br>Noc2: -98dBm/15kHz<br>Ês1 / Noc1: -infinity<br>Ês2 / Noc2: +7dB |
| 14.3.1.1 NR SA FR1 UE transmit timing accuracy for Satellite Access | <u>Test 1 and Test 2:</u><br>Uplink timing: ±29*64 $T_c$<br>Ês / $N_{oc}$: +3.00dB<br>$N_{oc}$ = -98dBm/15kHz<br><br><u>Test 1 (no DRX):</u><br>Max step size $T_q$: 5.5*64*$T_c$<br>Min adjust rate $T_p$: 5.5*64*$T_c$<br>Max adjust rate: 5.5*64*$T_c$ | <u>Test 1 and Test 2:</u><br>±5.5*64*$T_c$<br>+0.3 dB<br>0 dB<br><br><u>Test 1 (no DRX):</u><br>+1.375*64$T_c$<br>-4.475*64*$T_c$<br>+1.975*64*$T_c$ | <u>Test 1 and Test 2:</u><br>Uplink timing: ±34.5*64*$T_c$<br>Ês / $N_{oc}$: +3.30dB<br>$N_{oc}$ = -98dBm/15kHz<br><br><u>Test 1 (no DRX):</u><br>Max step size $T_q$: 6.875*64*$T_c$<br>Min adjust rate: 1.025*64*$T_c$<br>Max adjust rate: 7.475*64*$T_c$ |
| 14.3.2.1 NR SA FR1 timing advance adjustment accuracy for Satellite Access | Ês / $N_{oc}$: +3.00dB<br>$N_{oc}$ = -98dBm/15kHz<br>Timing Advance Accuracy: ±256*$T_c$ | +0.3 dB<br>0 dB<br>±88*$T_c$ | Ês / $N_{oc}$: +3.30dB<br>$N_{oc}$ = -98dBm/15kHz<br>Timing Advance Accuracy: ±344*$T_c$ |
| 14.4.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in non- | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB |

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| DRX mode for Satellite Access | | | |
| 14.4.1.2 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in non-DRX mode for Satellite Access | SNR during<br>T1: 1dB<br>T2: -7dB<br>T3: -15dB<br>T4: -4.5dB<br>T5: 1dB | Offset during<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: +0.8dB | SNR during<br>T1: 1.8dB<br>T2: -6.2dB<br>T3: -15.8dB<br>T4: -5.3dB<br>T5: 1.8dB |
| 14.4.1.3 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.4 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with SSB-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.2 | Same as 14.4.1.2 | Same as 14.4.1.2 |
| 14.4.1.5 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.6 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in non-DRX mode for Satellite Access | Same as 14.4.1.2 | Same as 14.4.1.2 | Same as 14.4.1.2 |
| 14.4.1.7 NR SA FR1 Radio Link Monitoring Out-of-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.1 | Same as 14.4.1.1 | Same as 14.4.1.1 |
| 14.4.1.8 NR SA FR1 Radio Link Monitoring In-sync for PCell configured with CSI-RS-based RLM-RS in DRX mode for Satellite Access | Same as 14.4.1.2 | Same as 14.4.1.2 | Same as 14.4.1.2 |
| 14.4.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in non-DRX mode for Satellite Access | q0 SSB SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10dB<br><br>q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 SSB during T1:<br>0dB<br>-0.2dB<br><br>q1 SSB during T2:<br>0dB<br>-0.2dB<br><br>q1 SSB during T3, T4 and T5:<br>0dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br><br>q1 SSB during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10.2dB<br><br>q1 SSB during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: -10.2dB<br><br>q1 SSB during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1 / Noc_1$: +10.2dB |

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| | | +0.2dB | |
| 14.4.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with SSB-based BFD and LR in DRX mode for Satellite Access | Same as 14.4.2.1 | Same as 14.4.2.1 | Same as 14.4.2.1 |
| 14.4.2.3 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in non-DRX mode for Satellite Access | q0 CSI-RS SNR during:<br>T1: 5dB<br>T2: -3dB<br>T3: -12dB<br>T4: -12dB<br>T5: -12dB<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10dB | Offset during:<br>T1: +0.8dB<br>T2: +0.8dB<br>T3: -0.8dB<br>T4: -0.8dB<br>T5: -0.8dB<br><br>q1 CSI-RS during T1:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T2:<br>0dB<br>-0.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>0dB<br>+0.2dB | SNR during:<br>T1: +5.8dB<br>T2: -2.2dB<br>T3: -12.8dB<br>T4: -12.8dB<br>T5: -12.8dB<br><br>q1 CSI-RS during T1:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 CSI-RS during T2:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: -10.2dB<br><br>q1 CSI-RS during T3, T4 and T5:<br>$Noc_1$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +10.2dB |
| 14.4.2.4 NR SA FR1 Beam Failure Detection and Link Recovery Test for PCell configured with CSI-RS-based BFD and LR in DRX mode for Satellite Access | Same as 14.4.2.3 | Same as 14.4.2.3 | Same as 14.4.2.3 |
| 14.4.3.1.1 NR SA FR1 DCI-based DL active BWP switch with non-DRX for Satellite Access | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB | During T1:<br>0dB<br>0dB | During T1:<br>$Noc_1$: -104dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +17dB |
| 14.4.3.2.1 NR SA FR1 RRC-based DL active BWP switch with non-DRX for Satellite Access | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 |
| 14.4.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for Satellite Access | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 | Same as 14.4.3.1.1 |
| 14.5.1.1 SA FR1 event triggered reporting tests without gap under non-DRX for NR satellite access | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB | During T1:<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB | During T1:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: -infinity<br><br>During T2:<br>Noc: -98dBm/15kHz<br>Ês1 / Noc: +4.00dB<br>Ês2 / Noc: +4.00dB |
| 14.5.1.2 SA FR1 Event triggered reporting tests without gap under DRX for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.3 SA FR1 event triggered reporting tests | Same as 14.5.1.1 | Same as 14.5.1.1 | Same as 14.5.1.1 |

| | | | |
|---|---|---|---|
| without gap under non-DRX with FDD PCell with SSB index reading for NR satellite access | | | |
| 14.5.1.4 SA FR1 event triggered reporting tests with single measurement gap under non-DRX for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.5 SA FR1 event triggered reporting tests with FNO concurrent gaps under DRX for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.1.6 SA FR1 event triggered reporting tests with PPO concurrent gaps under non-DRX with SSB index reading for satellite access for NR satellite access | Same as 14.5.1.1 | Same as 14.5.1.1 | Same as 14.5.1.1 |
| 14.5.2.1 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with single gap for satellite access | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +7.00dB |
| 14.5.2.2 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is used with single gap for satellite access | Same as 14.5.2.1 | Same as 14.5.2.1 | Same as 14.5.2.1 |
| 14.5.2.3 NR SA FR1-FR1 Event-triggered reporting with SSB time index detection when DRX is not used with single gap for satellite access | Same as 14.5.2.1 | Same as 14.5.2.1 | Same as 14.5.2.1 |
| 14.5.2.4 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent fully non-overlapped (FNO) gaps for satellite access | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br>$\hat{E}s_3$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +7.00dB<br>$\hat{E}s_3$ / $Noc_2$: +7.00dB | During T1:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB<br><br>During T2:<br>0dB<br>0dB<br>0dB<br>0dB<br>0dB | During T1:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: -infinity<br>$\hat{E}s_3$ / $Noc_2$: -infinity<br><br>During T2:<br>Freq 1 $Noc_1$: -98dBm/15kHz<br>Freq 2 $Noc_2$: -98dBm/15kHz<br>$\hat{E}s_1$ / $Noc_1$: +4.00dB<br>$\hat{E}s_2$ / $Noc_2$: +7.00dB<br>$\hat{E}s_3$ / $Noc_2$: +7.00dB |
| 14.5.2.6 NR SA FR1-FR1 Event-triggered reporting without SSB time index detection when DRX is not used with two concurrent partial overlapping (PPO) gaps for satellite access | Same as 14.5.2.4 | Same as 14.5.2.4 | Same as 14.5.2.4 |

| | | | |
|---|---|---|---|
| 14.6.3.1 NR SA FR1 SS-SINR Measurement Accuracy for Satellite Access | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +4.54dB<br>$\hat{E}s_2 / N_{oc}$: +2.66dB<br>Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: -4dB<br>$\hat{E}s_2 / N_{oc}$: -4dB<br>Reported SINR values: ±3.5dB | Test 1:<br>0dB<br>0dB<br>0dB<br>Via mapping<br><br>Test 2:<br>0dB<br>0.5dB<br>0.5dB<br>Via mapping | Test 1:<br>$N_{oc}$: -93dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +4.54dB<br>$\hat{E}s_2 / N_{oc}$: +2.66dB<br>SINR_31 to SINR_49<br><br>Test 2:<br>$N_{oc}$: -116dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: -3.5dB<br>$\hat{E}s_2 / N_{oc}$: -3.5dB<br>SINR_28 to SINR_45 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s_2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end. | | | |
| 14.6.3.2 NR SA FR1-FR1 SS-SINR Measurement Accuracy for Satellite Access | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -1.75dB<br>$\hat{E}s_2 / N_{oc2}$: -1.75dB<br>Absolute Reported SINR values: ±3dB<br>Relative Reported SINR values: ±3.5dB<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 20dB<br>$\hat{E}s_2 / N_{oc2}$: 20dB<br><br>Absolute Reported SINR values: ±3dB<br>Relative Reported SINR values: ±3.5dB<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz<br>$N_{oc2}$: -119.5dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -4dB<br>$\hat{E}s_2 / N_{oc2}$: -4dB<br><br>Absolute Reported SINR values: ±3.5dB<br>Relative Reported SINR values: ±4dB | Test 1:<br>0dB<br>0dB<br>0dB<br>0dB<br>Via mapping<br>Via mapping<br><br>Test 2:<br>0dB<br>0dB<br>0dB<br>0dB<br><br>Via mapping<br>Via mapping<br><br>Test 3:<br>0dB<br>0dB<br>1.9dB<br>1.9dB<br><br>Via mapping<br>Via mapping | Test 1:<br>$N_{oc1}$: -88 dBm/15kHz<br>$N_{oc2}$: -88 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -1.75dB<br>$\hat{E}s_2 / N_{oc2}$: -1.75dB<br>SINR_35 to SINR_51<br>SINR_x-10 to SINR_x+10<br><br>Test 2:<br>$N_{oc1}$: -108.5dBm/15kHz<br>$N_{oc2}$: -108.5dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 20dB<br>$\hat{E}s_2 / N_{oc2}$: 20dB<br><br>SINR_79 to SINR_94<br>SINR_x-10 to SINR_x+10<br><br>Test 3:<br>$N_{oc1}$: -119.5dBm/15kHz<br>$N_{oc2}$: -119.5dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -2.1dB<br>$\hat{E}s_2 / N_{oc2}$: -2.1dB<br><br>SINR_34 to SINR_51<br>SINR_x-11 to SINR_x+11 |
| The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from $N_{oc}$ and $\hat{E}s_2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function.<br>The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3. | | | |
| 14.6.4.1 NR SA FR1 SSB based L1-RSRP Measurement Accuracy for Satellite Access | Test 1:<br>$N_{oc1}$: -94.65 dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br><br>Reported L1-RSRP values: ±8.5dB<br>(±3dB additionally for extreme conditions)<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -3dB<br><br>Reported L1-RSRP values: ±5dB<br>(±4.5dB additionally for extreme conditions)<br>Reported differential L1-RSRP values for normal conditions: -4.6dB to 0dB<br>Reported differential L1-RSRP values for extreme conditions: -5.6dB to 0dB | Test 1:<br>0dB<br>0dB<br><br>Via mapping<br><br>Via mapping<br><br>Via mapping<br><br>Test 2:<br>0dB<br>0.8dB<br><br>Via mapping<br><br>Via mapping<br><br>Via mapping | Test 1:<br>$N_{oc1}$: -94.65dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: 10dB<br><br>RSRP_62 to RSRP_82<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br>Test 2:<br>$N_{oc1}$: -117dBm/15kHz<br>$\hat{E}s_1 / N_{oc1}$: -2.2dB<br><br>RSRP_31 to RSRP_44<br><br>DIFFRSRP_0 to DIFFRSRP_2<br><br>DIFFRSRP_0 to DIFFRSRP_2 |
| 14.6.4.2 NR SA FR1 CSI-RS based L1-RSRP | Same as 14.6.4.1 | Same as 14.6.4.1 | Same as 14.6.4.1 |

| | | | |
|---|---|---|---|
| Measurement Accuracy for Satellite Access | | | |

**Table F.1.3.2-15: Derivation of test requirements for RRM requirements for SA FR1 Air-to-ground test cases**

| Test | Minimum requirement in TS 38.133 [6] | Test tolerance (TT) | Test requirement in TS 38.533 |
|---|---|---|---|
| 19.2.1.1 Intra-frequency handover from FR1 to FR1; known target cell | Same as 6.3.1.1 | Same as 6.3.1.1 | Same as 6.3.1.1 |
| 19.2.1.2 Inter-frequency handover from FR1 to FR1; unknown target cell | Same as 6.3.1.3 | Same as 6.3.1.3 | Same as 6.3.1.3 |
| 19.6.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.2.1 NR SA FR1 SS-RSRQ absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.3.1 NR SA FR1 SS-SINR absolute measurement accuracy for ATG | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 | Same as 6.7.1.1.1 |
| 19.6.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |
| 19.6.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy for ATG | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 | Same as 6.7.1.2.1 |

# Annex G (normative): Statistical testing

## G.1 General

The test requirements are expressed as absolute requirements with a single value stating the requirement or expressed as a success rate. The statistical nature depends on the type of test requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a Device Under Test (DUT) passing the test actually meets the test requirement and determines how many times a test have to be repeated and what the pass and fail criteria is. This Annex describes how to set the statistical significance.

## G.2 Statistical testing of delay and UE measurement performance in RRM tests

### G.2.1 General

The RRM tests are either of deterministic or of statistical nature. The pass fail limits in tests of statistical nature are expressed as a limit (e.g. delay limit) and a success ratio applicable for the limit. The success ratio is 90% uniform (the complement is the error ratio ER = 10%).

### G.2.2 Design of the test

The test is defined by the following design principles (see TS 36.521-1 clause G.X, Theory):

1) The early decision concept is applied.

2) A second limit is introduced: bad DUT factor M>1

To decide the test pass:

Supplier risk is applied based on the bad DUT quality

To decide the test fails

Customer risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1) Limit ER = 0.1 (success ratio = 90%)

2) Bad DUT factor M=1.5 (selectivity)

3) Confidence level CL = 95% (for specified DUT and bad DUT-quality)

### G.2.3 Numerical definition of the pass fail limits

Editor's Note:

- Further investigate the technical details behind this statistical method to ensure that this is applicable for FR2 radiated test cases.

**Table G.2.3-1: pass fail limits**

| ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 33 | NA | 43 | 408 | 283 | 86 | 737 | 644 | 129 | 1056 | 1021 |
| 1 | 46 | NA | 44 | 416 | 291 | 87 | 745 | 653 | 130 | 1064 | 1030 |
| 2 | 58 | NA | 45 | 424 | 299 | 88 | 752 | 661 | 131 | 1071 | 1039 |
| 3 | 69 | NA | 46 | 432 | 307 | 89 | 760 | 670 | 132 | 1078 | 1048 |
| 4 | 79 | NA | 47 | 440 | 315 | 90 | 767 | 679 | 133 | 1086 | 1057 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 89 | NA | 48 | 447 | 324 | 91 | 775 | 687 | 134 | 1093 | 1066 |
| 6 | 99 | NA | 49 | 455 | 332 | 92 | 782 | 696 | 135 | 1100 | 1074 |
| 7 | 109 | NA | 50 | 463 | 340 | 93 | 790 | 705 | 136 | 1108 | 1083 |
| 8 | 118 | NA | 51 | 471 | 348 | 94 | 797 | 713 | 137 | 1115 | 1092 |
| 9 | 127 | NA | 52 | 478 | 356 | 95 | 804 | 722 | 138 | 1122 | 1101 |
| 10 | 136 | 39 | 53 | 486 | 365 | 96 | 812 | 731 | 139 | 1130 | 1110 |
| 11 | 145 | 45 | 54 | 494 | 373 | 97 | 819 | 739 | 140 | 1137 | 1119 |
| 12 | 154 | 51 | 55 | 502 | 381 | 98 | 827 | 748 | 141 | 1144 | 1128 |
| 13 | 163 | 58 | 56 | 509 | 389 | 99 | 834 | 757 | 142 | 1152 | 1137 |
| 14 | 172 | 64 | 57 | 517 | 398 | 100 | 842 | 766 | 143 | 1159 | 1147 |
| 15 | 180 | 71 | 58 | 525 | 406 | 101 | 849 | 774 | 144 | 1166 | 1155 |
| 16 | 189 | 78 | 59 | 532 | 414 | 102 | 857 | 783 | 145 | 1174 | 1164 |
| 17 | 197 | 85 | 60 | 540 | 423 | 103 | 864 | 792 | 146 | 1181 | 1173 |
| 18 | 206 | 92 | 61 | 548 | 431 | 104 | 871 | 801 | 147 | NA | 1182 |
| 19 | 214 | 99 | 62 | 555 | 440 | 105 | 879 | 809 | 148 | | |
| 20 | 223 | 106 | 63 | 563 | 448 | 106 | 886 | 818 | 149 | | |
| 21 | 231 | 113 | 64 | 571 | 456 | 107 | 894 | 827 | 150 | | |
| 22 | 239 | 120 | 65 | 578 | 465 | 108 | 901 | 836 | 151 | | |
| 23 | 248 | 128 | 66 | 586 | 473 | 109 | 909 | 844 | 152 | | |
| 24 | 256 | 135 | 67 | 594 | 482 | 110 | 916 | 853 | 153 | | |
| 25 | 264 | 142 | 68 | 601 | 490 | 111 | 923 | 862 | 154 | | |
| 26 | 272 | 150 | 69 | 609 | 499 | 112 | 931 | 871 | 155 | | |
| 27 | 281 | 157 | 70 | 616 | 507 | 113 | 938 | 880 | 156 | | |
| 28 | 289 | 165 | 71 | 624 | 516 | 114 | 946 | 888 | 157 | | |
| 29 | 297 | 173 | 72 | 632 | 524 | 115 | 953 | 897 | 158 | | |
| 30 | 305 | 180 | 73 | 639 | 533 | 116 | 960 | 906 | 159 | | |
| 31 | 313 | 188 | 74 | 647 | 541 | 117 | 968 | 915 | 160 | | |
| 32 | 321 | 196 | 75 | 654 | 550 | 118 | 975 | 924 | 161 | | |
| 33 | 329 | 204 | 76 | 662 | 558 | 119 | 983 | 933 | 162 | | |
| 34 | 337 | 211 | 77 | 669 | 567 | 120 | 990 | 941 | 163 | | |
| 35 | 345 | 219 | 78 | 677 | 575 | 121 | 997 | 950 | 164 | | |
| 36 | 353 | 227 | 79 | 684 | 584 | 122 | 1005 | 959 | 165 | | |
| 37 | 361 | 235 | 80 | 692 | 592 | 123 | 1012 | 968 | 166 | | |
| 38 | 369 | 243 | 81 | 700 | 601 | 124 | 1019 | 977 | 167 | | |
| 39 | 377 | 251 | 82 | 707 | 610 | 125 | 1027 | 986 | 168 | | |
| 40 | 385 | 259 | 83 | 715 | 618 | 126 | 1034 | 994 | 169 | | |
| 41 | 393 | 267 | 84 | 722 | 627 | 127 | 1042 | 1003 | | | |
| 42 | 400 | 275 | 85 | 730 | 635 | 128 | 1049 | 1012 | | | |

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit ($ns_p$ , ns=Number of samples= number of successes + number of exceedings or number of reports)

The third column is the number of samples for the fail limit ($ns_f$)

## G.2.4 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.6

Having observed 0 errors, pass the test at 33+ samples, otherwise continue

Having observed 1 error, pass the test at 46+ samples, otherwise continue

Having observed 2 errors, pass the test at 58+ samples, otherwise continue

Having observed 10 errors, pass the test at 136+ samples, fail the test at 39 samples, otherwise continue

Having observed 146 errors, pass the test at 1181+ samples, fail the test at 1173- samples, otherwise continue

Having observed 147 errors, fail the test at 1182- samples,

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 33 samples. The maximum test time is 1181 samples.

## G.2.5 Void

## G.2.6 Test conditions for delay tests and UE measurement performance

**Table G.2.6-1: test conditions**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | Over all Pass/Fail condition |
|---|---|---|---|
| All tests in clauses 4.4.3, 4.5, 4.6, 5.4.3, 5.5, 5.6, 6.1, 6.2, 6.3.1, 6.3.2.1, 6.3.2.3, 6.4.3, 6.5, 6.6, 7.1, 7.2, 7.3.1, 7.3.2.1, 7.3.2.3, 7.4.3, 7.5, 7.6, 10.1.2, 10.2.2, 10.3, 10.4, 11.1, 11.2.1, 11.2.2.1, 11.2.2.3, 11.3.2, 11.4, 11.5, 12.1, 12.2, 12.3, 12.4, 13.1.2, 13.2, 13.3, 16.1, 16.2, 16.3.1, 16.3.2.1, 16.3.2.3, 16.5, 16.6, 17.1, 17.2, 17.3.1, 17.3.2.1, 17.3.2.3, 17.4.3, 17.5, 17.6, 18.1, 18.2, 18.3 are delay tests of statistical nature<br>while<br>4.3.2.2, 4.4.1, 5.3.2.2, 5.4.1, 6.3.2.2, 6.4.1, 7.3.2.2, 7.4.1, 10.1.1.1, 10.2.1.1, 11.2.2.2, 11.3.1, 13.1.1, 16.3.2.2, 16.4.1, 17.3.2.2, 17.4.1 are not applicable, since they are deterministic. | Test procedure in all statistical tests ensures independency | 1 per operating band (if tested, see 3A.3) | Full set of environmental conditions (5) per operating band |
| All tests in clauses 4.7, 5.7, 6.7 and 7.7, 10.5, 11.6, 12.5, 13.4, 16.7, 17.7 are UE level reports of statistical nature | Independency is assumed, although Layer 1 filtering is applied to the reported results | Full set of environmental conditions (5) per operating band | Full set of environmental conditions (5) per operating band |

## G.2.7 Additional considerations for tests in bands subject to CCA failure

The scope of shared spectrum RRM tests is similar to their corresponding licensed carrier tests. However, the unlicensed channel accessibility is subject to a probabilistic Clear Channel Assessment (CCA) model and therefore is not guaranteed. This model applies independently to DL ($P_{CCA_DL_i}$) and UL ($P_{CCA_UL}$) and is defined in section D.7.

The SS has knowledge on whether a given DL or UL slot is subject to CCA failure:

- In DL slots subject to CCA failure the SS will not schedule the slot
- In UL slots subject to CCA failure the SS will occupy the channel according to section D.7.2.2

Due to the statistical nature of the CCA model, iterations can fail. In the event the SS detects a failure caused by CCA failure, the SS shall declare that iteration as inconclusive (remove it from the count) and continue testing.

Table G.2.7-1 lists test cases from sections 10, 11, 12 and 13 that have been considered as untestable due to issues related with how the CCA model impacts the test outcome. Unless otherwise listed in Table G.2.7-1, all tests from sections 10, 11, 12 and 13 can be executed following the statistical methodology defined in clause G.2.3.

**Table G.2.7-1: Test cases in bands subject to CCA failure with testability issues**

| Test Case | Channel Access Mode | $P_{CCA_DL_i}$ | $P_{CCA_UL}$ | Testability Issue Reason |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 11.2.2.2.1 | Semi-static | N/A | 0.87 | SS may not be able to identify whether a missing PRACH was caused by CCA failure as UE does not have a fixed schedule |
| | Dynamic | N/A | 0.75 | |
| 11.2.2.2.2 | Semi-static | N/A | 0.87 | SS may not be able to identify whether a missing PRACH was caused by CCA failure as UE does not have a fixed schedule |
| | Dynamic | N/A | 0.75 | |
| 11.2.2.2.3 | Semi-static | N/A | 0.87 | SS may not be able to identify whether a missing PRACH was caused by CCA failure as UE does not have a fixed schedule |
| | Dynamic | N/A | 0.75 | |
| 11.2.2.2.4 | Semi-static | N/A | 0.87 | SS may not be able to identify whether a missing PRACH was caused by CCA failure as UE does not have a fixed schedule |
| | Dynamic | N/A | 0.75 | |

# G.3 Statistical testing of NR sidelink CBR measurement tests

## G.3.1 General

The CBR measurement tests are of statistical nature. The pass fail limits in tests of statistical nature are expressed as a limit (e.g. delay limit) and a success ratio applicable for the limit. The success ratio is 98% (the complement is the error ratio ER = 2%).

## G.3.2 Design of the test

The test is defined by the following design principles (see TS 36.521-1 clause G.7, Theory):

1) The early decision concept is applied.

2) A second limit is introduced: bad DUT factor M>1

To decide the test pass:

- Supplier risk is applied based on the bad DUT quality

To decide the test fails

- Customer risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1) Limit ER = 0.02 (success ratio = 98%)

2) Bad DUT factor M=1.5 (selectivity)

3) Confidence level CL = 95% (for specified DUT and bad DUT-quality)

## G.3.3 Numerical definition of the pass fail limits

**Table G.3.3-1: pass fail limits for ER = 0.02**

| ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 206 | N/A | 43 | 1970 | 1389 | 86 | 6370 | 3300 | 129 | 6413 | 5409 |
| 1 | 287 | N/A | 44 | 2005 | 1431 | 87 | 6371 | 3348 | 130 | 6414 | 5459 |
| 2 | 345 | N/A | 45 | 2041 | 1468 | 88 | 6372 | 3396 | 131 | 6415 | 5511 |
| 3 | 398 | 10 | 46 | 2078 | 1511 | 89 | 6373 | 3443 | 132 | 6416 | 5560 |
| 4 | 447 | 23 | 47 | 2113 | 1555 | 90 | 6374 | 3492 | 133 | 6417 | 5613 |
| 5 | 494 | 39 | 48 | 2149 | 1600 | 91 | 6375 | 3537 | 134 | 6418 | 5660 |
| 6 | 540 | 57 | 49 | 6333 | 1637 | 92 | 6376 | 3585 | 135 | 6419 | 5712 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 585 | 78 | 50 | 6334 | 1683 | 93 | 6377 | 3631 | 136 | 6420 | 5765 |
| 8 | 629 | 102 | 51 | 6335 | 1728 | 94 | 6378 | 3683 | 137 | 6421 | 5811 |
| 9 | 671 | 130 | 52 | 6336 | 1768 | 95 | 6379 | 3728 | 138 | 6422 | 5866 |
| 10 | 714 | 155 | 53 | 6337 | 1813 | 96 | 6380 | 3778 | 139 | 6423 | 5915 |
| 11 | 756 | 182 | 54 | 6338 | 1857 | 97 | 6381 | 3828 | 140 | 6424 | 5970 |
| 12 | 797 | 212 | 55 | 6339 | 1900 | 98 | 6382 | 3874 | 141 | 6425 | 6020 |
| 13 | 838 | 243 | 56 | 6340 | 1938 | 99 | 6383 | 3922 | 142 | 6426 | 6069 |
| 14 | 879 | 276 | 57 | 6341 | 1982 | 100 | 6384 | 3971 | 143 | 6427 | 6124 |
| 15 | 918 | 306 | 58 | 6342 | 2028 | 101 | 6385 | 4018 | 144 | N/A | 6427 |
| 16 | 959 | 342 | 59 | 6343 | 2072 | 102 | 6386 | 4070 | 145 | | |
| 17 | 998 | 375 | 60 | 6344 | 2116 | 103 | 6387 | 4118 | 146 | | |
| 18 | 1037 | 408 | 61 | 6345 | 2161 | 104 | 6388 | 4169 | 147 | | |
| 19 | 1077 | 442 | 62 | 6346 | 2203 | 105 | 6389 | 4216 | 148 | | |
| 20 | 1115 | 480 | 63 | 6347 | 2246 | 106 | 6390 | 4264 | 149 | | |
| 21 | 1154 | 517 | 64 | 6348 | 2292 | 107 | 6391 | 4314 | 150 | | |
| 22 | 1192 | 553 | 65 | 6349 | 2338 | 108 | 6392 | 4358 | 151 | | |
| 23 | 1230 | 591 | 66 | 6350 | 2382 | 109 | 6393 | 4413 | 152 | | |
| 24 | 1269 | 629 | 67 | 6351 | 2427 | 110 | 6394 | 4462 | 153 | | |
| 25 | 1306 | 666 | 68 | 6352 | 2473 | 111 | 6395 | 4506 | 154 | | |
| 26 | 1344 | 706 | 69 | 6353 | 2516 | 112 | 6396 | 4561 | 155 | | |
| 27 | 1382 | 741 | 70 | 6354 | 2559 | 113 | 6397 | 4611 | 156 | | |
| 28 | 1420 | 777 | 71 | 6355 | 2608 | 114 | 6398 | 4661 | 157 | | |
| 29 | 1457 | 815 | 72 | 6356 | 2652 | 115 | 6399 | 4712 | 158 | | |
| 30 | 1494 | 855 | 73 | 6357 | 2694 | 116 | 6400 | 4760 | 159 | | |
| 31 | 1531 | 898 | 74 | 6358 | 2741 | 117 | 6401 | 4807 | 160 | | |
| 32 | 1568 | 936 | 75 | 6359 | 2789 | 118 | 6402 | 4854 | 161 | | |
| 33 | 1605 | 976 | 76 | 6360 | 2836 | 119 | 6403 | 4909 | 162 | | |
| 34 | 1642 | 1015 | 77 | 6361 | 2883 | 120 | 6404 | 4960 | 163 | | |
| 35 | 1679 | 1059 | 78 | 6362 | 2928 | 121 | 6405 | 5010 | 164 | | |
| 36 | 1715 | 1098 | 79 | 6363 | 2971 | 122 | 6406 | 5062 | 165 | | |
| 37 | 1752 | 1138 | 80 | 6364 | 3018 | 123 | 6407 | 5110 | 166 | | |
| 38 | 1788 | 1180 | 81 | 6365 | 3068 | 124 | 6408 | 5158 | 167 | | |
| 39 | 1825 | 1220 | 82 | 6366 | 3115 | 125 | 6409 | 5204 | 168 | | |
| 40 | 1861 | 1263 | 83 | 6367 | 3162 | 126 | 6410 | 5256 | 169 | | |
| 41 | 1897 | 1302 | 84 | 6368 | 3203 | 127 | 6411 | 5305 | | | |
| 42 | 1933 | 1344 | 85 | 6369 | 3251 | 128 | 6412 | 5358 | | | |

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit ($ns_p$ , ns=Number of samples= number of successes + number of wrong reports)

The third column is the number of samples for the fail limit ($ns_f$)

## G.3.4 Pass fail decision rules

The pass/fail decision rules apply for a single test, comprising one component in the test vector. The over all pass/fail conditions are defined in clause G.2.6:

Having observed 0 error, pass the test at 206+ samples, otherwise continue,

Having observed 1 error, pass the test at 287+ samples, otherwise continue,

Having observed 2 errors, pass the test at 345+ samples, otherwise continue,

Having observed 3 errors, pass the test at 398+ samples, fail the test at 10- samples, otherwise continue,

…

Having observed 143 errors, pass the test at 6427+ samples, fail the test at 6124- samples, otherwise continue,

Having observed 144 errors, fail the test at 6427- samples,

Where x+ means: x or more, x- means x or less.

NOTE 1: an ideal DUT passes after 206 samples. The maximum test time is 6427 samples.

# G.4 Theory to derive the numbers in Table G.2.3-1 (informative)

TS 36.521-1 Anne4 G.X applies.

# G.5 Theory to derive the numbers in Table G.3.3-1 (informative)

TS 36.521-1 Annex G.7 applies except that:

- 36.521-1 Annex G.7.9 is replaced by G.5.1 and G.5.2.

## G.5.1 Algorithm to calculate pass and fail probabilities

Following basic assumptions for statistical testing are introduced in this clause:

- Result of single iteration of test procedure loop obeys Bernoulli distribution with error ratio $p$, i.e. the probability that the TE observes expected UE behaviour in single iteration (counted as a success) is $1 - p$ and the probability that the TE doesn't observe expected UE behaviour in single iteration (counted as a fail) is $p$.
- Results of different iterations are independent and identically distributed (i.i.d).
- Early decision concept is applied, i.e., the TE repeats multiple iterations of the test procedure loop. For each iteration the TE records its result (count as a success if the TE observes the expected behavior, count as a fail otherwise) and its index in all iterations. When the i-th fail is observed in $e_i$-th iteration, the TE compares $e_i$ with corresponding pass limit $N_{p,i}$ and fail limit $N_{f,i}$. The TE shall:
  - terminate the test and decide the DUT passes the test if $e_i > N_{p,i}$
  - terminate the test and decide the DUT fails the test if $e_i \leq N_{f,i}$,
  - continue the test and make no decision if $N_{f,i} < e_i \leq N_{p,i}$.

For a more intuitive understanding, we use the state transition diagram shown in Figure G.5.1-1 to describe the entire process of statistical testing. In Figure 1, X-axis and Y-axis denote the success count and fail count in iterations already executed respectively. And the point with coordinate $(i, j)$ (referred as *state* $(i, j)$ thereafter) is used to indicates that the DUT has executed $i + j$ iterations which includes $i$ successes and $j$ fails, where $i, j \geq 0$.

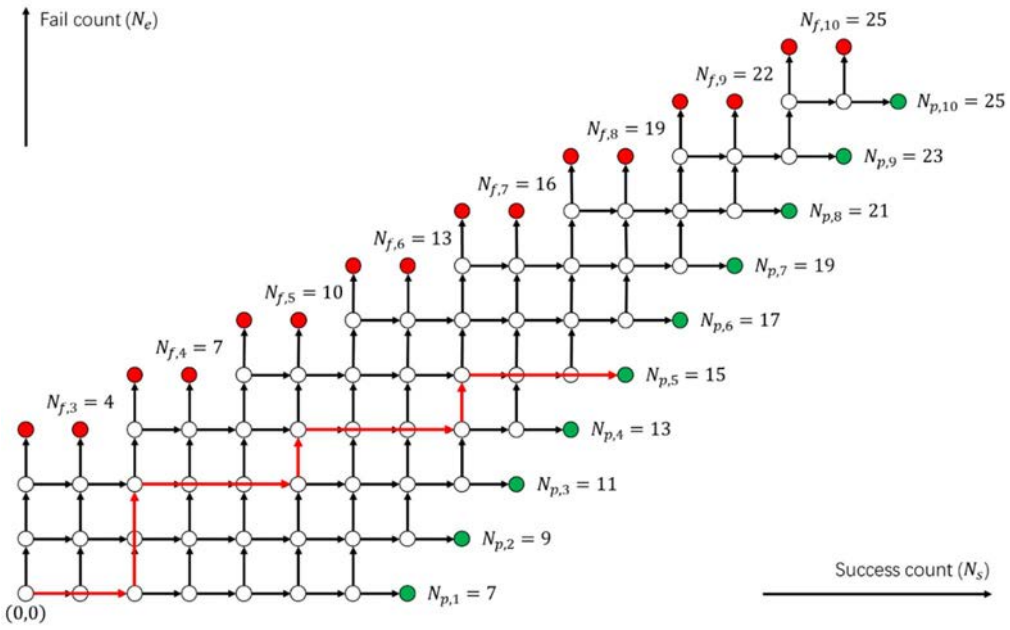


**Figure G.5.1-1: Visualization of early decision statistical testing process. In this example, the TE verdicts that the DUT passes the test after executing 15 iterations of test procedure loop. The results of these 15 iterations are "s", "f", "f", "s", "s", "s", "f", "s", "s", "s", "f", "s", "s" and "s" in order ("s" = "success" and "f" = "fail")**

From Figure G.5.1-1 it's straightforward to get following observations:

- The DUT is always in state $(0,0)$ at the beginning of statistical test since no iteration is executed at that moment.
- Assume the DUT is in state $(i,j)$ after executing $i+j$ iterations. Then,
  - if the $i+j+1$-th iteration counts a success (with probability $1-p$), the success count shall increase 1 and fail count shall remain unchanged after the $i+j+1$-th iteration. As a result, the DUT will be in state $(i+1,j)$ after the $i+j+1$-th iteration. We call that the DUT moves from state $(i,j)$ to state $(i+1,j)$, depicted as moving right by one in the diagram.
  - if the $i+j+1$-th iteration counts a fail (with probability $p$), the success count remains unchanged and the fail count increases 1 after the $i+j+1$-th iteration. Then the DUT will be in state $(i,j+1)$ after the $i+j+1$-th iteration. We call that the DUT moves from state $(i,j)$ to state $(i,j+1)$, depicted as moving up by one in the diagram.
- The TE shall evaluate whether pass criteria or fail criteria is satisfied every time the DUT has executed a new iteration, i.e. the DUT moves to a new state. Specifically speaking,
  - If pass criterion is satisfied when DUT is in state $(i,j)$, the TE makes the decision that the DUT passes the test. Correspondingly, state $(i,j)$ is referred as a passing state (depicted as green points in Figure G.5.1-1);
  - If fail criterion is satisfied when DUT is in state $(i,j)$, the TE makes the decision that the DUT fails the test. Correspondingly, state $(i,j)$ is referred as a failure state (depicted as red points in Figure G.5.1-1).
  - If neither pass criterion nor fail criterion is satisfied when DUT is in state $(i,j)$, the TE makes no decision and continues the test. Correspondingly, state $(i,j)$ is referred as a non-decidable state (depicted as hollow points in Figure G.5.1-1).

In this way, the statistical testing is represented as a process in which the DUT starts from state $(0,0)$, moves along certain path in the diagram, and finally stops in certain passing state or failure state.

Obviously, there must be a close relationship between the pass/fail states and the pass/fail limits used for the test. The following two conclusions precisely describes the mapping between pass/fail limits and pass/fail states.

**Conclusion 1:** The DUT is decided to pass the test if and only if the DUT moves from state $(0,0)$ to a state belongs to passing state set $\mathcal{P} = \{(N_{p,i+1} - i, i): i = 0,1,2, \cdots\}$.

**Proof**: We prove sufficiency first, and then necessity.

- **Sufficiency**: If the DUT is in state $(N_{p,i+1} - i, i)$, it means that the DUT has executed $N_{p,i+1}$ iterations which includes $i$ success and $N_{p,i+1} - i$ fails. Clearly, the TE can only get the i+1-th fail as early as the $N_{p,i+1} + 1$-th iteration, then we have $e_{i+1} > N_{p,i+1}$. This is just the pass criterion when the TE collecting the i+1-th fail.

- **Necessity**: If the TE verdicts the DUT to pass when it collects the i+1-th fail, following inequations must have been satisfied according to the pass criterion:

$$e_1 \le N_{p,1}, e_2 \le N_{p,2}, \cdots, e_i \le N_{p,i}, e_{i+1} > N_{p,i+1}.$$

  The DUT is in state $(e_i - i, i)$ when the i-th fail happens in the $e_i$-th iteration. Then the next $N_{p,i+1} - e_i$ iterations after the $e_i$-th iteration must be counted as success since $e_{i+1} > N_{p,i+1}$. Then the DUT will be in state $(N_{p,i+1} - i, i)$ after executing these $N_{p,i+1} - e_i$ iterations.

**Conclusion 2**: The DUT is decided to fail the test if and only if the DUT moves from state $(0,0)$ to a state belongs to failure set $\mathcal{F} = \{(j, i+1): N_{f,i} - i < j \le N_{f,i+1} - (i+1), i = 0,1,2, \cdots\}$, where $N_{f,0} \triangleq -1$ for sake of simplify.

Proof of conclusion 2 is quite similar as the proof of conclusion 1 and is omitted here. Conclusion 1 and 2 have shown the equivalence between pass/fail limits and pass/fail state sets. As a result, the probability that the DUT pass the test for given error ratio $p$, passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$, denoted as $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$, is given by

$$\mathbb{P}_p(\mathcal{P}, \mathcal{F}) = \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j) \text{ which belongs to } \mathcal{P}\}.$$

Furthermore, it's easy to prove that any path from state$(0,0)$ to passing state $(i,j)$ won't pass through any passing state or failure state except the ending state. This is because if the path contains a passing state or failure state $(i', j')$ which is not the ending state, the test will be terminated immediately when the DUT is in state $(i', j')$. Then $(i', j')$ shall be the ending state, i.e. $(i', j') = (i, j)$. This contradicts the assumption that state $(i', j')$ is not the ending state. This also means that two events "DUT moves from state $(0,0)$ to passing state $(i,j)$" and "DUT moves from state $(0,0)$ to passing state $(i', j')$" are disjoint if $(i', j') \neq (i, j)$. Then we have,

$$\mathbb{P}_p(\mathcal{P}, \mathcal{F}) = \sum_{(i,j)\in\mathcal{P}} \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to passing state } (i,j)\} = \sum_{(i,j)\in\mathcal{P}} T^p_{(i,j)}(\mathcal{P}, \mathcal{F}),$$

where $T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$ is defined as the transition probability from state $(0,0)$ to state $(i,j)$, i.e.

$$T^p_{(i,j)}(\mathcal{P}, \mathcal{F}) \triangleq \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j)\}.$$

Similarly, the probability that the DUT fail the test for given error ratio $p$, passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$, denoted as $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$, is derived as

$$\mathbb{F}_p(\mathcal{P}, \mathcal{F}) = \sum_{(i,j)\in\mathcal{F}} T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$$

From the discussion above we can observe that the calculation of the $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$ and $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$ is finally transformed into the calculation of the transition probability $T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$. Assuming DUT is in state $(i,j)$ after the $i+j$-th iteration, $i, j \ge 0$. Considering that the $i+j$-th iteration can only have two possible results: success or fail, we can derive that the DUT can only be in state $(i-1, j)$ or state $(i, j-1)$ after executing $i+j-1$ iterations. Then we have:

$$\begin{aligned} T^p_{(i,j)}(\mathcal{P}, \mathcal{F}) = {} & \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j), \text{passing } (i-1,j)\} \\ & + \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j), \text{passing state } (i,j-1)\} \\ & = \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i-1,j)\}\text{Prob}\{\text{DUT moves from state } (i-1,j) \text{ to } (i,j)\} \\ & + \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i,j-1)\}\text{Prob}\{\text{DUT moves from state } (i,j-1) \text{ to } (i,j)\} \end{aligned}$$

The first equation above holds because the event "DUT moves from state $(0,0)$ to state $(i,j)$, passing state $(i,j-1)$" and event "DUT moves from state $(0,0)$ to state $(i,j)$, passing state $(i-1,j)$" are disjoint. And the second equation above holds because results of different iterations are independent.

Furthermore, we have following obvious observations:

If $i = 0$, obviously the event "DUT moves from state $(0,0)$ to state $(i-1, j)$" won't happen since state $(i-1, j)$ doesn't exist in this case. Otherwise, the probability that this event occurs equals to $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ according to the definition of transition probability. Then we have

$$\text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i-1, j)\} = T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})\mathbb{I}_{i>0},$$

Similarly, we can also derive that

$$\text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i, j-1)\} = T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})\mathbb{I}_{j>0},$$

Where, $\mathbb{I}_{i>0}$ and $\mathbb{I}_{j>0}$ are indicator functions,

$$\mathbb{I}_{i>0} = \begin{cases} 1, & \text{if } i > 0 \\ 0, & \text{otherwise} \end{cases}, \qquad \mathbb{I}_{j>0} = \begin{cases} 1, & \text{if } j > 0 \\ 0, & \text{otherwise} \end{cases}$$

If $(i-1, j) \in \mathcal{P} \cup \mathcal{F}$, the event "DUT moves from state $(i-1, j)$ to state $(i, j)$" won't happen since the test will be terminated when DUT reaches state $(i-1, j)$. Otherwise, this event is equivalent to the event "result of the $(i+j)$-th iteration is a success". Then we have

$$\text{Prob}\{\text{DUT moves from state } (i-1, j) \text{ to } (i, j)\} = (1-p)\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}}$$

Similarly, we can also derive that

$$\text{Prob}\{\text{DUT moves from state } (i, j-1) \text{ to } (i, j)\} = p\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

where,

$$\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} = \begin{cases} 1, & (i-1, j) \notin \mathcal{P} \cup \mathcal{F} \\ 0, & \text{otherwise} \end{cases}, \qquad \mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}} = \begin{cases} 1, & \text{if } (i, j-1) \notin \mathcal{P} \cup \mathcal{F} \\ 0, & \text{otherwise} \end{cases}$$

Finally, we have shown that following conclusion holds.

**Conclusion 3**: Transition probability $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ can be calculated by

$$T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1-p)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})p\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

The conclusion above shows that $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ can be calculated in a dynamic programming manner: Clearly, we can calculate $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ using the above equation if we know the value of $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})$; For the same reason, we can calculate $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})$ using the equation above if we know the value of $T^{p}_{(i-2,j)}(\mathcal{P}, \mathcal{F})$, $T^{p}_{(i-1,j-1)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-2)}(\mathcal{P}, \mathcal{F})$; Repeating the recursion above, at last all we need to know is only $T^{p}_{(0,0)}(\mathcal{P}, \mathcal{F})$. And we know $T^{p}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$ since UE always is in state $(0,0)$ when test starts.

Using the recursion above, we can finally obtain $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and further $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$ and $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$ for given $p$, $\mathcal{P}$ and $\mathcal{F}$.

Assume the limit-risk mapping given in 36.521-1 is still used. Then the customer risk $R_c$ and supplier risk $R_s$ for given passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$ is the probability that baseline bad DUT (error ratio = $Mp$, where $M$ is the bad DUT factor) passes the test and the probability that baseline good DUT (error ratio = $mp$, where $m$ is the bad DUT factor) fails the test respectively. Then we have

$$R_c = \sum_{(i,j)\in\mathcal{P}} T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F}), \quad R_s = \sum_{(i,j)\in\mathcal{F}} T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}).$$

## G.5.2 Method of designing pass/fail limit to approach given risk probability

For given error ratio $p$, confidence level $P_{CL}$, good DUT factor $m$ and bad DUT factor $M$, pass limit $\{N_{p,i}, i = 1,2,\cdots\}$ and fail limit $\{N_{f,i}: i = 1,2,\cdots\}$ can be obtained by using the method listed below. Note that the limit-risk mapping in 36.521-1 is assumed.

**Step 1**: Initialize as follows:

- Set $\mathcal{P}$ and $\mathcal{F}$, passing state set and failure state set respectively, as $\mathcal{P}, \mathcal{F} = \emptyset$.
- Set $R_c$ and $R_s$, customer risk and supplier risk respectively, as $R_c, R_s = 0$;
- Set $n$, number of executed iterations, as $n = 0$;
- Set $\mathcal{S}$, non-decidable state set after $n$-th iteration, as $\mathcal{S} = \{(0,0)\}$;
- Set $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F})$, transition probability to state $(0,0)$ for baseline good DUT and for baseline bad DUT respectively, as $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = 1$, $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$.
- Select $\Delta_c$ and $\Delta_s$, step size for customer risk and supplier risk respectively, as $\Delta_c \leq 1 - P_{CL}$, $\Delta_s \leq 1 - P_{CL}$.

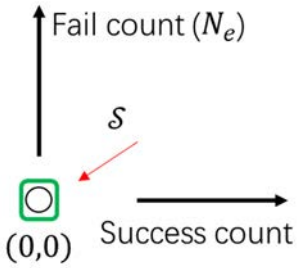


**Figure G.5.2-1: Demonstration of step 1**

Figure G.5.2-1 is the demonstration of step 1. The reason to initialize $= \{(0,0)\}$, $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = 1$, $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$ is because the DUT is always in state $(0,0)$ before executing any iteration. And we have $\mathcal{P}, \mathcal{F} = \emptyset$ since no passing state or failure state is selected yet.

**Step 2**: Calculate set $\mathcal{S}'$, the set of the state can be reached after the n+1-th iteration, as $\mathcal{S}' = \{(i,j): (i-1,j) \in \mathcal{S} \text{ or } (i,j-1) \in \mathcal{S}\}$. Then for all state $(i,j) \in \mathcal{S}'$, calculate $T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ as follows:

$$T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{Mp}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1 - Mp)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{Mp}_{(i,j-1)}(\mathcal{P}, \mathcal{F})Mp\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}},$$

$$T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{mp}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1 - mp)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{mp}_{(i,j-1)}(\mathcal{P}, \mathcal{F})mp\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

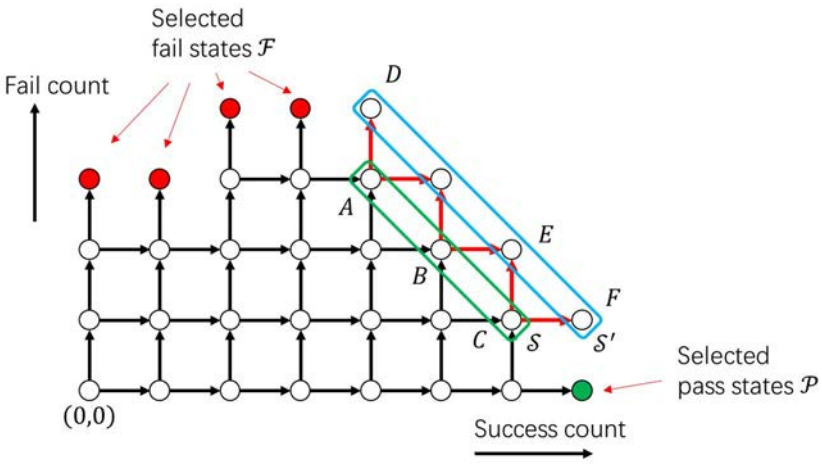


**Figure G.5.2-2: Demonstration of step 2**

See Figure G.5.2-2 for better understanding of step 2. If DUT doesn't pass or fail the test after the n-th iteration then DUT must be in one state in $\mathcal{S}$. It's easy to observe that the DUT must be in one state in $\mathcal{S}'$. Then the transition

probability to state in $\mathcal{S}'$ can be calculated by using Conclusion 3. For example, the only way to move to state $D$ in Figure 2 is to first move to state $A$ then count a fail in the n+1-th iteration, then we have $T_D^p = T_A^p p$. On the other hand, to move to state $E$, the DUT can first move to state $B$ then count a success in the n+1-th iteration or first move to state $C$ then count a fail in the n+1-the iteration, i.e. $T_E^p = T_B^p(1-p) + T_C^p p$.

**Step 3**: First, try finding an integer $n_e$ which satisfies $(n+1-n_e, n_e) \in \mathcal{S}'$, $R_c + \sum_{\substack{(i,j)\in\mathcal{S}' \\ j\le n_e}} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}) \le 1 - P_{CL}$ and $R_s + \sum_{\substack{(i,j)\in\mathcal{S}' \\ j> n_e}} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}) \le 1 - P_{CL}$. If such a $n_e$ exists, let

$$R_c = R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_e} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}), \quad R_s = R_s + \sum_{(i,j)\in\mathcal{S}', j> n_e} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}),$$

$$\mathcal{P} = \mathcal{P} \cup \{(i,j): (i,j) \in \mathcal{S}', j \le n_e\}, \quad \mathcal{F} = \mathcal{F} \cup \{(i,j): (i,j) \in \mathcal{S}', j > n_e\},$$

If such a $n_e$ doesn't exist, instead try finding integers $n_p$ and $n_f$ which satisfy

$$(n+1-n_p, n_p) \in \mathcal{S}', \quad (n+1-n_f, n_f) \in \mathcal{S}',$$

$$min(i_c\Delta_c, 1-P_{CL}) < R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_p} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}) \le min\big((i_c+1)\Delta_c, 1-P_{CL}\big),$$

$$min(i_s\Delta_s, 1-P_{CL}) < R_s + \sum_{(i,j)\in\mathcal{S}', j\ge n_f} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}) \le min\big((i_s+1)\Delta_s, 1-P_{CL}\big).$$

Then,

- if such a $n_p$ exists, set

$$R_c = R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_p} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}), \quad \mathcal{P} = \mathcal{P} \cup \{(i,j): (i,j) \in \mathcal{S}', j \le n_p\}, \quad i_c = i_c + 1.$$

- if such a $n_f$ exists, set

$$R_s = R_s + \sum_{(i,j)\in\mathcal{S}', j\ge n_f} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}), \quad \mathcal{F} = \mathcal{F} \cup \{(i,j): (i,j) \in \mathcal{S}', j \ge n_f\}, \quad i_s = i_s + 1.$$

Two possible cases in step 3 are depicted in figure G.5.2-3 and figure G.5.2-4 respectively. If $n_e$ exists, even we add all states $(i,j) \in \mathcal{S}'$ with $j \le n_e$ to $\mathcal{P}$ and all states $(i,j) \in \mathcal{S}'$ with $j > n_e$ to $\mathcal{F}$, the customer risk and supplier risk are still no larger than $1 - P_{CL}$ (the increment of the customer risk and supplier risk, are denoted as blue and green triangle in figure 4 respectively).

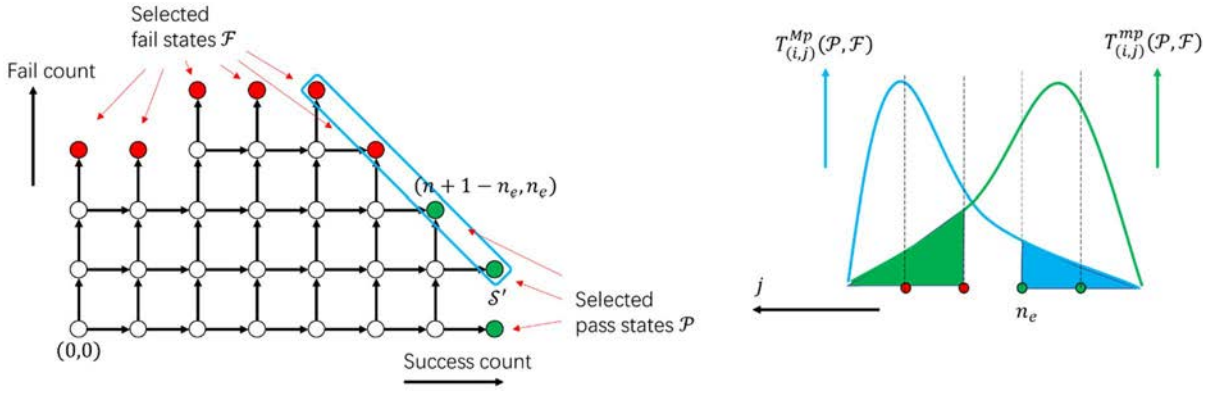


**Figure G.5.2-3: Demonstration of step 3 ($n_e$ exists)**

If $n_e$ doesn't exist, instead we try to find state set $\{(i,j): (i,j) \in \mathcal{S}', j \leq n_p\}$ which satisfies that the total transition probability to any state in the set is approximately $\Delta_c$. If such a set exists we can add states in this set to $\mathcal{P}$ without breaking customer risk threshold. Similarly, we can also try to a state set$\{(i,j): (i,j) \in \mathcal{S}', j \geq n_f\}$ which satisfies that the total transition probability to any state in the set is approximately $\Delta_s$ and add states in this set to $\mathcal{F}$.

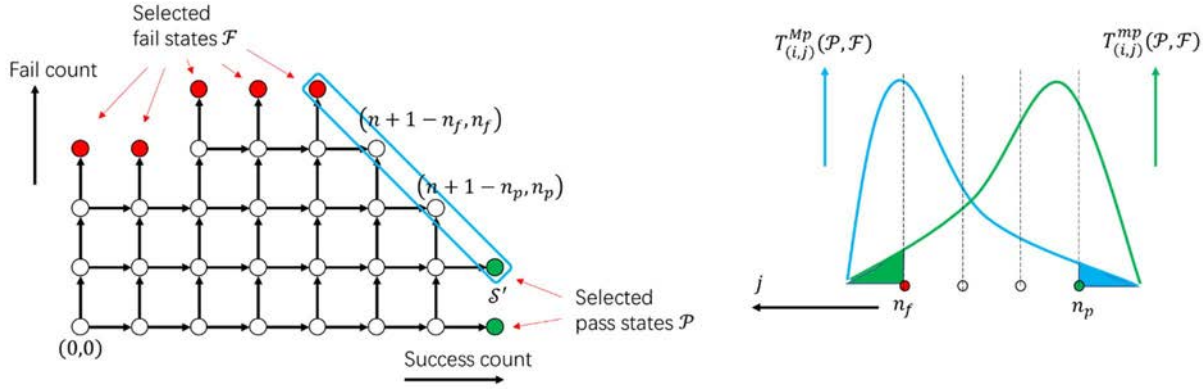


**Figure G.5.2-4: Demonstration of step 3 ($n_e$ doesn't exist)**

**Step 4**: Let $\mathcal{S} = \mathcal{S}' \backslash (\mathcal{P} \cup \mathcal{F})$, $n = n + 1$. Then go back to Step 2 if $\mathcal{S} \neq \emptyset$, otherwise go to Step 5.

If a state $(i,j) \in \mathcal{S}'$ is selected as a passing state or failing state then it's no longer a non-decidable state. Then we need to exclude it from non-decidable state set after n+1-the iteration. If all states in $\mathcal{S}'$ are excluded, clearly the test surely will terminate after the n+1-the iteration and the designing is finished. Otherwise, we need to go back to step 2 and repeat procedures above.

**Step 5**: Sort all states $(i,j)$ in $\mathcal{P}$ in the ascending order of $j$ and all states $(i,j)$ in $\mathcal{F}$ in the ascending order of $i$, i.e. we denote

$$\mathcal{P} = (A_0, 0), (A_1, 1), (A_2, 2), (A_3, 3) \cdots, \qquad \mathcal{F} = (0, B_0), (1, B_1), (2, B_2), (3, B_3), \cdots$$

Then construct passing state set $\mathcal{P}'$ and failure state set $\mathcal{F}'$ as

$$\mathcal{P}' = \{(A'_j, j): j = 0,1,2, \cdots\}, \qquad \mathcal{F}' = \{(i, B'_i): i = 0,1,2 \cdots\}$$

Where $A'_j = \min_{k \geq j} A_k$, $B'_i = \min_{k \geq i} B_i$

Purpose of step 5 is to further optimize the passing state and failure state obtained in step 2 to 4. To understand step 5, we only need to note that all path to passing state $A, B$ must also pass state $C, D$. On the other hand, if a path passes state $D$ or $E$, it must eventually reach one passing state in $A$, $B$ and $C$. Then one can derive that

$$\sum_{(i,j) \in \{A,B,C\}} T^{p}_{(i,j)}(\mathcal{P},\mathcal{F}) = \sum_{(i,j) \in \{A,D,E\}} T^{p}_{(i,j)}(\mathcal{P},\mathcal{F})$$

In other words, if $\mathcal{P} = \{A, B, C\}$ is a passing set which satisfies customer risk requirements, then $\mathcal{P}' = \{A, D, E\}$ is also a passing set satisfying customer risk requirements since it has exactly the same customer risk as $\mathcal{P}$. But $\mathcal{P}'$ is a better choice than $\mathcal{P}$ since it requires fewer iterations to make decision.

For the same reason, we can also derive that failure set $\mathcal{F}' = \{F, G, L, M, N, K\}$ has same supplier risk with $\mathcal{F} = \{F, G, H, I, J, K\}$ but requires fewer iterations to fail the test.

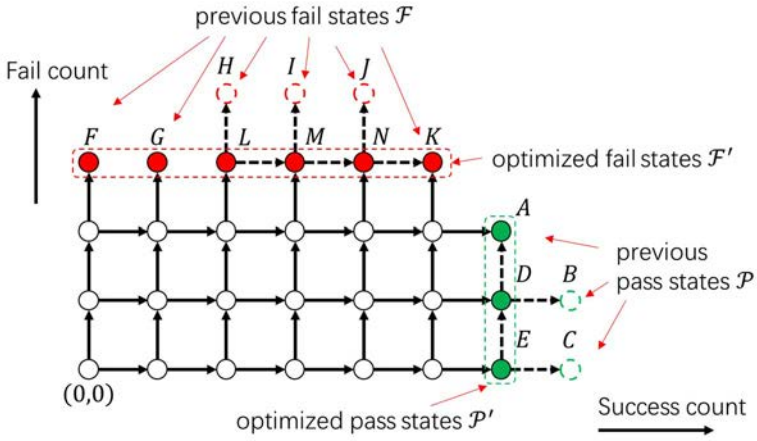


**Figure G.5.2-5: Demonstration of step 3 ($n_e$ doesn't exist).**

**Step 6**: Construct pass limit $\{N_{p,i}\}$ and fail limit $\{N_{f,i}\}$ as follows:

$$N_{f,1} = \max_{B_i=1}(i + B_i), \quad N_{f,2} = \max_{B_i=2}(i + B_i), \quad N_{f,3} = \max_{B_i=3}(i + B_i), \quad \cdots$$

At last, we can convert pass/fail state sets to pass/fail limits by using conclusion 3 in Annex G.5.1.

# Annex H (normative): Default message contents for RRM

## H.1 Void

## H.2 System information blocks message content exceptions

### H.2.1 System information blocks message contents exceptions for NR intra-frequency cell re-selection

SIB2: for NR intra-frequency cell re-selection

**Table H.2.1-1: *SIB2*: NR intra-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionInfoCommon SEQUENCE { | | | |
| rangeToBestCell | Not present | | |
| } | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | -140 is actual value in dBm (-70 * 2 dBm) | SCS15 |
| | -69 | -138 is actual value in dBm (-69 * 2 dBm) | SCS30 |
| | -69 | -138 is actual value in dBm (-69 * 2 dBm) | SCS120 |
| | -68 | -136 is actual value in dBm (-68 * 2 dBm) | SCS240 |
| s-IntraSearchP | 30 | 60 is actual value in dB (30 * 2 dB) | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n | | SMTC.n |
| deriveSSB-IndexFromCell | false | | Asynchronous cells |
| | true | | Synchronous cells |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SMTC.n | SMTC pattern n according to TS 38.133 [6] A.3.11 |
| Synchronous cells | SSB indices of neigibour cells can be derived from timing of serving cell |
| Asynchronous cells | SSB indices of neigibour cells cannot be derived from timing of serving cell |

SIB3: for NR intra-frequency cell re-selection

**Table H.2.1-2: *SIB3*: NR intra-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB3 ::= SEQUENCE { | | | |
| intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE { | | | |
| IntraFreqNeighCellInfo ::= SEQUENCE{ | | | |

| | | | |
|---|---|---|---|
| physCellId | Set according to the neighbour cell PCI | | |
| q-OffsetCell | dB0 | 0 is actual value in dB (0 * 2 dB) | |
| } | | | |
| } | | | |
| } | | | |

SIB1: for NR intra-frequency cell re-selection

**Table H.2.1-3: *SIB1*: NR intra-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | -140 is actual value in dBm (-70 * 2 dBm) | SCS15 |
| | -69 | -138 is actual value in dBm (-69 * 2 +1 dBm) | SCS30 |
| | -69 | -138 is actual value in dBm (-69 * 2 dBm) | SCS120 |
| | -68 | -136 is actual value in dBm (-68 * 2 dBm) | SCS240 |
| } | | | |
| servingCellConfigCommon SEQUENCE { | | | |
| highSpeedConfig-r16 SEQUENCE { | | | |
| highSpeedMeasFlag-r16 | true | | HighSpeedMeas |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| HighSpeedMeas | highSpeedMeasFlag-r16 is configured. UE shall apply the enhanced measurement requirements to support high speed up to 500 km/h as specified in TS 38.133 [14] |

## H.2.2 System information blocks message contents exceptions for NR inter-frequency cell re-selection

SIB2: for NR inter-frequency cell re-selection

**Table H.2.2-1: *SIB2*: NR inter-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionInfoCommon SEQUENCE { | | | |
| rangeToBestCell | Not present | | |
| } | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 25 | 50 is actual value in dB (25 * 2 dB) | |
| threshServingLowP | 22 | 44 is actual value in dB (22 * 2 dB) | |
| cellReselectionPriority | 4 | | NR Cell 1 |
| | 5 | | NR Cell 2 |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

SIB4: for NR inter-frequency cell re-selection

**Table H.2.2-2: *SIB4*: NR inter-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB4 ::= SEQUENCE { | | | |
| interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | 1 Entry | | |
| dl-CarrierFreq[1] | Downlink NR SSB ARFCN of NR Cell 2 | | NR Cell 1 |
| | Downlink NR SSB ARFCN of NR Cell 1 | | NR Cell 2 |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n | | SMTC.n |
| deriveSSB-IndexFromCell[1] | false | | Asynchronous cells |
| | true | | Synchronous cells |
| q-RxLevMin[1] | -70 | -140 is actual value in dBm (-70 * 2 dBm) | dBm/15kHz |
| | -69 | -137 is actual value in dBm (-69 * 2 +1 dBm) | dBm/30kHz |
| threshX-HighP[1] | 24 | 48 is actual value in dB (24 * 2 dB) | |
| threshX-LowP[1] | 25 | 50 is actual value in dB (25 * 2 dB) | |
| cellReselectionPriority[1] | 5 | | NR Cell 1 |
| | 4 | | NR Cell 2 |
| q-OffsetFreq[1] | dB0 | 0 is actual value in dB (0 * 2 dB). | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB.n FRm | SSB pattern n in FRm according to TS 38.133 [6] A.3.10 |
| Synchronous cells | SSB indices of neighbour cells can be derived from timing of serving cell |
| Asynchronous cells | SSB indices of neighbour cells cannot be derived from timing of serving cell |

SIB1: for NR inter-frequency cell re-selection

**Table H.2.2-3: *SIB1*: NR inter-frequency cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | -140 is actual value in dBm (-70 * 2 dBm) | dBm/15kHz |
| | -69 | -137 is actual value in dBm (-69 * 2 +1 dBm) | dBm/30kHz |
| } | | | |
| } | | | |

## H.2.3 System information blocks message contents exceptions for NR inter-RAT cell re-selection

SIB1: for inter-RAT NR – E-UTRA cell re-selection

**Table H.2.3-1: *SIB1*: Inter-RAT NR – E-UTRA cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB1 ::= SEQUENCE { | | | |
| cellSelectionInfo SEQUENCE { | | | |
| q-RxLevMin | -70 | -140 is actual value in dBm (-70 * 2 dBm) | SCS15 |
| | -69 | -137 is actual value in dBm (-69 * 2 +1 dBm) | SCS30 |
| } | | | |
| } | | | |

SIB2: for inter-RAT NR – E-UTRA cell re-selection

**Table H.2.3-2: *SIB2*: Inter-RAT NR – E-UTRA cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB2 ::= SEQUENCE { | | | |
| cellReselectionServingFreqInfo SEQUENCE { | | | |
| s-NonIntraSearchP | 25 | 50 is actual value in dB (25 * 2 dB) | |
| threshServingLowP | 22 | 44 is actual value in dB (22 * 2 dB) | |
| cellReselectionPriority | 4 | | higher priority |
| | 5 | | lower priority |
| } | | | |
| intraFreqCellReselectionInfo SEQUENCE { | | | |
| smtc | SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n | | SMTC.n |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SMTC.n | SMTC pattern n according to TS 38.133 [6] A.3.11 |
| higher priority | NR cell re-selection to higher priority E-UTRA |
| lower priority | NR cell re-selection to lower priority E-UTRA |

SIB5: for inter-RAT NR – E-UTRA cell re-selection

**Table H.2.3-3: *SIB5*: Inter-RAT NR – E-UTRA cell re-selection**

| Derivation Path: TS 38.508-1 [14], Table 4.6.2-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SIB5 ::= SEQUENCE { | | | |
| carrierFreqListEUTRA SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF SEQUENCE { | 1 Entry | | |
| carrierFreq[1] | Downlink EUTRA ARFCN of E-UTRA Cell 1 | | |
| eutra-FreqNeighCellList[1] SEQUENCE (SIZE (1..maxCellEUTRA)) OF SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| physCellId | E-UTRA physical cell identity | | |
| dummy | dB0 | | |
| } | | | |
| presenceAntennaPort1[1] | FALSE | | |
| cellReselectionPriority[1] | 5 | | higher priority |
| | 4 | | lower priority |
| threshX-High | 24 | 48 is actual value in dB (24 * 2 dB) | |
| threshX-Low | 25 | 50 is actual value in dB (25 * 2 dB) | |
| q-RxLevMin | -70 | -140 is actual value in dBm (-70 * 2 dBm) | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| higher priority | NR cell re-selection to higher priority E-UTRA |
| lower priority | NR cell re-selection to lower priority E-UTRA |

# H.3 RRC message content exceptions

## H.3.1 RRC messages and information elements contents exceptions for NR measurement configuration

RRCReconfiguration

To setup NR Measurement Configuration.

**Table H.3.1-1: *RRCReconfiguration*: NR measurement Configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT | Measurement configuration | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| needForInterruptionConfigNR-r18 | enabled | | NFICN |
| | disabled | | NNFICN |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| NFICN | UE shall report interruption requirement information of NR target bands in the *RRCReconfigurationComplete* and *RRCResumeComplete* message |

| | |
|---|---|
| NNFICN | UE shall not report interruption requirement information of NR target bands in the *RRCReconfigurationComplete* and *RRCResumeComplete* message |

MeasConfig-DEFAULT

Configuration for NR measurement.

**Table H.3.1-2: MeasConfig-DEFAULT: Configuration of NR measurement**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-69 | | | |
|---|---|---|---|
| **Information Element** | **Value/Remark** | **Comment** | **Condition** |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | n entries | n=1 without condition<br>n=2 for INTER-FREQ OR INTER-RAT OR Deactivated SCell | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with Condition INTRA-FREQ MO | | |
| } | | | |
| measObjectId[2] | 2 | | INTER-FREQ OR INTER-RAT OR Deactivated SCell |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-DEFAULT with Condition INTER-FREQ MO | | INTER-FREQ |
| measObjectNR | MeasObjectNR-DEFAULT with Condition Deactivated SCell | | Deactivated SCell |
| measObjectEUTRA | MeasObjectEUTRA-DEFAULT | | INTER-RAT |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-DEFAULT | | |
| | ReportConfigNR-DEFAULT | | INTER-FREQ OR Deactivated SCell |
| reportConfigInterRAT | ReportConfigInterRAT-DEFAULT | | INTER-RAT |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | MeasId | | |
| measObjectId[1] | 1 | | |
| | 2 | | INTER-FREQ OR INTER-RAT OR |

| | | | |
|---|---|---|---|
| | | | Deactivated SCell |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| | QuantityConfig | TS 38.508-1 Table 4.6.3-127 | L3 FILTERING NEEDED |
| measGapConfig | MeasGapConfig-DEFAULT | | GAP NEEDED |
| measGapSharingConfig | Not present | | |
| interFrequencyConfig-NoGap-r16 | Not present | | |
| effectiveMeasWindowConfig-r18 CHOICE { | | | |
| setup | MeasWindowConfig-r18-DEFAULT | | EMW_Setup |
| release | null | | EMW_Release |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| GAP NEEDED | Measurement gap on the NR Cell is needed for measurement |
| INTER-FREQ | Configuration for inter-frequency NR measurement tests |
| INTER-RAT | Configuration for inter-RAT EUTRA measurement tests |
| Deactivated SCell | Configuration for measurement on deactivated SCell tests |
| L3 FILTERING NEEDED | L3 filtering is needed for measurement |
| EMW_Setup | Setup effective measurement window in NR for E-UTRA measurements |
| EMW_Release | Release effective measurement window in NR for E-UTRA measurements |

MeasObjectNR-DEFAULT

NR measurement object configuration.

**Table H.3.1-3: MeasObjectNR-DEFAULT: NR intra-frequency measurement object configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR of the SSB associated to serving cell | frequency of the serving cell | INTRA-FREQ MO |
| | ARFCN-ValueNR of the SSB associated to SCell | | Deactivated SCell |
| | ARFCN-ValueNR of the SSB associated to inter-frequency neighbour cell | | INTER-FREQ MO |
| refFreqCSI-RS | ARFCN-ValueNR with condition DL_PointA | | CSI-RS MOBILITY |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure | Not present | | |
| | SSB-ToMeasure specified in TS.38.508-1 [14] Table 7.3.1-31 with condition SSB.7 FR2 OR SSB.8 FR2 | | SSB.7 FR2 OR SSB.8 FR2 |
| deriveSSB-IndexFromCell | false | | |
| | true | | Synchronous cells OR RLM |
| ssb-PositionQCL-Common-r16 | n1 | | SSB.1 CCA SSB.2 CCA |
| | n2 | | SSB.3 CCA SSB.4 CCA |
| } | | | |

| | | | |
|---|---|---|---|
| csi-rs-ResourceConfigMobility CHOICE { | | | CSI-RS MOBILITY |
| setup | CSI-RS-ResourceConfigMobility-DEFAULT | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 0 | SS-RSRP < -156dB | NOT SS-SINR |
| thresholdSINR | 0 | SS-SINR<-23 | SS-SINR |
| } | | | |
| measCycleSCell-v1530 | sf640 | | Deactivated SCell |
| rmtc-Config-r16 SEQUENCE { | | | RSSI |
| rmtc-Periodicity-r16 | ms40 | | |
| measDurationSymbols-r16 | sym14or12 | | |
| rmtc-SubframeOffset-r16 | 20 | | |
| ref-SCS-CP-r16 | kHz15 | | |
| } | | | |
| associatedMeasGapSSB-r17 | Not present | | |
| | MeasGapId-r17 | | MGe |
| } | | | |

| Condition | Explanation |
|---|---|
| INTRA-FREQ MO | Configuration for NR MO associated to intra-frequency carrier |
| INTER-FREQ MO | Configuration for NR MO associated to inter-frequency carrier |
| Synchronous cells | SSB indices of neighbour cells can be derived from timing of serving cell |
| RLM | Configuration for RLM tests |
| Deactivated SCell | Configuration for SCell activation and deactivation tests |
| SS-SINR | Configuration for SS-SINR tests |
| MGe | Indicates measurement gap enhancements configuration |
| SSB.X CCA | SSB pattern SSB.X CCA configured as per section A.3A (X = {1,2,3,4}) |
| RSSI | Configuration associated to RSSI or Channel Occupancy measurements |
| CSI-RS MOBILITY | Configuration for CSI-RS based measurement tests |

MeasObjectEUTRA-DEFAULT

EUTRA measurement object configuration

**Table H.3.1-3A: MeasObjectEUTRA-DEFAULT: InterRAT EUTRA measurement object configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-74 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectEUTRA ::= SEQUENCE { | | | |
| cellsToAddModListEUTRAN SEQUENCE (SIZE (1..maxCellMeasEUTRA)) OF SEQUENCE{ | | | |
| cellIndexEUTRA | 1 | | |
| physCellId | Physical Cell ID of the E-UTRA cell | Annex E | |
| cellIndividualOffset | dB0 | | |
| } | | | |
| eutra-PresenceAntennaPort1 | false | | |
| associatedMeasGap-r17 | Not present | | |
| | MeasGapId-r17 | | MGe |
| } | | | |

| Condition | Explanation |
|---|---|
| MGe | Indicates measurement gap enhancements configuration |

CSI-RS-ResourceConfigMobility-DEFAULT

CSI-RS based measurement resource configuration

**Table H.3.1-3B: *CSI-RS-ResourceConfigMobility-DEFAULT***

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-44 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ResourceConfigMobility ::= SEQUENCE { | | | |
| csi-RS-CellList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-CellsRRM)) OF CSI-RS-CellMobility { | 2 entries | | |
| CSI-RS-CellMobility[1] SEQUENCE { | | Entry 1 | |
| cellId | PhysCellId of NR SpCell | | |
| csi-rs-MeasurementBW SEQUENCE { | | | |
| nrofPRBs | 48 | | |
| startPRB | 3 | | |
| } | | | |
| density | d3 | | |
| csi-rs-ResourceList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-ResourcesRRM)) OF CSI-RS-Resource-Mobility { | 1 entry | | |
| CSI-RS-Resource-Mobility[1] SEQUENCE { | | Entry 1 | |
| csi-RS-Index | 0 | | |
| slotConfig CHOICE { | | | |
| ms20 | 1 | | |
| } | | | |
| associatedSSB SEQUENCE { | | | |
| ssb-Index | 0 | | |
| isQuasiColocated | true | | |
| } | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 1111 | | |
| } | | | |
| firstOFDMSymbolInTimeDomain | 10 | | |
| sequenceGenerationConfig | 0 | | |
| } | | | |
| } | | | |
| CSI-RS-CellMobility[2] SEQUENCE { | | Entry 2 | |
| cellId | PhysCellId of NR neighbour cell | | |
| csi-rs-MeasurementBW SEQUENCE { | | | |
| nrofPRBs | 48 | | |
| startPRB | 3 | | |
| } | | | |
| density | d3 | | |
| csi-rs-ResourceList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-ResourcesRRM)) OF CSI-RS-Resource-Mobility { | 1 entry | | |
| CSI-RS-Resource-Mobility[1] SEQUENCE { | | Entry 1 | |
| csi-RS-Index | 0 | | |
| slotConfig CHOICE { | | | |
| ms20 | 1 | | |
| } | | | |
| associatedSSB SEQUENCE { | | | |
| ssb-Index | 0 | | |
| isQuasiColocated | true | | |
| } | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 1111 | | |
| } | | | |
| firstOFDMSymbolInTimeDomain | 10 | | |
| sequenceGenerationConfig | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

ReportConfigNR-DEFAULT

NR Report Configuration

**Table H.3.1-4: ReportConfigNR-DEFAULT(a3-offset): NR report configuration for event A3**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | A3-offset*2 | The actual value is field value * 0.5 dB | |
| rsrq | A3-offset*2 | The actual value is field value * 0.5 dB | RSRQ |
| sinr | A3-offset*2 | The actual value is field value * 0.5 dB | SINR |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| reportInterval | ms120 | | RSSI |
| reportQuantityRS-Indexes SEQUENCE { | | | SSB Index |
| rsrp | true | | |
| rsrq | false | | |
| | true | | RSRQ |
| sinr | false | | |
| | true | | SINR |
| } | | | |
| maxReportCells | 2 | | |
| maxNrofRS-IndexesToReport | 2 | | SSB Index |
| measRSSI-ReportConfig-r16 SEQUENCE { | | | |
| channelOccupancyThreshold-r16 | RSSI-Range-r16 | Integer (0..76), actual value is field value -101 dBm | RSSI |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB Index | To include SSB Index |
| RSRQ | RSRQ trigger quantity |
| SINR | SINR trigger quantity |
| RSSI | RSSI or Channel Occupancy measurements |

**Table H.3.1-4AA: ReportConfigNR-DEFAULT(a4-threshold): NR report configuration for event A4**

| Derivation Path: 38.508-1 [14], Table 4.6.3-142 with condition EVENT_A4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA4 SEQUENCE { | | | |
| a4-Threshold CHOICE { | | | |
| rsrp | a4-threshold+156 | For thresholds, the actual value is (IE value – 156) dBm | |
| } | | | |
| hysteresis | 0 | | |
| timeToTrigger | ms0 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| reportQuantityRS-Indexes SEQUENCE { | | | SSB Index |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 2 | | |
| maxNrofRS-IndexesToReport | 2 | | SSB Index |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB Index | To include SSB Index |

ReportConfigInterRAT-DEFAULT

InterRAT NR Report Configuration.

**Table H.3.1-4A: ReportConfigInterRAT- DEFAULT (b2-Thres1, b2-Thres2): InterRAT NR report configuration for FR1 to E-UTRAN handover with b2-Threshold1 = b2-Thres1 and b2-Threshold2EUTRA = b2-Thres2 dBm**

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-141 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| rsrp | b2-Thres1 | b2-Thres1 – 156 dBm | |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| rsrp | b2-Thres2 | b2-Thres2 – 140 dBm | |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

QuantityConfig-DEFAULT

NR quantity configuration when L3 filtering is not used.

**Table H.3.1-5: QuantityConfig-DEFAULT: NR quantity configuration when L3 filtering is not used**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-127 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| QuantityConfig::= SEQUENCE { | | | |
| quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE { | 1 entry | | |
| quantityConfigCell[1] SEQUENCE { | | | |
| ssb-FilterConfig SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| filterCoefficientRSRP | fc0 | No L3 filtering | |
| filterCoefficientRSRQ | fc0 | No L3 filtering | |
| filterCoefficientRS-SINR | fc0 | No L3 filtering | |
| } | | | |
| csi-RS-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc0 | No L3 filtering | |
| filterCoefficientRSRQ | fc0 | No L3 filtering | |
| filterCoefficientRS-SINR | fc0 | No L3 filtering | |
| } | | | |
| } | | | |
| quantityConfigRS-Index | Not present | | |
| quantityConfigRS-Index SEQUENCE { | | | SSB Index |
| ssb-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc0 | No L3 filtering | |
| filterCoefficientRSRQ | fc0 | No L3 filtering | |
| filterCoefficientRS-SINR | fc0 | No L3 filtering | |
| } | | | |
| csi-RS-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc0 | No L3 filtering | |
| filterCoefficientRSRQ | fc0 | No L3 filtering | |
| filterCoefficientRS-SINR | fc0 | No L3 filtering | |
| } | | | |
| } | | | |
| } | | | |
| quantityConfigEUTRA | Not present | | |
| quantityConfigEUTRA SEQUENCE { | | | INTER-RAT |
| filterCoefficientRSRP | fc0 | | |
| filterCoefficientRSRQ | fc0 | | |
| filterCoefficientRS-SINR | fc0 | | |

| Condition | Explanation |
|---|---|
| INTER-RAT | Configuration for inter-RAT EUTRA measurement tests |
| SSB Index | SSB Index (RS Index) is reported |

MeasGapConfig-DEFAULT

Measurement gap configuration.

**Table H.3.1-6: MeasGapConfig: measurement gap configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-70 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR2 CHOICE { | | | gapFR2 |
| setup SEQUENCE { | | | |
| gapOffset | 39 | | Pattern #13 |
| mgl | ms5dot5 | | Pattern #13 |
| mgrp | ms40 | | Pattern #13 |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| gapFR1 CHOICE { | | | gapFR1 |
| setup SEQUENCE { | | | |
| gapOffset | 39 | | Pattern #2 |
| | 19 | | Pattern #4 |
| mgl | ms3 | | Pattern #2 |
| | ms6 | | Pattern #4 |
| mgrp | ms40 | | Pattern #2 |
| | ms20 | | Pattern #4 |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| gapUE CHOICE { | | | gapUE |
| setup SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| gapOffset | 39 | | Pattern #0 OR Pattern #2 OR Pattern #13 |
| | 0 | | RLM OR BFD |
| mgl | ms6 | | Pattern #0 OR RLM OR BFD |
| | ms3 | | Pattern #2 OR Pattern #3 |
| | ms5dot5 | | Pattern #13 |
| mgrp | ms40 | | Pattern #0 OR Pattern #2 OR Pattern #13 OR RLM OR BFD |
| | ms80 | | Pattern #3 |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 SEQUENCE{ | 1 entry | | MGe |
| GapConfig-r17[1] SEQUENCE{ | | | |
| measGapId-r17 | 1 | | Pattern #0 |
| | 2 | | Pattern #1 OR Pattern #13 |
| | 3 | | Pattern #24 |
| gapType-r17 | perUE | | |
| gapOffset-r17 | 39 | | Pattern #0 OR Pattern #13 |
| | 19 | | Pattern #1 |
| | 11 | | Pattern #24 |
| mgl-r17 | ms6 | | Pattern #0 OR Pattern #1 |
| | ms5dot5 | | Pattern #13 |
| | ms10 | | Pattern #24 |
| mgrp-r17 | ms40 | | Pattern #0 OR Pattern #13 |
| | ms80 | | Pattern #1 OR Pattern #24 |
| mgta-r17 | ms0 | | |
| refServCellIndicator-r17 | Not present | | |
| refFR2-ServCellAsyncCA-r17 | Not present | | |
| preConfigInd-r17 | Not present | | |
| | true | | Pre-CFG |
| ncsgInd-r17 | Not present | | |
| | true | | NCSG |
| gapAssociationPRS-r17 | Not present | | |
| | true | | PRS |
| gapSharing-r17 | Not present | | |
| gapPriority-r17 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| Pattern #0 | Measurement gap pattern #0 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #1 | Measurement gap pattern #1 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #2 | Measurement gap pattern #2 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #3 | Measurement gap pattern #3 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #4 | Measurement gap pattern #4 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #13 | Measurement gap pattern #13 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| Pattern #24 | Measurement gap pattern #24 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests |
| RLM | Measurement gap pattern for RLM tests |
| BFD | Measurement gap pattern for Beam Failure Dectection tests |
| gapFR2 | Indicates measurement gap configuration that applies to FR2 only. gapFR2 cannot be configured together with gapUE. In (NG)EN-DC or NE-DC, gapFR2 can only be set up by NR RRC |
| gapFR1 | Indicates measurement gap configuration that applies to FR1 only. gapFR1 cannot be configured together with gapUE. In (NG)EN-DC, gapFR1 cannot be set up by NR RRC |

| | |
|---|---|
| gapUE | Indicates measurement gap configuration that applies to all frequencies (FR1 and FR2). If gapUE is configured, then neither gapFR1 nor gapFR2 can be configured. In (NG)EN-DC, gapUE cannot be set up by NR RRC. |
| MGe | Indicates measurement gap enhancements configuration |
| Pre-CFG | Pre-configured measurement gap |
| NCSG | Measurement gap pattern for NCSG (network controlled small gap) tests |
| PRS | Measurement gap associated with PRS measurement |

MeasResults-DEFAULT

measurement result for NR measurements.

**Table H.3.1-7: MeasResults: measurement result for NR measurements**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 with condition A3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| measResults SEQUENCE { | | | |
| measId | MeasId | | |
| measResultServingMOList | Not Checked | | CSI-RS MOBILITY |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 2 entries | | |
| servCellId[1] | ServCellIndex of NR SpCell | | |
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | PhysCellId of NR SpCell | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | SINR |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| servCellId[2] | ServCellIndex of NR SCell | | Deactivated SCell |
| measResultServingCell[2] SEQUENCE { | | | Deactivated SCell |
| physCellId | PhysCellId of NR SCell | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | SINR |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE(1..maxCellReport)) OF SEQUENCE { | 1 entry | | INTRA-FREQ OR INTER-FREQ |
| physCellId[1] | PhysCellId of NR neighbour Cell | | |
| measResult[1] SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | RSRQ |

| | | | |
|---|---|---|---|
| sinr | (0..127) | | SINR |
| } | | | |
| resultsSSB-Cell | Not Checked | | CSI-RS MOBILITY |
| resultsCSI-RS-Cell SEQUENCE { | | | CSI-RS MOBILITY |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | RSRQ |
| sinr | (0..127) | | SINR |
| } | | | |
| } | | | |
| rsIndexResults | Not Checked | | CSI-RS MOBILITY |
| rsIndexResults SEQUENCE { | *n* entires of ResultsPerSSB-Index | *ResultsPerSSB-IndexList* | SSB Index |
| resultsPerSSB-Index SEQUENCE { | entry [1] | | |
| ssb-Index | SSB-Index | an SS-Block within an SS-Burst | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | INTER-RAT |
| eutra-PhysCellId [1] | PhysCellId of E-UTRA neighbour Cell | | |
| measResult[1] SEQUENCE { | | | |
| rsrp | (0..97) | | |
| rsrq | (0..34) | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB Index | To include SSB Index |
| INTRA-FREQ | Configuration for intra-frequency NR measurement tests |
| INTER-FREQ | Configuration for inter-frequency NR measurement tests |
| INTER-RAT | Configuration for inter-RAT EUTRA measurement tests |
| Deactivated SCell | Configuration for measurement on Deactivated SCell tests |
| RSRQ | RSRQ measurement reporting |
| SINR | SINR measurement reporting |
| CSI-RS MOBILITY | Configuration for CSI-RS based measurement tests |

RadioLinkMonitoringConfig -DEFAULT

Default configuration for RLM resources.

**Table H.3.1-8: RadioLinkMonitoringConfig-DEFAULT: Default configuration for RLM and BFD resources**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF { | n entries | n = 1 for FR1, n = 2 for FR2 with 2SSB or second resource set of TRS, n = 1 otherwise | SSB RLM OR CSI-RS RLM |
| RadioLinkMonitoringRS[1] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 0 | | |

| | | | |
|---|---|---|---|
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[2] SEQUENCE { | | | FR2 |
| radioLinkMonitoringRS-Id | 1 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| } | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF { | 2 entries | | SSB BFD OR CSI-RS BFD |
| RadioLinkMonitoringRS[1] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 0 | | |
| purpose | both | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | SSB BFD |
| csi-RS-Index | NZP-CSI-RS-ResourceId for BM(0) | TS 38.508-1[14], Table 7.3.1-7E | CSI-RS BFD |
| } | | | |
| } | | | |
| RadioLinkMonitoringRS[2] SEQUENCE { | | | |
| radioLinkMonitoringRS-Id | 1 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | SSB BFD |
| csi-RS-Index | NZP-CSI-RS-ResourceId for BM(1) | TS 38.508-1[14], Table 7.3.1-7E | CSI-RS BFD |
| } | | | |
| } | | | |
| } | | | |
| beamFailureInstanceMaxCount | n1 | | SSB BFD OR CSI-RS BFD |
| beamFailureDetectionTimer | pbfd4 | | SSB BFD OR CSI-RS BFD |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB RLM | Used when SSB based RLM is configured in test case |
| CSI-RS RLM | Used when CSI-RS based RLM is configured in test case |
| SSB BFD | Used when SSB based BFD is configured in test case |
| CSI-RS BFD | Used when CSI-RS based BFD is configured in test case |
| 2SSB | For configuration with 2 SS Blocks |

**Table H.3.1-8A: RadioLinkMonitoringConfig-Release 17: Release 17 configuration for TRP specific RLM and BFD resources**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| beamFailure-r17 ::= SEQUENCE { | | | |
| failureDetectionSet1-r17::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| bfdResourcesToAddModList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF BeamLinkMonitoringRS-r17 { | n entries | n = 1 for FR1, n = 2 for FR2 | SSB RLM OR CSI-RS RLM |
| BeamLinkMonitoringRS-r17[1] ::= SEQUENCE { | | entry 1 | |
| beamLinkMonitoringRS-Id-r17 | 0 | | |
| detectionResource-r17 CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| BeamLinkMonitoringRS-r17[2] ::= SEQUENCE { | | entry 2 | |
| beamLinkMonitoringRS-Id-r17 | 1 | | |
| detectionResource-r17 CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| } | | | |
| bfdResourcesToReleaseList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF BeamLinkMonitoringRS-Id-r17 { | 2 entries | | SSB BFD OR CSI-RS BFD |
| BeamLinkMonitoringRS-Id-r17[1] | 0 | entry 1 | |
| BeamLinkMonitoringRS-Id-r17[2] | 1 | entry 2 | |
| } | | | |
| beamFailureInstanceMaxCount-r17 | n1 | | SSB BFD OR CSI-RS BFD |
| beamFailureDetectionTimer-r17 | pbfd4 | | SSB BFD OR CSI-RS BFD |
| } | | | |
| failureDetectionSet2-r17::= SEQUENCE { | | | |
| bfdResourcesToAddModList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF BeamLinkMonitoringRS-r17 { | n entries | n = 1 for FR1, n = 2 for FR2 | SSB RLM OR CSI-RS RLM |
| BeamLinkMonitoringRS-r17[1] ::= SEQUENCE { | | entry 1 | |
| beamLinkMonitoringRS-Id-r17 | 2 | | |
| detectionResource-r17 CHOICE { | | | |
| ssb-Index | 2 | Index of SSB #2 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| BeamLinkMonitoringRS-r17[2] ::= SEQUENCE { | | entry 2 | |
| beamLinkMonitoringRS-Id-r17 | 3 | | |
| detectionResource-r17 CHOICE { | | | |
| ssb-Index | 3 | Index of SSB #3 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| } | | | |
| } | | | |
| bfdResourcesToReleaseList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OBeamLinkMonitoringRS-Id-r17 F { | 2 entries | | SSB BFD OR CSI-RS BFD |
| BeamLinkMonitoringRS-Id-r17[1] | 2 | entry 1 | |
| BeamLinkMonitoringRS-Id-r17[2] | 3 | entry 2 | |
| } | | | |
| beamFailureInstanceMaxCount-r17 | n1 | | SSB BFD OR CSI-RS BFD |
| beamFailureDetectionTimer-r17 | pbfd4 | | SSB BFD OR CSI-RS BFD |

| | | | |
|---|---|---|---|
| } | | | |
| additionalPCI-r17 | not present | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB RLM | Used when SSB based RLM is configured in test case |
| CSI-RS RLM | Used when CSI-RS based RLM is configured in test case |
| SSB BFD | Used when SSB based BFD is configured in test case |
| CSI-RS BFD | Used when CSI-RS based BFD is configured in test case |

RLF-TimersAndConstants-DEFAULT

Default parameters for RLM related timers and counters.

**Table H.3.1-9: RLF-TimersAndConstants-DEFAULT**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-150 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RLF-TimersAndConstants ::= SEQUENCE { | | | |
| t310 | ms0 | | |
| } | | | |

BeamFailureRecoveryConfig-DEFAULT

Default configuration for CBD and contention-free RACH in link recovery.

**Table H.3.1-10: BeamFailureRecoveryConfig-DEFAULT**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BeamFailureRecoveryConfig ::= SEQUENCE { | | | |
| rootSequenceIndex-BFR | 0 | | |
| rach-ConfigBFR | RACH-ConfigGeneric specified in TS.38.508-1 [14] Table 7.3.1-14 | | SSB |
| | RACH-ConfigGeneric specified in TS.38.508-1 [14] Table 7.3.1-14 with condition PRACH.4 FR1 | | CSI-RS and FR1 |
| | RACH-ConfigGeneric specified in TS.38.508-1 [14] Table 7.3.1-14 with condition PRACH.4 FR2 | | CSI-RS and FR1 |
| rsrp-ThresholdSSB | 58 | Actual value is 58 - 156 = -98 dBm | SCS15 |
| | 61 | Actual value is 61 - 156 = -95 dBm | SCS30 |
| | 47 | Actual value is 47 - 156 = -109 dBm | SCS120 |
| | 50 | Actual value is 50 - 156 = -106 dBm | SCS240 |
| candidateBeamRSList SEQUENCE (SIZE(1..maxNrofCandidateBeams)) OF CHOICE { | 1 entry | | |
| ssb[1] SEQUENCE { | | | SSB |
| ssb | 1 | | |
| ra-PreambleIndex | 40 | | |
| } | | | |
| csi-RS[1] SEQUENCE { | | | CSI-RS |
| csi-RS | NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD | | |
| ra-OccasionList | 1 | | |
| ra-PreambleIndex | 40 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| ssb-perRACH-Occasion | oneFourth | | |
| ra-ssb-OccasionMaskIndex | Not present | | |
| | 1 | | PRACH.2 FR1 OR PRACH.2 FR2 |
| recoverySearchSpaceId | SearchSpaceId of the search space used for BFD RAR in DL active BWP | | |
| ra-Prioritization | Not present | | |
| beamFailureRecoveryTimer | Not present | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB | Configuration for SSB based CBD |
| CSI-RS | Configuration for CSI-RS based CBD |

BWP-UplinkDedicated

Default BWP configuration for Beam Failure Recovery

**Table H.3.1-10A: *BWP-UplinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-15 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-UplinkDedicated ::= SEQUENCE { | | | |
| beamFailureRecoveryConfig | BeamFailureRecoveryConfig-DEFAULT | | |
| } | | | |

RACH-ConfigCommon

Default RACH configuration for Beam Failure Recovery

**Table H.3.1-10B: *RACH-ConfigCommon***

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon::= SEQUENCE { | | | |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE { | | | |
| oneFourth | n40 | | |
| } | | | |
| } | | | |

**Table H.3.1-11: Void**

BeamFailureRecoverySCellConfig-DEFAULT

Default configuration for CBD and contention-free RACH in link recovery.

**Table H.3.1-12: BeamFailureRecoverySCellConfig-DEFAULT**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-6AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BeamFailureRecoveryRSConfig-r16 ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| rsrp-ThresholdBFR-r16 | 58 | -98dBm | SCS15 |
| | 61 | -95dBm | SCS30 |
| | 47 | -109dBm | SCS120 |
| candidateBeamRS-List-r16 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF CandidateBeamRS-r16 { | 1 entry | | |
| CandidateBeamRS-r16[1] SEQUENCE { | | entry 1 | |
| candidateBeamConfig-r16 CHOICE { | | | |
| ssb-r16 | 1 | | SSB |
| csi-RS-r16 | NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD | | CSI-RS |
| } | | | |
| servingCellId | ServCellIndex of the SCell | | |
| } | | | |
| } | | | |
| } | | | |

**Table H.3.1-12A: BeamFailureRecoverySpCellConfig-DEFAULT**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BeamFailureRecoveryRSConfig-r16 ::= SEQUENCE { | | | |
| rsrp-ThresholdBFR-r16 | 58 | -98dBm | SCS15 |
| | 61 | -95dBm | SCS30 |
| | 47 | -109dBm | SCS120 |
| candidateBeamRS-List2-r17 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF CandidateBeamRS-r16 { | 1 entry | | |
| CandidateBeamRS-r16[1] SEQUENCE { | | entry 1 | |
| candidateBeamConfig-r16 CHOICE { | | | |
| ssb-r16 | 1 | | SSB |
| csi-RS-r16 | NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD | | CSI-RS |
| } | | | |
| servingCellId | ServCellIndex of the SpCell | | |
| } | | | |
| } | | | |
| } | | | |

BWP-DownlinkDedicated

**Table H.3.1-13: *BWP-DownlinkDedicated***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-11 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| BWP-DownlinkDedicated ::= SEQUENCE { | | | |
| beamFailureRecoverySCellConfig-r16 CHOICE { | | | |
| setup | BeamFailureRecoverySCellConfig-DEFAULT | | SCell |
| } | | | |
| } | | | |
| beamFailureRecoverySpCellConfig-r17 CHOICE { | | | |
| setup | BeamFailureRecoverySpCellConfig-DEFAULT | | SpCell |
| } | | | |
| } | | | |

MeasWindowConfig-DEFAULT

**Table H.3.1-14: *MeasWindowConfig-DEFAULT***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-80C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasWindowConfig-r18 ::= SEQUENCE { | | | |
| windowOffsetPeriodicity CHOICE { | | | |
| periodicityMs40 | 0 | | MS40 |
| periodicityMs80 | 0 | | MS80 |
| } | | | |
| windowDuration | ms5 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| MS40 | 40 ms for measurement window periodicity |
| MS80 | 80 ms for measurement window periodicity |

NeedForInterruptionNR

**Table H.3.1-15: *NeedForInterruptionNR***

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NeedForInterruptionNR-r18 ::= SEQUENCE { | | | |
| interruptionIndication-r18 | no-gap-with-interruption | | NGWI |
| | no-gap-no-interruption | | NGNI |
| } | | | |

| Condition | Explanation |
|---|---|
| NGWI | interruption is needed to perform SSB based measurements without measurement gap |
| NGNI | interruption is not needed to perform SSB based measurements without measurement gap |

## H.3.2 RRC messages and information elements contents exceptions for handover

**Table H.3.2-1: *Void***

**Table H.3.2-2: RRCReconfiguration-HO**

| Derivation Path: TS 38.508-1 [14], Table 4.8.1-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig with conditions SRB_NR_PDCP and DRBn and Re-establish_PDCP | | RBConfig_KeyChange |
| | RadioBearerConfig with conditions DRBn and Recover_PDCP | | RBConfig_NoKeyChange |
| secondaryCellGroup | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | Table H.3.2-3 | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |

| Condition | Explanation |
|---|---|
| RBConfig_KeyChange | RadioBearerConfig to perform Intra-NR handover with security key change |
| RBConfig_NoKeyChange | RadioBearerConfig to perform Intra-NR handover without security key change |

**Table H.3.2-3: CellGroupConfig**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-19 with condition PCell_change | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| smtc | SMTC specified in TS.38.508-1 [14] Table 7.3.1-3 with condition SMTC.n | SMTC.n is the SMTC reference configuration used in test case | |
| } | | | |
| } | | | |

## H.3.3 RRC messages and information elements contents exceptions for NR inter-RAT handover

MobilityFromNRCommand

For Inter-RAT NR handover.

**Table H.3.3-1: *MobilityFromNRCommand*: InterRAT NR handover**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MobilityFromNRCommand::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| mobilityFromNRCommand SEQUENCE { | | | |
| targetRAT-Type | eutra | | |
| targetRAT-MessageContainer | OCTET STRING including the RRCConnectionReconfiguration message according to TS 36.508 [25], table 4.6.1-8 with condition HO-TO-EUTRA | | |
| nas-SecurityParamFromNR | The 4 LSB of the downlink NAS COUNT | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |

MobilityFromEUTRACommand

**Table H.3.3-2: *MobilityFromEUTRACommand*: inter-RAT handover to NR Cell**

| Derivation Path:TS 36.508 [25] Table 4.6.1-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MobilityFromEUTRACommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---|---|---|
| c1 CHOICE { | | | |
| mobilityFromEUTRACommand-r9 SEQUENCE { | | | |
| purpose CHOICE { | | | |
| handover SEQUENCE { | | | |
| targetRAT-Type | nr | | |
| targetRAT-MessageContainer | OCTET STRING containing RRCReconfiguration according to TS 38.508-1 [14] with Condition NR | | |
| nas-SecurityParamFromEUTRA | Not present | | |
| systemInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## H.3.4 E-UTRA RRC messages and information elements contents exceptions

*RRCConnectionReconfiguration*

Includes the nr-SecondaryCellGroupConfig-r15 to convey NR *RRCReconfiguration* message as specified in TS 38.331 [13].

**Table H.3.4-1: RRCConnectionReconfiguration: NR RRC Reconfiguration in EN-DC**

| Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MCG_and_SCG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | *RRCReconfiguration* | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table H.3.4-1a: RRCConnectionReconfiguration for measurement configuration**

For measurement configuration provided by NR PSCell under EN-DC.

| Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | Not present | | |
| | MeasConfig-DEFAULT | Table H.3.4-4 | GAP_NEEDED |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| nonCriticalExtensions::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | *RRCReconfiguration* | Table H.3.1-1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| GAP_NEEDED | Measurement gap is needed in Test |

*ULInformationTransferMRDC*

uplink transfer of MR DC information for transferring the NR RRC Measurement Report message in EN-DC.

**Table H.3.4-2: ULInformationTransferMRDC: uplink transfer of MR DC information**

| Derivation Path: 36.508 [25], Table 4.6.1-27 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport | | |
| } | | | |

*RRCConnectionReconfigurationComplete*

Includes the scg-ConfigResponseNR to convey NR *RRCReconfigurationComplete* message as specified in TS 38.331 [13].

**Table H.3.4-3: *RRCConnectionReconfigurationComplete*: NR RRC Reconfiguration Complete in EN-DC**

| Derivation Path: 36.508 [25], Table 4.6.1-9: with condition MCG_and_SCG | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier-UL | | |

| | | | |
|---|---|---|---|
| criticalExtensions CHOICE { | | | |
| rrcConnectionReconfigurationComplete-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | OCTET STRING including the RRCReconfigurationComplete message according to TS 38.508-1 [14], Table 4.6.1-14. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

MeasConfig-DEFAULT

Configures measurement gap that applies to FR1 only in EN-DC as specified in TS 38.331 [13].

**Table H.3.4-4: MeasConfig-DEFAULT**

| Derivation Path: 36.508 [25],Table 4.6.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasConfig-DEFAULT ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-GENERIC(Freq) | Freq is the frequency of E-UTRA PCell | |
| } | | | |
| } | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 2 entries | | INTER-RAT NR |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-GENERIC(Freq) | Freq is the frequency of E-UTRA PCell | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR-r15 | MeasObjectNR | Table H.3.4-6 | |
| } | | | |
| } | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 3 entries | | E-UTRA_Deactivated_SCell |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-GENERIC(Freq) | Freq is the frequency of E-UTRA PCell Table H.3.4-9 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-GENERIC(Freq) | Freq is the frequency of E-UTRA SCell Table H.3.4-9 | E-UTRA_Deactivated_SCell |
| } | | | |
| measObjectId[3] | 3 | | |
| measObject[3] CHOICE { | | | |

| | | | |
|---|---|---|---|
| measObjectNR-r15 | MeasObjectNR | Table H.3.4-6 | |
| } | | | |
| } | | | |
| | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | INTER-RAT NR OR E-UTRAN_Deactivated_SCell |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigEUTRA | ReportConfigEUTRA-A4(Thres) | Set Thres according to test parameters specified in test cases | EVENT A4 |
| | ReportConfigEUTRA-A3(A3-offset) | Table H.3.4-10 | E-UTRA_Deactivated_SCell |
| reportConfigInterRAT | ReportConfigInterRAT-B2-NR(EUTRA-Thres, NR-Thres) | Set EUTRA-Thres and NR-Thres according to test parameters specified in test cases | EVENT B2 |
| | ReportConfigInterRAT-B1-NR(EUTRA-Thres, NR-Thres) | Set EUTRA-Thres and NR-Thres according to test parameters specified in test cases | EVENT B1 |
| | ReportConfigInterRAT-SFTD with Condition INTER-RAT | TS 36.508 [25] Table 4.6.6-8B | SFTD |
| | ReportConfigInterRAT-PERIODICAL | Table 4.6.6-9 in TS 36.508 [25] | PERIODICAL |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | INTER-RAT NR OR E-UTRA_Deactivated_SCell |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig-FR1 | Table H.3.4-5 | |
| | Not present | | GAPLESS |
| fr1-Gap-r15 | false | | gapUE |
| | true | | gapFR1 |
| | Not present | | E-UTRA_Deactivated_SCell |
| quantityConfig | QuantityConfig-DEFAULT | Table H.3.4-11 | E-UTRA_Deactivated_SCell |
| } | | | |

| Condition | Explanation |
|---|---|
| gapUE | fr1-Gap-r15 set to false indicates the gap is applicable for measurements on FR1 and FR2. E-UTRAN includes this field only when the UE is configured with (NG)EN-DC. |

| | |
|---|---|
| gapFR1 | fr1-Gap-r15 set to true indicates the gap is only applicable for measurements on FR1. E-UTRAN includes this field only when the UE is configured with (NG)EN-DC. |
| INTER-RAT NR | Measurement configuration for inter-RAT NR measurements |
| EVENT B2 | For event B2 triggered measurement reporting test cases |
| EVENT B1 | For event B1 triggered measurement reporting test cases |
| EVENT A4 | For event A4 triggered measurement reporting |
| SFTD | For inter-RAT SFTD measurement test cases |
| GAPLESS | MG is not needed in test |
| PERIODICAL | For periodic measurement reporting test cases |
| E-UTRA_Deactivated_SCell | For test cases with an LTE deactivated SCell |

MeasGapConfig

Configures measurement gap by LTE RRC in EN-DC as specified in TS 38.331 [13].

**Table H.3.4-5: MeasGapConfig**

| Derivation Path: 36.508 [25],Table 4.6.6-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasGapConfig ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 39 | TGRP = 40 ms | Pattern #0 |
| | 0 | | BFD |
| gp4-r15 | 19 | TGRP = 20 ms | Pattern #4 |
| } | | | |
| } | | | |
| } | | | |

| **Condition** | **Explanation** |
|---|---|
| Pattern #0 | *gp0* corresponds to gap offset of Gap Pattern Id "0" with MGRP = 40ms |
| Pattern #4 | *gp4-r15* corresponds to gap offset of Gap Pattern Id "4" with MGRP = 40ms (see TS 38.133, Table 9.1.2-1). It can be applied for (NG)EN-DC, see TS 38.133, Table 9.1.2-2. |
| BFD | Measurement gap pattern for Beam Failure Dectection tests |

**Table H.3.4-6: MeasObjectNR**

| Derivation Path: TS 36.508 [25] Table 4.6.6-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| rs-ConfigSSB-r15 ::= SEQUENCE { | | | |
| measTimingConfig-r15 ::= SEQUENCE { | | | |
| periodicityAndOffset-r15 CHOICE { | | | |
| sf20-r15 | 0 | | SMTC.1 or SMTC.2 |
| | 10 | | SMTC.4 or SMTC.5 |
| | 17 | | SMTC.6 |
| sf160-r15 | 0 | | SMTC.3 |
| } | | | |
| ssb-Duration-r15 | sf1 | | SMTC.1, SMTC.3 or SMTC.4 |
| | sf5 | | SMTC.2, SMTC.5 or SMTC.6 |
| } | | | |
| subcarrierSpacingSSB-r15 | kHz15 | | SSB.1 FR1, SSB.3 FR1 or SSB.5 FR1 |
| | kHz30 | | SSB.2 FR1, SSB.4 FR1 or SSB.6 FR1 |
| | kHz120 | | SSB.1 FR2, SSB.3 FR2, SSB.5 FR2 or SSB.7 FR2 |

| | | | |
|---|---|---|---|
| | KHz240 | | SSB.2 FR2, SSB.4 FR2, SSB.6 FR2 or SSB.8 FR2 |
| } | | | |
| deriveSSB-IndexFromCell-r15 | Not present | | |
| | true | | Synchronous cells |
| | false | | Asynchronous cells |
| } | | | |

**Table H.3.4-7: RRCConnectionReconfiguration for iRAT measurement configuration**

| Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| measConfig | MeasConfig-DEFAULT with Conditions INTER RAT NR and PERIODICAL | Table H.3.4-4 | |
| | MeasConfig-DEFAULT with Conditions INTER RAT NR and SFTD | Table H.3.4-4 | INTER-RAT and SFTD |
| | MeasConfig-DEFAULT with Conditions INTER RAT NR and EVENT B2 | Table H.3.4-4 | INTER-RAT and EVENT B2 |
| | MeasConfig-DEFAULT with Conditions INTER RAT NR and EVENT B1 | Table H.3.4-4 | INTER-RAT and EVENT B1 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table H.3.4-8: ReportConfigInterRAT-B2-NR(EUTRA-Thres, NR-Thres)**

| Derivation Path: 36.508 [25], Table 4.6.6-8A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigInterRAT-B2-NR ::= SEQUENCE { | | | |
| maxReportRS-Index-r15 | 2 | | SSB-Index |
| reportQuantityRS-IndexNR-r15 SEQUENCE { | | | SSB-Index |
| ss-rsrp | TRUE | | |
| ss-rsrq | FALSE | | |
| ss-sinr | FALSE | | |
| } | | | |
| reportRS-IndexResultsNR | TRUE | | SSB-Index |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB-Index | To include SSB Index |

**Table H.3.4-9: MeasObjectEUTRA-GENERIC(Freq)**

| Derivation Path: 36.508 [25],Table 7.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasObjectEUTRA-GENERIC(Freq) ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| measCycleSCell-r10 | sf640 | | E-UTRA_Deactivated_SCell |
| } | | | |

**Table H.3.4-10: ReportConfigEUTRA-A3(a3-offset)**

| Derivation Path: 36.508 [25],Table 4.6.6-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ReportConfigEUTRA-A3 ::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |
| event SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset | A3-offset *2 | The actual value is field value * 0.5 dB | |
| } | | | |
| } | | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| reportQuantity | sameAsTriggerQUantity | | |
| maxReportCells | 2 | | |
| reportInterval | ms480 | | |
| reportAmount | r2 | | |
| } | | | |

**Table H.3.4-11: QuantityConfig-DEFAULT**

| Derivation Path: 36.508 [25],Table 4.6.6-3A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| QuantityConfig-DEFAULT ::= SEQUENCE { | | | |
| quantityConfigEUTRA SEQUENCE { | | | |
| filterCoefficientRSRP | fc0 | | |
| filterCoefficientRSRQ | fc0 | | |
| } | | | |
| quantityConfigNRList-r15 (SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | 1 entries | | |
| measQuantityCellNR-r15[1] SEQUENCE { | | | |
| filterCoeff-RSRP-r15 | fc0 | | |
| filterCoeff-RSRQ-r15 | fc0 | | |
| filterCoefficient-SINR-r13 | fc0 | | |
| } | | | |
| } | | | |
| } | | | |

## H.3.5 RRC messages and information elements contents exceptions for NR radio link monitoring (RLM)

CSI-RS information elements contents exception for NR RLM SSB-Based test cases

**Table H.3.5-1 to H.3.5-3: Void**

**Table H.3.5-4: CSI-ReportConfig**

| Derivation Path: TS 38.508[14] Table 7.3.1-12F | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| reportSlotConfig ::= CHOICE { | | | |
| slots5 | 0 | | SCS15kHz_FDD |
| slots5 | 2 | | SCS15kHz_TDD |
| slots10 | 4 | | SCS30kHz |
| slots40 | 16 | | SCS120kHz |
| } | | | |
| pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{ | | | |
| PUCCH_CSI_Resource[0] SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id | | |
| pucch_Resource | 9 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table H.3.5-5 to H.3.5-7: Void**

BWP-DownlinkDedicated: to setup radioLinkMonitoringConfig Configuration

Table H.3.5-8: Void

RadioLinkMonitoringConfig: Configuration for RLM-RS

**Table H.3.5-9: *RadioLinkMonitoringConfig***

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-133 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE { | n entries | n = 1 for FR1,<br>n = 2 for FR2 | |
| radioLinkMonitoringRS-Id[1] | 0 | | |
| purpose[1] | rlf | | |
| detectionResource[1] CHOICE { | | | |
| ssb-Index | 0 | Index of SSB #0 | SSB RLM |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| RadioLinkMonitoringRS[2] SEQUENCE { | | | FR2 |
| radioLinkMonitoringRS-Id | 1 | | |
| purpose | rlf | | |
| detectionResource CHOICE { | | | |
| ssb-Index | 1 | Index of SSB #1 | SSB RLM |

| | | | |
|---|---|---|---|
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET | TS 38.508-1[14], table 7.3.1-7C | CSI-RS RLM |
| } | | | |
| failureDetectionResourcesToReleaseList | Not present | | |
| beamFailureInstanceMaxCount | Not present | | |
| beamFailureDetectionTimer | Not present | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB RLM | Configuration for SSB based RLM test cases |
| CSI-RS RLM | Configuration for CSI-RS based RLM test cases |

**Table H.3.5-10: Void**

## H.3.6 RRC messages and IE content exceptions for L1-RSRP measurement for beam reporting

ServingCellConfig: Default generic configuration for enabling CSI measurements and reporting

**Table H.3.6-1: Void**

CSI-ReportConfig: Default generic configuration for L1-RSRP measurements

**Table H.3.6-2: CSI-ReportConfig**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12G | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| csi-IM-ResourcesForInterference | Not present | | |
| nzp-CSI-RS-ResourcesForInterference | Not present | | |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | PERIODIC |
| reportSlotConfig CHOICE { | | | |
| slot80 | 7 | Periodicity 80 slots and offset 7 | SCS30 |
| | 2 | Periodicity 80 slots and offset 2 | SCS15 |
| slot320 | 4 | Periodicity 320 slots and offset 4 | FR2 |
| pucch-CSI-ResourceList SEQUENCE { | 1 entry | | |
| (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id of active BWP | | |
| pucch-Resource | 8 | PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| reportQuantity CHOICE { | | | |
| ssb-Index-RSRP | NULL | | SS-RSRP |
| cri-RSRP | NULL | | CSI-RSRP |
| } | | | |
| timeRestrictionForChannelMeasurements | configured | | |
| groupBasedBeamReporting CHOICE { | | | |
| disabled SEQUENCE { | | | |
| nrofReportedRS | n2 | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| PERIODIC | Configuration for periodic reporting |
| SS-RSRP | L1-RSRP measurement based on SSB |
| CSI-RSRP | L1-RSRP measurement based on CSI-RS |

CSI-ResourceConfig: Default generic resource configuration for L1-RSRP measurements

**Table H.3.6-3: CSI-ResourceConfig**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ResourceConfig ::= SEQUENCE { | | | |
| csi-RS-ResourceSetList CHOICE { | | | |
| nzp-CSI-RS-SSB SEQUENCE { | | | |
| nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF { | 1 entry | | CSI-RS |
| NZP-CSI-RS-ResourceSetId[0] | 0 | | |
| } | | | |
| csi-SSB-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSetsPerConfig)) OF { | 1 entry | | SSB |
| CSI-SSB-ResourceSetId[0] | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB | Configuration for SSB based CSI |
| CSI-RS | Configuration for CSI-RS based CSI |

**Table H.3.6-4 to H.3.6-9: Void**

CSI-MeasConfig: Default generic resource configuration for L1-RSRP measurements

**Table H.3.6-10: CSI-MeasConfig**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-MeasConfig::= SEQUENCE { | | | |
| csi-SSB-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSets)) OF CSI-SSB-ResourceSet { | | | |
| CSI-SSB-ResourceSet[1] | CSI-SSB-ResourceSet-RRM | TS 38.508-1 Table 7.3.1-29 | |
| } | | | |
| } | | | |

# H.3.6A RRC messages and IE content exceptions for L1-SINR measurement for beam reporting

ServingCellConfig: Default generic configuration for enabling CSI measurements and reporting.

CSI-ReportConfig: Default generic configuration for L1-SINR measurements.

**Table H.3.6A-1: CSI-ReportConfig**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12G | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| csi-IM-ResourcesForInterference | CSI-IM-ResourceConfigId-IMR | | CSI-IM_IMR |
| | CSI-IM-ResourceConfigId-IMR with condition APERIODIC | | CSI-IM_IMR AND APERIODIC |
| nzp-CSI-RS-ResourcesForInterference | CSI-ResourceConfigId-IMR | | CSI-RS_IMR |
| | CSI-ResourceConfigId-IMR with condition APERIODIC | | CSI-RS_IMR AND APERIODIC |
| reportConfigType CHOICE { | | | |
| periodic SEQUENCE { | | | PERIODIC |
| reportSlotConfig CHOICE { | | | |
| slot80 | 7 | Periodicity 80 slots and offset 7 | SCS30 |
| | 2 | Periodicity 80 slots and offset 2 | SCS15 |
| | 4 | Periodicity 80 slots and offset 4 | FR2 |
| pucch-CSI-ResourceList SEQUENCE { | 1 entry | | |
| (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | | | |
| uplinkBandwidthPartId | BWP-Id of active BWP | | |
| pucch-Resource | 8 | PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| aperiodic SEQUENCE { | | | APERIODIC |
| reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF { | 1 entry | | |
| INTEGER[1] | 26 | | |
| } | | | |
| } | | | |
| } | | | |
| timeRestrictionForChannelMeasurements | configured | | |
| groupBasedBeamReporting CHOICE { | | | |
| disabled SEQUENCE { | | | |
| nrofReportedRS | n2 | | |
| } | | | |
| } | | | |
| reportQuantity-r16 CHOICE { | | | |
| cri-SINR-r16 | NULL | | CSI-SINR |
| ssb-Index- SINR-r16 | NULL | | SS-SINR |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|

| | |
|---|---|
| PERIODIC | Configuration for periodic reporting |
| APERIODIC | Configuration for aperiodic reporting |
| SS-SINR | L1-SINR measurement based on SSB |
| CSI- SINR | L1-SINR measurement based on CSI-RS |
| CSI-RS_IMR | Configuration for NZP-CSI-RS based IMR |
| CSI-IM_IMR | Configuration for CSI-IM based IMR |

CSI-ResourceConfig for CMR: Default generic resource configuration for L1-SINR measurements.

**Table H.3A.6-2: CSI-ResourceConfig for CMR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ResourceConfig ::= SEQUENCE { | | | |
| csi-RS-ResourceSetList CHOICE { | | | |
| nzp-CSI-RS-SSB SEQUENCE { | | | |
| nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF { | 1 entry | | CSI-RS |
| NZP-CSI-RS-ResourceSetId[1] | 0 | | |
| } | | | |
| csi-SSB-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSetsPerConfig)) OF { | 1 entry | | SSB |
| CSI-SSB-ResourceSetId[1] | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| bwp-Id | BWP-Id of active BWP | | |
| resourceType | aperiodic | | APERIODIC |
| | periodic | | PERIODIC |
| } | | | |

| **Condition** | **Explanation** |
|---|---|
| SSB | Configuration for SSB based CMR |
| CSI-RS | Configuration for CSI-RS based CMR |

CSI-ResourceConfig for IMR: For NZP-CSI-RS resource configured as dedicated IMR, refer to Table H.3A.6-3; For CSI-IM resource configured as dedicated IMR, refer to Table H.3A.6-4.

**Table H.3A.6-3: CSI-ResourceConfig for NZP-CSI-RS as IMR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ResourceConfig ::= SEQUENCE { | | | |
| csi-ResourceConfigId | CSI-ResourceConfigId-IMR | | |
| | CSI-ResourceConfigId-IMR with condition APERIODIC | | APERIODIC |
| csi-RS-ResourceSetList CHOICE { | | | |
| nzp-CSI-RS-SSB SEQUENCE { | | | |
| nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF { | 1 entry | | |
| NZP-CSI-RS-ResourceSetId[1] | NZP-CSI-RS-ResourceSetId-IMR | | |
| | NZP-CSI-RS-ResourceSetId-IMR with condition APERIODIC | | APERIODIC |
| } | | | |
| } | | | |
| } | | | |
| bwp-Id | BWP-Id of active BWP | | |

| | | | |
|---|---|---|---|
| resourceType | aperiodic | | APERIODIC |
| | periodic | | PERIODIC |
| } | | | |

**Table H.3A.6-3a: NZP-CSI-RS-ResourceSet for IMR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-11B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-ResourceSet ::= SEQUENCE { | | | |
| nzp-CSI-ResourceSetId | NZP-CSI-RS-ResourceSetId-IMR | | |
| | NZP-CSI-RS-ResourceSetId-IMR with condition APERIODIC | | APERIODIC |
| nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId { | 2 entries | | |
| NZP-CSI-RS-ResourceId[1] | NZP-CSI-RS-ResourceId for IMR(0) | INTEGER 12 | |
| | NZP-CSI-RS-ResourceId for IMR(0) with condition APERIODIC | INTEGER 22 | APERIODIC |
| NZP-CSI-RS-ResourceId[2] | NZP-CSI-RS-ResourceId for IMR(1) | INTEGER 13 | |
| | NZP-CSI-RS-ResourceId for IMR(1) with condition APERIODIC | INTEGER 23 | APERIODIC |
| } | | | |
| aperiodicTriggeringOffset | 6 | | APERIODIC |
| } | | | |

**Table H.3A.6-3b: NZP-CSI-RS-Resource for IMR(Id)**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-7B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| nzp-CSI-RS-ResourceId | NZP-CSI-RS-ResourceId for IMR(Id) | | |
| | NZP-CSI-RS-ResourceId for IMR(Id) with condition APERIODIC | | APERIODIC |
| resourceMapping SEQUENCE { | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 0001 | | |
| } | | | |
| nrofPorts | p1 | | |
| firstOFDMSymbolInTimeDomain | 6 | | Id = 0 |
| | 10 | | Id = 1 |
| | 7 | | Id = 0 AND APERIODIC |
| | 11 | | Id = 1 AND APERIODIC |
| cdm-Type | noCDM | | |
| density CHOICE { | | | |
| three | NULL | | |
| } | | | |
| freqBand | CSI-FrequencyOccupation-RRM | | See TS 38.508-1 [14], Table 7.3.1-10 |
| } | | | |
| powerControlOffset | 0 | | |
| powerControlOffsetSS | db0 | | |
| scramblingID | 0 | | |
| periodicityAndOffset { | | | |

| | | | |
|---|---|---|---|
| slots20 | 1 | | SCS15 |
| slots40 | 2 | | SCS30 |
| } | | | |
| periodicityAndOffset | Not present | | APERIODIC |
| qcl-InfoPeriodicCSI-RS | Not present | | |
| } | | | |

**Table H.3A.6-3c: NZP-CSI-RS-ResourceSetId-IMR**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-ResourceSetId | 1 | | |

**Table H.3A.6-4: CSI-ResourceConfig for CSI-IM as IMR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ResourceConfig ::= SEQUENCE { | | | |
| csi-ResourceConfigId | CSI-IM-ResourceConfigId-IMR | | |
| | CSI-IM-ResourceConfigId-IMR with condition APERIODIC | | APERIODIC |
| csi-RS-ResourceSetList CHOICE { | | | |
| csi-IM-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-IM-ResourceSetsPerConfig) OF { | 1 entry | | |
| CSI-IM-ResourceSetId[1] | CSI-IM-ResourceSetId-IMR | | |
| | CSI-IM-ResourceSetId-IMR with condition APERIODIC | | APERIODIC |
| } | | | |
| } | | | |
| bwp-Id | BWP-Id of active BWP | | |
| resourceType | aperiodic | | APERIODIC |
| | periodic | | PERIODIC |
| } | | | |

**Table H.3A.6-4a: CSI-IM-ResourceSet for IMR**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-26 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-IM-ResourceSet ::= SEQUENCE { | | | |
| csi-IM-ResourceSetId | CSI-IM-ResourceSetId-IMR | | |
| | CSI-IM-ResourceSetId-IMR with condition APERIODIC | | APERIODIC |
| csi-IM-Resources SEQUENCE (SIZE (1..maxNrofCSI-IM-ResourcesPerSet)) OF CSI-IM-ResourceId { | 2 entries | | |
| CSI-IM-ResourceId[1] | CSI-IM-ResourceId for IMR(0) | INTEGER 0 | |
| | CSI-IM-ResourceId for IMR(0) with condition APERIODIC | INTEGER 10 | APERIODIC |
| CSI-IM-ResourceId[2] | CSI-IM-ResourceId for IMR(1) | INTEGER 1 | |
| | CSI-IM-ResourceId for IMR(1) with condition APERIODIC | INTEGER 11 | APERIODIC |
| } | | | |
| } | | | |

**Table H.3A.6-4b: CSI-IM-Resource for IMR(Id)**

| Derivation Path: TS 38.508-1 [14], Table 7.3.1-24 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-IM-Resource ::= SEQUENCE { | | | |
| csi-IM-ResourceId | CSI-IM-ResourceId for IMR(Id) | | |
| | CSI-IM-ResourceId for IMR(Id) with condition APERIODIC | | APERIODIC |
| csi-IM-ResourceElementPattern CHOICE { | | | |
| pattern1 SEQUENCE { | | | |
| subcarrierLocation-p1 | s0 | | |
| symbolLocation-p1 | 6 | | Id = 0 |
| | 10 | | Id = 1 |
| | 7 | | Id = 0 AND APERIODIC |
| | 11 | | Id = 1 AND APERIODIC |
| } | | | |
| } | | | |
| freqBand | CSI-FrequencyOccupation-RRM | | See TS 38.508-1 [14], Table 7.3.1-10 |
| periodicityAndOffset | CSI-ResourcePeriodicityAndOffset for CSI | | |
| slots20 | 1 | | SCS15 |
| slots40 | 2 | | SCS30 |
| } | | | |
| periodicityAndOffset | Not present | | APERIODIC |
| } | | | |

**Table H.3A.6-4c: CSI-IM-ResourceSetId-IMR**

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-IM-ResourceSetId | 0 | | |

## H.3.7 RRC messages and information elements contents exceptions for NR cell search when DRX is used

MAC-CellGroupConfig: DRX configuration for NR serving cell

**Table H.3.7-1: *MAC-CellGroupConfig:* NR intra-frequency cell search when DRX is used**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-68 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| drx-onDurationTimer CHOICE { | | | |
| milliSeconds | ms1 | | DRX.1 OR DRX.2 OR DRX.6 |
| | ms6 | | DRX.3 OR DRX.7 OR DRX.8 OR DRX.11 OR DRX.14 |

| | | | |
|---|---|---|---|
| } | | | |
| drx-InactivityTimer | ms1 | | |
| drx-RetransmissionTimerDL | sl1 | | |
| drx-RetransmissionTimerUL | sl1 | | |
| drx-LongCycleStartOffset CHOICE { | | | |
| ms20 | 0 | | DRX.11 |
| ms40 | 0 | | DRX.1 or DRX.3 |
| | 10 | | (DRX.1 and Gap) OR (DRX.1 and Offset) OR (DRX.3 and Offset) |
| | 15 | | DRX.1 and Gap and INTER-FREQ |
| | 20 | | DRX.3 and Gap |
| ms320 | 0 | | DRX.6 OR DRX.8 |
| | 10 | | DRX.6 and Gap |
| ms160 | 0 | | DRX.14 |
| ms640 | 0 | | DRX.2 OR DRX.7 |
| | 10 | | (DRX.2 and Gap) OR (DRX.7 and Offset) OR (DRX.7 and Gap) |
| | 15 | | (DRX.2 OR DRX.7) and Gap and INTER-FREQ |
| } | | | |
| shortDRX | not present | | |
| drx-SlotOffset | 0 | | |
| } | | | |
| } | | | |
| tag-Config SEQUENCE { | | | |
| tag-ToReleaseList | Not present | | |
| tag-ToAddModList SEQUENCE (SIZE (1..maxNrofTAGs)) OF SEQUENCE { | 1 entry | | |
| tag-Id[1] | 0 | | |
| timeAlignmentTimer[1] | ms500 | | DRX.1 OR DRX.2 OR DRX.6 |
| | infinity | | DRX.3 OR DRX.7 OR DRX.8 OR DRX.11 OR DRX.14 |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| DRX.1 | DRX Configuration 1 according to TS 38.133 [6] A.3.3.1 |
| DRX.2 | DRX Configuration 2 according to TS 38.133 [6] A.3.3.2 |
| DRX.3 | DRX Configuration 3 according to TS 38.133 [6] A.3.3.3 |
| DRX.6 | DRX Configuration 6 according to TS 38.133 [6] A.3.3.6 |
| DRX.7 | DRX Configuration 7 according to TS 38.133 [6] A.3.3.7 |
| DRX.8 | DRX Configuration 8 according to TS 38.133 [6] A.3.3.8 |
| DRX.14 | DRX Configuration 14 according to TS 38.133 [6] A.3.3.14 |
| INTER-FREQ | Configuration for inter-frequency NR measurement tests |

| | |
|---|---|
| Gap | Configuration for tests with measurement gap |
| Offset | Tests that requires offset for DRX to eliminate overlap of DRX and SMTC |

MAC-MainConfig: DRX configuration for E-UTRAN serving cell

**Table H.3.7-2: MAC-MainConfig**

| Derivation Path: 36.508, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf2 | | DRX.4 OR DRX.9 |
| | psf6 | | DRX.5 OR DRX.10 OR DRX.12 |
| drx-InactivityTimer | psf2 | | DRX.4 OR DRX.12 |
| | psf1920 | | DRX.5 OR DRX.10 |
| | psf100 | | DRX.9 |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf160 | 0 | | DRX.4 |
| sf320 | 0 | | DRX.5 |
| | 10 | | DRX.5 and Gap |
| sf40 | 0 | | DRX.9 |
| | 10 | | DRX.9 and Gap |
| sf640 | 0 | | DRX.10 OR DRX.12 |
| | 10 | | DRX.12 and Gap |
| } | | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | infinity | | DRX.4 OR DRX.5 OR DRX.12 |
| | sf500 | | DRX.9 OR DRX.10 |
| } | | | |

| Condition | Explanation |
|---|---|
| DRX.4 | DRX Configuration 4 according to TS 38.133 [6] A.3.3.4 |
| DRX.5 | DRX Configuration 5 according to TS 38.133 [6] A.3.3.5 |
| DRX.9 | DRX Configuration 9 according to TS 38.133 [6] A.3.3.9 |
| DRX.10 | DRX Configuration 10 according to TS 38.133 [6] A.3.3.10 |
| DRX.12 | DRX Configuration 12 according to TS 38.133 [6] A.3.3.12 |

## H.3.8 RRC messages and information elements contents exceptions for NR RRC reconfiguration delay

ServingCellConfigCommonSIB: information elements content exception for RRC reconfiguration delay test cases to specific both NR uplink and supplementary uplink for SCell.

**Table H.3.8-1: ServingCellConfigCommonSIB-Procedure Delay**

| Derivation Path: TS 38.508-1 [14], table 4.6.3-169 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---|---|---|---|
| ServingCellConfigCommonSIB ::= SEQUENCE { | | | |
| downlinkConfigCommon | DownlinkConfigCommonSIB | | |
| uplinkConfigCommon | UplinkConfigCommonSIB | NR uplink | |
| | UplinkConfigCommonSIB with condition SUL_NUL | | SUL |
| supplementaryUplink | UplinkConfigCommonSIB with condition SUL_SUL | | SUL |
| n-TimingAdvanceOffset | Not present | | |
| ssb-PositionsInBurst SEQUENCE { | | | |
| inOneGroup | '0100 0000'B | When carrier frequency is smaller than or equal to 3 GHz, only the 4 leftmost bits are valid; | |
| groupPresence | Not present | | |
| } | | | |
| ssb-PeriodicityServingCell | ms20 | | |
| tdd-UL-DL-ConfigurationCommon | TDD-UL-DL-ConfigCommon | | FR1_TDD |
| ss-PBCH-BlockPower | 0 | | |
| } | | | |

RRCReconfiguration: information elements contents exception for RRC reconfiguration delay test cases to specific radio bearers and cell groups.

**Table H.3.8-2: RRCReconfiguration-Procedure Delay**

| Derivation Path: TS 38.508-1 [14], table 4.6.1-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig with conditions SRB2 and DRB1 | | |
| } | | | |
| secondaryCellGroup | CellGroupConfig with condition EN-DC_SCell_add | OCTET STRING (CONTAINING CellGroupConfig) | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig with conditions EN-DC | OCTET STRING (CONTAINING CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

# H.3.9 RRC messages and information elements contents exceptions for UL timing

**Table H.3.9-1: *PUSCH-TimeDomainResourceAllocationList***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-122 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-TimeDomainResourceAllocationList ::= SEQUENCE (SIZE(1..maxNrofUL-Allocations)) OF { | 2 entries | | |
| PUSCH-TimeDomainResourceAllocation[1] SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| startSymbolAndLength | 41 | Start symbol(S)=0, Length(L)=13 | |
| } | | | |
| PUSCH-TimeDomainResourceAllocation[2] SEQUENCE { | | addressed by Msg3 PUSCH time resource allocation field of the Random Access Response acc. to TS 38.213 [22] Table 8.2-1. | |
| startSymbolAndLength | 41 | Start symbol(S)=0, Length(L)=13 | |
| } | | | |
| } | | | |

## H.3.10 RRC messages and information elements contents exceptions for Shared Spectrum Access

**Table H.3.10-1: *ServingCellConfigCommon* for Shared Spectrum Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ssb-PositionsInBurst CHOICE { | | | |
| mediumBitmap | 10000000 | | SSB.1 CCA |
| | 10100000 | | SSB.2 CCA |
| | 11000000 | | SSB.3 CCA |
| | 11110000 | | SSB.4 CCA |
| } | | | |
| channelAccessMode-r16 CHOICE { | | | |
| dynamic | NULL | | Dynamic |
| semiStatic SEQUENCE { | | | SemiStatic |
| period | ms2 | | |
| } | | | |
| } | | | |
| discoveryBurstWindowLength-r16 | ms1 | DBT.1 | |
| ssb-PositionQCL-r16 | n1 | | SSB.1 CCA<br>SSB.2 CCA |
| | n2 | | SSB.3 CCA<br>SSB.4 CCA |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB.X CCA | SSB pattern SSB.X CCA configured as per section A.3A (X = {1,2,3,4}) |
| Dynamic | Dynamic channel access |
| SemiStatic | Semi-static channel access |

**Table H.3.10-2: SSB-MTC for Shared Spectrum Access**

| Derivation Path: Table 38.508-1 Table 7.3.1-3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SSB-MTC ::= SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sf20 | 0 | | SMTC.1<br>SMTC.2 |
| | 10 | | SMTC.4<br>SMTC.5 |
| } | | | |
| duration | sf1 | | SMTC.1<br>SMTC.4 |
| | sf5 | | SMTC.2<br>SMTC.5 |

| | | | |
|---|---|---|---|
| } | | | |

| Condition | Explanation |
|---|---|
| SMTC.X | SMTC pattern SMTC.X configured as per section A.4 (X = {1,2,4,5}) |

**Table H.3.10-3: *MeasResultForRSSI* for Shared Spectrum Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-78AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasResultForRSSI ::= SEQUENCE { | | | |
| rssi-Result-r16 | measResultRSSI | RSSI-Range-r16, integer (0..76) | RSSI |
| channelOccupancy-r16 | measResultChannelOccupancy | Integer (0..100) | Channel_Occupancy |
| } | | | |

| Condition | Explanation |
|---|---|
| RSSI | RSSI measurements |
| Channel_Occupancy | Channel Occupancy measurements |

## H.3.11 RRC messages and information elements contents exceptions for UL Tx switching

CellGroupConfig-R16-R17

Rel-16 1T-2T or Rel-17 2T-2T UL Tx switch configuration for PCell and 1 SCell or 2 intra-band contiguous SCells.

**Table H.3.11-1: CellGroupConfig-R16-R17**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 PCell (Cell 1) | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 1 entry | | |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellIndex | 1 | | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 1st SCell (Cell 2) | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 2 entries | | 2SCELLS |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellIndex | 1 | | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 1st SCell (Cell 2) | |
| } | | | |
| SCellConfig[2] SEQUENCE { | | entry 2 | |
| sCellIndex | 2 | | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |

| | | | |
|---|---|---|---|
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 2nd SCell (Cell 3) | |
| } | | | |
| } | | | |
| bap-Address-r16 | Not present | | |
| bh-RLC-ChannelToAddModList-r16 | Not present | | |
| bh-RLC-ChannelToReleaseList-r16 | Not present | | |
| f1c-TransferPath-r16 | Not present | | |
| simultaneousTCI-UpdateList1-r16 | Not present | | |
| simultaneousTCI-UpdateList2-r16 | Not present | | |
| simultaneousSpatial-UpdatedList1-r16 | Not present | | |
| simultaneousSpatial-UpdatedList2-r16 | Not present | | |
| uplinkTxSwitchingOption-r16 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r16 OR pc_uplinkTxSwitching_OptionSupport_both_r16 OR pc_uplinkTxSwitching_OptionSupport_switchedUL_r17 OR pc_uplinkTxSwitching_OptionSupport_both_r17 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r16 OR pc_uplinkTxSwitching_OptionSupport_dualUL_r17 |
| uplinkTxSwitchingPowerBoosting-r16 | Not present | | |
| uplinkTxSwitching-2T-Mode-r17 | Not present | | 1T-2T |
| | enabled | | 2T-2T |
| } | | | |

| Condition | Explanation |
|---|---|
| 2SCELLS | In case two intra-band contiguous SCells are used in UL Tx switching tests |
| 1T-2T | For 1T-2T UL Tx switching tests |
| 2T-2T | For 2T-2T UL Tx switching tests |

CellGroupConfig-R18

Rel-18 UL Tx switch configuration for PCell and 2 or 3 inter-band SCells over 3 or 4 bands.

**Table H.3.11-2: CellGroupConfig-R18**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CellGroupConfig ::= SEQUENCE { | | | |
| mac-CellGroupConfig | Not present | | |
| mac-CellGroupConfig SEQUENCE { | | | DualTAGs |
| tag-Config SEQUENCE { | | | |
| tag-ToReleaseList | Not present | | |
| tag-ToAddModList SEQUENCE (SIZE (1..maxNrofTAGs)) OF TAG { | 2 entries | | |
| TAG[1] SEQUENCE { | | entry 1 | |
| tag-Id | 0 | | |
| timeAlignmentTimer | infinity | | |
| } | | | |
| TAG[2] SEQUENCE { | | entry 2 | |
| tag-Id | 1 | | |
| timeAlignmentTimer | infinity | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| spCellConfig SEQUENCE { | | | |
| rlf-TimersAndConstants | Not present | | |
| spCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 2 entries | | 1T1T-2T |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellIndex | 1 | 1st SCell (Cell 2) | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| } | | | |
| SCellConfig[2] SEQUENCE { | | entry 2 | |
| sCellIndex | 2 | 2nd SCell (Cell 3) | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig { | 3 entries | | 1T1T-1T1T |
| SCellConfig[1] SEQUENCE { | | entry 1 | |
| sCellIndex | 1 | 1st SCell (Cell 2) | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| } | | | |
| SCellConfig[2] SEQUENCE { | | entry 2 | |
| sCellIndex | 2 | 2nd SCell (Cell 3) | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| } | | | |
| SCellConfig[3] SEQUENCE { | | entry 3 | |
| sCellIndex | 3 | 3rd SCell (Cell 4) | |
| sCellConfigCommon | ServingCellConfigCommon with condition SCell_add | TS 38.508-1 [14] Table 4.6.3-168 | |
| sCellConfigDedicated | ServingCellConfig-TxSwitch | Table H.3.11-3 | |
| } | | | |
| } | | | |
| ncr-FwdConfig-r18 | Not present | | |
| autonomousDenialParameters-r18 | Not present | | |
| nonCollocatedTypeMRDC-r18 | Not present | | |
| nonCollocatedTypeNR-CA-r18 | Not present | | |
| uplinkTxSwitchingMoreBands-r18 CHOICE { | | | 1T1T-2T |

| | | | |
|---|---|---|---|
| setup SEQUENCE{ | | | |
| uplinkTxSwitchingBandList-r18 SEQUENCE (SIZE (1..maxSimultaneousBands)) OF FreqBandIndicatorNR { | 3 entries | | |
| FreqBandIndicatorNR[1] | FreqBandIndicatorNR of PCell (Cell 1) | entry 1<br>Band A | |
| FreqBandIndicatorNR[2] | FreqBandIndicatorNR of 1st SCell (Cell 2) | entry 2<br>Band B | |
| FreqBandIndicatorNR[3] | FreqBandIndicatorNR of 2nd SCell (Cell 3) | entry 3<br>Band C | |
| } | | | |
| uplinkTxSwitchingBandPairList-r18 SEQUENCE (SIZE (1.. maxULTxSwitchingBandPairs)) OF UplinkTxSwitchingBandPairConfig-r18 { | 3 entries | | |
| UplinkTxSwitchingBandPairConfig-r18[1] SEQUENCE { | | entry 1 | |
| bandInfoUL1-r18 | 1 | Band A | |
| bandInfoUL2-r18 | 3 | Band C | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[2] SEQUENCE { | | entry 2 | |
| bandInfoUL1-r18 | 2 | Band B | |
| bandInfoUL2-r18 | 3 | Band C | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[3] SEQUENCE { | | entry 3 | |
| bandInfoUL1-r18 | 1 | Band A | |
| bandInfoUL2-r18 | 2 | Band B | |
| switchingOptionConfigForBandPair-r18 | dualUL | | |
| switching2T-Mode-r18 | Not present | | |

| | | | |
|---|---|---|---|
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| } | | | |
| uplinkTxSwitchingAssociatedBandDualUL-List-r18 | Not present | | |
| } | | | |
| } | | | |
| uplinkTxSwitchingMoreBands-r18 CHOICE { | | | 1T1T-1T1T |
| setup SEQUENCE{ | | | |
| uplinkTxSwitchingBandList-r18 SEQUENCE (SIZE (1..maxSimultaneousBands)) OF FreqBandIndicatorNR { | 4 entries | | |
| FreqBandIndicatorNR[1] | FreqBandIndicatorNR of PCell (Cell 1) | entry 1 | |
| FreqBandIndicatorNR[2] | FreqBandIndicatorNR of 1st SCell (Cell 2) | entry 2 | |
| FreqBandIndicatorNR[3] | FreqBandIndicatorNR of 2nd SCell (Cell 3) | entry 3 | |
| FreqBandIndicatorNR[4] | FreqBandIndicatorNR of 3rd SCell (Cell 4) | entry 4 | |
| } | | | |
| uplinkTxSwitchingBandPairList-r18 SEQUENCE (SIZE (1.. maxULTxSwitchingBandPairs)) OF UplinkTxSwitchingBandPairConfig-r18 { | 6 entries | | |
| UplinkTxSwitchingBandPairConfig-r18[1] SEQUENCE { | | entry 1 | |
| bandInfoUL1-r18 | 1 | Band A | |
| bandInfoUL2-r18 | 3 | Band C | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[2] SEQUENCE { | | entry 2 | |
| bandInfoUL1-r18 | 2 | Band B | |
| bandInfoUL2-r18 | 3 | Band C | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSu |

| | | | |
|---|---|---|---|
| | | | pport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[3] SEQUENCE { | | entry 3 | |
| bandInfoUL1-r18 | 1 | Band A | |
| bandInfoUL2-r18 | 2 | Band B | |
| switchingOptionConfigForBandPair-r18 | dualUL | | |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[4] SEQUENCE { | | entry 4 | |
| bandInfoUL1-r18 | 1 | Band A | |
| bandInfoUL2-r18 | 4 | Band D | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[5] SEQUENCE { | | entry 5 | |
| bandInfoUL1-r18 | 2 | Band B | |
| bandInfoUL2-r18 | 4 | Band D | |
| switchingOptionConfigForBandPair-r18 | switchedUL | | pc_uplinkTxSwitching_OptionSupport_switchedUL_r18 OR pc_uplinkTxSwitching_OptionSupport_both_r18 |
| | dualUL | | pc_uplinkTxSwitching_OptionSupport_dualUL_r18 |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |

| | | | |
|---|---|---|---|
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| UplinkTxSwitchingBandPairConfig-r18[6] SEQUENCE { | | entry 6 | |
| bandInfoUL1-r18 | 3 | Band C | |
| bandInfoUL2-r18 | 4 | Band D | |
| switchingOptionConfigForBandPair-r18 | dualUL | | |
| switching2T-Mode-r18 | Not present | | |
| switchingPeriodConfigForBandPair-r18 | Not present | 210 us | pc_switchingPeriod_210us_r18 |
| | n35us | 35 us | pc_switchingPeriod_35us_r18 |
| | n140us | 140 us | pc_switchingPeriod_140us_r18 |
| } | | | |
| } | | | |
| uplinkTxSwitchingAssociatedBandDualUL-List-r18 | Not present | | |
| } | | | |
| } | | | |
| | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| DualTAGs | For tests in which two TAGs are configured |
| 1T1T-2T | For Band A (1T)+Band B (1T) to Band C (2T) UL Tx switching tests |
| 1T1T-1T1T | For Band A (1T)+Band B (1T) to Band C (1T)+Band D (1T) UL Tx switching tests |

ServingCellConfig-TxSwitch

To provide dedicated serving cell configurations for PCell/SCell(s) in UL Tx switching tests.

**Table H.3.11-3: *ServingCellConfig-TxSwitch***

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition DLBWP_add and ULBWP_add | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfig ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE { | 1 entry | | |
| BWP-Uplink[1] SEQUENCE { | | entry 1 | |
| bwp-Dedicated SEQUENCE { | | | |
| srs-Config CHOICE { | | | |
| setup | SRS-Config-TxSwitch | Table H.3.11-4 Associated conditions shall be specified in test | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| enablePL-RS-UpdateForPUSCH-SRS-r16 | Not present | | |
| enableDefaultBeamPL-ForPUSCH0-0-r16 | Not present | | |
| enableDefaultBeamPL-ForPUCCH-r16 | Not present | | |
| enableDefaultBeamPL-ForSRS-r16 | Not present | | |
| uplinkTxSwitching-r16 | Not present | | 1T1T-2T OR 1T1T-1T1T |
| uplinkTxSwitching-r16 CHOICE { | | | 1T-2T OR 2T-2T |
| setup SEQUENCE { | | | |
| uplinkTxSwitchingPeriodLocation-r16 | true | | PCELL |
| | false | | |

| | | | |
|---|---|---|---|
| uplinkTxSwitchingCarrier-r16 | carrier1 | | PCELL |
| | carrier2 | | |
| } | | | |
| } | | | |
| mpr-PowerBoost-FR2-r16 | Not present | | |
| } | | | |
| csi-MeasConfig | CSI-MeasConfig-TxSwitch | Table H.3.11-5 Associated conditions shall be specified in test | |
| tag-Id | 0 | | |
| | 1 | | 2ND_TAG |
| } | | | |

| Condition | Explanation |
|---|---|
| 1T-2T | For 1T-2T UL Tx switching |
| 2T-2T | For 2T-2T UL Tx switching |
| 1T1T-2T | For Band A (1T)+Band B (1T) to Band C (2T) UL Tx switching |
| 1T1T-1T1T | For Band A (1T)+Band B (1T) to Band C (1T)+Band D (1T) UL Tx switching |
| PCELL | Configuration for PCell in UL Tx switching tests |
| 2ND_TAG | For Cell in 2nd TAG |

SRS-Config-TxSwitch

To provide SRS configurations for PCell/SCell(s) in UL Tx switching tests.

**Table H.3.11-4: SRS-Config-TxSwitch**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-182 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SRS-Config ::= SEQUENCE { | | | |
| srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet { | 1 entry | | |
| SRS-ResourceSet[1] SEQUENCE { | | entry 1 | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| associatedCSI-RS | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-Resource { | 1 entry | | |
| SRS-Resource[1] SEQUENCE { | | entry 1 | |
| nrofSRS-Ports | ports2 | | 2TX |
| | port1 | | |
| resourceMapping SEQUENCE { | | | |
| nrofSymbols | n2 | | |
| } | | | |
| freqHopping SEQUENCE { | | | |
| c-SRS | 14 | | FDD |
| | 25 | | TDD |
| } | | | |
| groupOrSequenceHopping | neither | | |
| resourceType CHOICE { | | | |
| periodic SEQUENCE { | | | |
| periodicityAndOffset-p CHOICE { | | | |
| sl10 | 6 | | FDD AND SwitchFrom |
| sl20 | 5 | | TDD AND SwitchFrom |
| sl20 | 3 | | TDD AND SwitchTo |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | For Bands supporting 2Tx UL-MIMO |
| SwitchFrom | For the switch-from Cells in UL Tx switching tests |
| SwitchTo | For the switch-to Cells in UL Tx switching tests |

CSI-MeasConfig-TxSwitch

To provide aperiodic CSI-RS resource configurations on PCell/SCell(s) and aperiodic L1-RSRP reporting configurations on PCell in UL Tx switching tests.

**Table H.3.11-5: CSI-MeasConfig-TxSwitch**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-MeasConfig::= SEQUENCE { | | | |
| nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource { | 1 entry | | |
| NZP-CSI-RS-Resource [1] | NZP-CSI-RS-Resource-TxSwitch | entry 1 Table H.3.11-6 | |
| } | | | |
| nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSet { | 1 entry | | |
| NZP-CSI-RS-ResourceSet[1] | NZP-CSI-RS-ResourceSet-TxSwitch | entry 1 Table H.3.11-7 | |
| } | | | |
| csi-IM-ResourceToAddModList | Not present | | |
| csi-ResourceConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig { | 1 entry | | |
| CSI-ResourceConfig[1] | CSI-ResourceConfig-TxSwitch | entry 1 Table H.3.11-8 | |
| } | | | |
| csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig { | 1 entry | | |
| CSI-ReportConfig[1] | CSI-ReportConfig-TxSwitch(6) | entry 1 Table H.3.11-9 reportSlotOffset = 6 | FDD-TDD AND SwitchFrom |
| | CSI-ReportConfig-TxSwitch(11) | entry 1 Table H.3.11-9 reportSlotOffset = 11 | TDD-TDD AND SwitchFrom |
| | CSI-ReportConfig-TxSwitch(11) | entry 1 Table H.3.11-9 reportSlotOffset = 11 | FDD-TDD AND SwitchTo |
| | CSI-ReportConfig-TxSwitch(10) | entry 1 Table H.3.11-9 reportSlotOffset = 10 | TDD-TDD AND SwitchTo |
| } | | | |
| reportTriggerSize | 1 | | |
| aperiodicTriggerStateList CHOICE { | | | |
| setup | CSI-AperiodicTriggerStateList-TxSwitch | Table H.3.11-10 | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SwitchFrom | For the switch-from Cells in UL Tx switching tests |
| SwitchTo | For the switch-to Cells in UL Tx switching tests |
| FDD-TDD | For FDD-TDD UL Tx switching tests |
| TDD-TDD | For TDD-TDD UL Tx switching tests |

NZP-CSI-RS-Resource-TxSwitch

To provide aperiodic CSI-RS resource configurations for PCell/SCell(s) in UL Tx switching tests.

**Table H.3.11-6: NZP-CSI-RS-Resource-TxSwitch**

| Derivation Path: TS 38.508-1[14] Table 7.3.1-7B with condition APERIODIC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-Resource ::= SEQUENCE { | | | |
| nzp-CSI-RS-ResourceId | 0 | | |
| resourceMapping SEQUENCE { | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 000001 | | |
| } | | | |
| firstOFDMSymbolInTimeDomain | 8 | | FDD AND ( pc_switchingPeriod_210us_r16 OR pc_switchingPeriod_210us_r17 OR pc_switchingPeriod_210us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 4 | | TDD AND ( pc_switchingPeriod_210us_r16 OR pc_switchingPeriod_210us_r17 OR pc_switchingPeriod_210us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 9 | | FDD AND ( pc_switchingPeriod_140us_r16 OR pc_switchingPeriod_140us_r17 OR pc_switchingPeriod_140us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 5 | | TDD AND ( pc_switchingPeriod_140us_r16 OR pc_switchingPeriod_140us_r17 OR pc_switchingPeriod_140us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 10 | | FDD AND ( pc_switchingPeriod_35us_r16 OR pc_switchingPeriod_35us_r17 OR pc_switchingPeriod_35us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR |

| | | | |
|---|---|---|---|
| | | | pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 8 | | TDD AND ( pc_switchingPeriod_35us_r16 OR pc_switchingPeriod_35us_r17 OR pc_switchingPeriod_35us_r18) AND ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 12 | | FDD AND NOT ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| | 10 | | TDD AND NOT ( pc_uplinkTxSwitching_DL_Interruption_r16 OR pc_uplinkTxSwitching_DL_Interruption_r17 OR pc_uplinkTxSwitching_DL_Interruption_r18 ) |
| } | | | |
| powerControlOffset | -6 | | |
| powerControlOffsetSS | db6 | 6dB power boost | |
| } | | | |

**Table H.3.11-7: NZP-CSI-RS-ResourceSet-TxSwitch**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-11B with condition APERIODIC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NZP-CSI-RS-ResourceSet ::= SEQUENCE { | | | |
| nzp-CSI-ResourceSetId | 0 | | |
| nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId { | 1 entry | | |
| NZP-CSI-RS-ResourceId[1] | 0 | entry 1 | |
| } | | | |
| } | | | |

CSI-ResourceConfig-TxSwitch

To provide CSI resource configurations for PCell/SCell(s) in UL Tx switching tests.

**Table H.3.11-8: CSI-ResourceConfig-TxSwitch**

| Derivation Path: TS 38.508-1 [14] Table 7.3.1-12B with condition APERIODIC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ResourceConfig ::= SEQUENCE { | | | |
| csi-ResourceConfigId | 0 | | |
| csi-RS-ResourceSetList CHOICE { | | | |
| nzp-CSI-RS-SSB SEQUENCE { | | | |
| nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF NZP-CSI-RS-ResourceSetId { | 1 entry | | |
| NZP-CSI-RS-ResourceSetId[1] | 0 | Entry 1 | |
| } | | | |
| } | | | |
| } | | | |
| bwp-Id | 1 | | |

| | | | |
|---|---|---|---|
| } | | | |

CSI-ReportConfig-TxSwitch (slotOffset)

To provide aperiodic CSI reporting configuration on serving cell. *slotoffset* is the configured *reportSlotOffset* (in slots).

**Table H.3.11-9: CSI-ReportConfig-TxSwitch (*slotOffset*)**

| Derivation Path: TS 38.508[14] Table 7.3.1-12G with condition APERIODIC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-ReportConfig ::= SEQUENCE { | | | |
| reportConfigId | 0 | | |
| reportConfigType CHOICE { | | | |
| aperiodic SEQUENCE { | | | |
| reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF { | 1 entry | | |
| INTEGER[1] | *slotOffset* | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

CSI-AperiodicTriggerStateList-TxSwitch

To provide aperiodic CSI reporting triggering state configuration on serving cell.

**Table H.3.11-10: CSI-AperiodicTriggerStateList-TxSwitch**

| Derivation Path: 38.508-1 [14] Table 7.3.1-12J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-AperiodicTriggerStateList ::= SEQUENCE (SIZE (1..maxNrOfCSI-AperiodicTriggers)) OF CSI-AperiodicTriggerState { | 1 entry | | |
| CSI-AperiodicTriggerState[1] SEQUENCE { | | entry 1 | |
| associatedReportConfigInfoList SEQUENCE (SIZE(1..maxNrofReportConfigPerAperiodicTrigger)) OF CSI-AssociatedReportConfigInfo { | 1 entry | | |
| CSI-AssociatedReportConfigInfo[k: k=1,..,m] SEQUENCE { | | entry k<br>For k-th switch-from cell | |
| reportConfigId | 0 | | |
| resourcesForChannel CHOICE { | | | |
| nzp-CSI-RS SEQUENCE { | | | |
| resourceSet | 0 | | |
| qcl-info SEQUENCE (SIZE(1..maxNrofAP-CSI-RS-ResourcesPerSet)) OF TCI-StateId { | 1 entry | | |
| TCI-StateId[1] | 0 | QCL to SSB #0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

TDD-UL-DL-ConfigCommon-TxSwitch

To provide common TDD UL/DL configuration for UL Tx switch tests

**Table H.3.11-11: TDD-UL-DL-ConfigCommon-TxSwitch**

| Derivation Path: 38.508-1[14] Table 7.3.1-1 with condition TDDConf.2.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-UL-DL-ConfigCommon ::= SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| pattern1 SEQUENCE { | | | |
| nrofDownlinkSymbols | 11 | | |
| nrofUplinkSymbols | 2 | | |
| } | | | |
| } | | | |

## H.3.12 RRC messages and information elements contents exceptions for L1/L2-triggered mobility

RRCReconfiguration

To setup NR Measurement Configuration.

**Table H.3.12-1: *RRCReconfiguration*: LTM Configuration**

| Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition LTM | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | Not present | | |
| masterCellGroup SEQUENCE { | | | L1-RSRP |
| spCellConfigDedicated SEQUENCE { | | | |
| csi-MeasConfig SEQUENCE { | | | |
| ltm-CSI-ReportConfigToAddModList-r18 SEQUENCE (SIZE (1..maxNrofLTM-CSI-ReportConfigurations-r18)) OF LTM-CSI-ReportConfig-r18 { | 1 entry | | |
| LTM-CSI-ReportConfig-r18[1] | LTM-CSI-ReportConfig-r18 | entry 1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| ltm-Config-r18 CHOICE { | | | |
| setup | LTM-Config-r18 | LTM Configuration | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| L1-RSRP | Neighbour cell L1-RSRP measurement and report |

LTM-Config-r18

Configuration for LTM.

**Table H.3.12-2: LTM-Config-r18: Configuration of LTM**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-Config-r18 ::= SEQUENCE { | | | |
| ltm-ReferenceConfiguration-r18 | Not present | | |
| ltm-CandidateToReleaseList-r18 | Not present | | |
| ltm-CandidateToAddModList-r18 SEQUENCE (SIZE (1..maxNrofLTM-Configs-r18)) OF LTM-Candidate-r18 { | 1 entry | | |
| LTM-Candidate-r18[1] | LTM-Candidate-r18 | entry 1 | |
| } | | | |
| ltm-ServingCellNoResetID-r18 | Not present | | |
| ltm-CSI-ResourceConfig-r18 | Not present | | |
| ltm-CSI-ResourceConfigToAddModList-r18 SEQUENCE (SIZE (1..maxNrofLTM-CSI-ResourceConfigurations-r18)) OF LTM-CSI-ResourceConfig-r18 { | 1 entry | | L1-RSRP |
| LTM-CSI-ResourceConfig-r18[1] | LTM-CSI-ResourceConfig-r18 | entry 1 | |
| } | | | |
| ltm-CSI-ResourceConfigToReleaseList-r18 | Not present | | |
| attemptLTM-Switch-r18 | Not present | | |
| | true | | Fast Recovery |
| ltm-ServingCellUE-MeasuredTA-ID-r18 | Not present | | TA_UE-BASED |
| | 1 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| Fast Recovery | LTM fast recovery |
| TA_UE-BASED | Early UL synchronization – UE based TA measurement |
| L1-RSRP | Neighbour cell L1-RSRP measurement and report |

LTM-Candidate-r18

Configuration for LTM candidate.

**Table H.3.12-3: LTM-Candidate-r18: Configuration for LTM candidate**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-Candidate-r18 ::= SEQUENCE { | | | |
| ltm-CandidateId-r18 | LTM-CandidateId-r18 | | |
| ltm-CandidatePCI-r18 | PhysCellId | | |
| ltm-SSB-Config-r18 | LTM-SSB-Config-r18 | | |
| ltm-CandidateConfig-r18 | Not present | | |
| ltm-CandidateConfig-r18 OCTET STRING (CONTAINING RRCReconfiguration) { | | | Candidate Config |
| RRCReconfiguration SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig specified in TS 38.508-1 [14] Table 4.6.3-19 with condition PCell_change | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| ltm-ConfigComplete-r18 | true | | |

| | | | |
|---|---|---|---|
| ltm-EarlyUL-SyncConfig-r18 | Not present | | |
| | EarlyUL-SyncConfig-r18 | | TA_PDCCH-ORDERED |
| ltm-EarlyUL-SyncConfigSUL-r18 | Not present | | |
| ltm-TCI-Info-r18 | Not present | | |
| | LTM-TCI-Info-r18 | | TCI_INFO |
| ltm-NoResetID-r18 | Not present | | |
| ltm-UE-MeasuredTA-ID-r18 | Not present | | |
| | 1 | | TA_UE-BASED |
| } | | | |

| Condition | Explanation |
|---|---|
| Candidate Config | LTM candidate configuration |
| TA_PDCCH-ORDERED | Early UL synchronization – PDCCH-order RACH |
| TCI_INFO | LTM TCI State List |
| TA_UE-BASED | LTM UE based TA measurement |

LTM-CSI-ResourceConfig-r18

Configuration for LTM CSI resource.

**Table H.3.12-4: LTM-CSI-ResourceConfig-r18: Configuration for LTM CSI resource**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67G | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-CSI-ResourceConfig-r18 ::= SEQUENCE { | | | |
| ltm-CSI-ResourceConfigId-r18 | LTM-CSI-ResourceConfigId-r18 | | |
| ltm-CSI-SSB-ResourceSet-r18 | LTM-CSI-SSB-ResourceSet-r18 | | |
| } | | | |

LTM-CSI-ReportConfig-r18

Configuration for LTM CSI report.

**Table H.3.12-5: LTM-CSI-ReportConfig-r18: Configuration for LTM CSI report**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67E | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-CSI-ReportConfig-r18 ::= SEQUENCE { | | | |
| ltm-CSI-ReportConfigId-r18 | LTM-CSI-ReportConfigId | | |
| ltm-ResourcesForChannelMeasurement-r18 | LTM-CSI-ResourceConfigId | | |
| ltm-ReportConfigType-r18 CHOICE { | | | |
| periodic-r18 SEQUENCE { | | | |
| reportSlotConfig-r18 CHOICE { | | | |
| slots80 | 2 | Periodicity 80 slots and offset 2 | SCS15 |
| | 7 | Periodicity 80 slots and offset 7 | SCS30 |
| slots320 | 4 | Periodicity 320 slots and offset 4 | SCS120 |
| | 9 | Periodicity 320 slots and offset 9 | SCS240 |
| pucch-CSI-ResourceList-r18 SEQUENCE (SIZE (1..maxNrofBWPs)) OF PUCCH-CSI-Resource { | 1 entry | | |
| uplinkBandwidthPartId | BWP-Id of active BWP | | |
| pucch-Resource | pucch-ResourceId | PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112 | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| ltm-ReportContent-r18 | LTM-ReportContent-r18 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| SCS15 | Configuration with 15 kHz SSB SCS |
| SCS30 | Configuration with 30 kHz SSB SCS |
| SCS120 | Configuration with 120 kHz SSB SCS |
| SCS240 | Configuration with 240 kHz SSB SCS |

LTM-CSI-SSB-ResourceSet-r18

Configuration for LTM CSI SSB resource set.

**Table H.3.12-6: LTM-CSI-SSB-ResourceSet-r18: Configuration for LTM CSI SSB resource set**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67HA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-CSI-SSB-ResourceSet-r18 ::= SEQUENCE { | | | |
| ltm-CSI-SSB-ResourceList-r18 SEQUENCE (SIZE (1..maxNrofLTM-CSI-SSB-ResourcesPerSet-r18)) OF SSB-Index { | 1 entry | | |
| SSB-Index[1] | SSB-Index | entry 1 | |
| } | | | |
| ltm-CandidateIdList-r18 SEQUENCE (SIZE (1..maxNrofLTM-CSI-SSB-ResourcesPerSet-r18)) OF LTM-CandidateId-r18 { | 1 entry | | |
| LTM-CandidateId-r18[1] | LTM-CandidateId-r18 | entry 1 | |
| } | | | |
| } | | | |

LTM-QCL-Info-r18

Configuration for LTM QCL information.

**Table H.3.12-7: LTM-QCL-Info-r18: Configuration for LTM QCL information**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67HB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-QCL-Info-r18 ::= SEQUENCE { | | | |
| referenceSignal-r18 CHOICE { | | | |
| ssb-Index | SSB-Index | | SSB |
| csi-RS-Index | NZP-CSI-RS-ResourceId for TRS(4) specified in TS 38.508-1 [14], table 7.3.1-11 | | TRS |
| } | | | |
| qcl-Type-r18 | typeA | | Type A |
| | typeD | | Type D |
| } | | | |

| Condition | Explanation |
|---|---|
| SSB | Configuration for SSB based LTM QCL |
| TRS | Configuration for TRS based LTM QCL |
| Type A | Indicates qcl-type1 of typeA to both FR1 and FR2 test cases |
| Type D | Indicates qcl-type2 of typeD to FR2 test cases only |

LTM-ReportContent-r18

Configuration for LTM report content.

**Table H.3.12-8: LTM-ReportContent-r18: Configuration for LTM report content**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67HC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-ReportContent-r18 ::= SEQUENCE { | | | |
| nrOfReportedCells-r18 | n1 | | |
| nrOfReportedRS-PerCell-r18 | n1 | | |
| spCellInclusion-r18 | Not present | | |
| | true | | Include SpCell |
| } | | | |

| Condition | Explanation |
|---|---|
| Include SpCell | L1-RSRP measurement report associated to current SpCell |

LTM-SSB-Config-r18

Configuration for LTM SSB.

**Table H.3.12-9: LTM-SSB-Config-r18: Configuration for LTM SSB**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67HD | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-SSB-Config-r18 ::= SEQUENCE { | | | |
| ssb-Frequency-r18 | ARFCN-ValueNR with condition DL_SSB | | |
| subcarrierSpacing-r18 | SubcarrierSpacing | | |
| ssb-Periodicity-r18 | ms20 | | |
| ssb-PositionsInBurst-r18 CHOICE { | | | |
| shortBitmap | 0100 | | FR1 AND SSB#1 AND (1.88GHz<FREQ<=3GHz AND (FDD OR (TDD AND SCS15)) OR FREQ<=1.88GHZ) |
| | 1000 | | FR1 AND SSB#0 AND (1.88GHz<FREQ<=3GHz AND (FDD OR (TDD AND SCS15)) OR FREQ<=1.88GHz) |
| mediumBitmap | 01000000 | | FR1 AND SSB#1 AND (1.88GHz<FREQ<=3GHz AND (TDD AND SCS30) OR FREQ>3GHz) |
| | 10000000 | | FR1 AND SSB#0 AND (1.88GHz<FREQ<=3GHz AND (TDD AND SCS30) OR |

| | | | |
|---|---|---|---|
| | | | FREQ>3GHz) |
| longBitmap | 01000000000000000000000000000000000000000000000000000000000000000000000000000000 | | FR2 AND SSB#1 |
| | 10000000000000000000000000000000000000000000000000000000000000000000000000000000 | | FR2 AND SSB#0 |
| } | | | |
| ss-PBCH-BlockPower-r18 | 0 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| FREQ<=1.88GHz | Frequency range <= 1.88 GHz |
| 1.88GHz<FREQ<=3GHz | Frequency range > 1.88 GHz and <= 3 GHz |
| FREQ>3GHz | Frequency range > 3 GHz |
| SSB#N | Cell configured with SSB-Index set to N as defined in TS 38.508-1 [14] Table 4.4.2-2 |

LTM-TCI-Info-r18

Configuration for LTM TCI information.

**Table H.3.12-10: LTM-TCI-Info-r18: Configuration for LTM TCI information**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-67l | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LTM-TCI-Info-r18 ::= SEQUENCE { | | | |
| ltm-DL-OrJointTCI-StateToAddModList-r18 SEQUENCE (SIZE (1..maxNrofCandidateTCI-State-r18)) OF CandidateTCI-State-r18 { | n entries | The number of entries depends on the condition | |
| CandidateTCI-State-r18[1] | TCI-StateId-LTM(2) | | |
| CandidateTCI-State-r18[2] | TCI-StateId-LTM(0) | | Joint AND Early DL Sync |
| | TCI-StateId-LTM(1) | | Joint |
| | TCI-StateId-LTM(3) | | Separate |
| CandidateTCI-State-r18[3] | TCI-StateId-LTM(1) | | Joint AND Early DL Sync |
| } | | | |
| ltm-DL-OrJointTCI-StateToReleaseList-r18 | Not present | | |
| ltm-UL-TCI-StateToAddModList-r18 | Not present | | |
| ltm-UL-TCI-StateToAddModList-r18 SEQUENCE (SIZE (1.. maxNrofCandidateUL-TCI-r18)) OF CandidateTCI-UL-State-r18 { | 1 entry | | Separate |
| CandidateTCI-UL-State-r18[1] | CandidateTCI-UL-State-r18 | entry 1 | |
| } | | | |
| ltm-UL-TCI-StateToReleaseList-r18 | Not present | | |
| ltm-NZP-CSI-RS-ResourceToAddModList-r18 SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource { | n entries | n=4 | |
| NZP-CSI-RS-Resource[k, k=1..n] | NZP-CSI-RS-Resource for TRS (k) specified in TS 38.508-1 [14] Table 7.3.1-7 with qcl-InfoPeriodicCSI-RS = TCI-StateId-LTM(2) | entry [k, k=1..n] | |
| } | | | |
| ltm-NZP-CSI-RS-ResourceToReleaseList-r18 | Not present | | |
| ltm-NZP-CSI-RS-ResourceSetToAddModList-r18 SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSet { | 1 entry | | |

| | | | |
|---|---|---|---|
| NZP-CSI-RS-ResourceSet[1] | NZP-CSI-RS-ResourceSet for TRS specified in TS 38.508-1 [14] Table 7.3.1-11 with NZP-CSI-RS-ResourceSetId-TRS = 0 | entry 1 | |
| } | | | |
| ltm-NZP-CSI-RS-ResourceSetToReleaseList-r18 | Not present | | |
| pathlossReferenceRS-ToAddModList-r18 SEQUENCE (SIZE (1..maxNrofPathlossReferenceRSs-r17)) OF PathlossReferenceRS-r17 { | 1 entry | | |
| PathlossReferenceRS-r17[1] | PathlossReferenceRS-r17 | entry 1 | |
| } | | | |
| pathlossReferenceRS-ToReleaseList-r18 | Not present | | |
| unifiedTCI-StateType-r18 | joint | | Joint OR (Joint AND Early DL Sync) |
| | separate | | Separate |
| } | | | |

| Condition | Explanation |
|---|---|
| Early DL Sync | For Early DL Sync tests |
| Separate | LTM candidate configuration is configured with ltm-DL-OrJointTCI-StateToAddModList for DL TCI states and ltm-UL-TCI-StatesToAddModList for UL TCI states |
| Joint | LTM candidate configuration is configured with ltm-DL-OrJointTCI-StateToAddModList for joint TCI states for UL and DL operation |

CandidateTCI-State-r18

Configuration for candidate TCI state.

**Table H.3.12-11: CandidateTCI-State-r18: Configuration for candidate TCI state**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-15B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CandidateTCI-State-r18 ::= SEQUENCE { | | | |
| tci-StateId-r18 | TCI-StateId LTM(Id) | | |
| qcl-Type1-r18 | LTM-QCL-Info-r18 with conditions SSB and Type A | | Id = 0 or 2 |
| | LTM-QCL-Info-r18 with conditions TRS and Type A | | Id = 1 or 3 |
| qcl-Type2-r18 | LTM-QCL-Info-r18 with conditions SSB and Type D | | FR2 AND (Id = 0 or 2) |
| | LTM-QCL-Info-r18 with conditions TRS and Type D | | FR2 AND (Id = 1 or 3) |
| pathlossReferenceRS-Id-r18 | Not present | | Id = 2 or 3 |
| | PathlossReferenceRS-Id-r17 | | Id = 0 or 1 |
| tag-Id-ptr-r18 | Not present | | |
| ul-powerControl-r18 | Not present | | |
| } | | | |

| Condition | Explanation |
|---|---|
| FR2 | Indicates qcl-Type2 of type D, which applies to FR2 only |
| Id | The ID number of the TCI state |

EarlyUL-SyncConfig-r18

Configuration for early UL synchronization.

**Table H.3.12-12: EarlyUL-SyncConfig-r18: Configuration for early UL synchronization**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-56CA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EarlyUL-SyncConfig-r18 ::= SEQUENCE { | | | |
| frequencyInfoUL-r18 | FrequencyInfoUL | | |
| rach-ConfigGeneric-r18 | RACH-ConfigGeneric specified in TS 38.508-1 [14] Table 7.3.1-14 | | |
| bwp-GenericParameters-r18 | BWP | | |
| ssb-PerRACH-Occasion-r18 | oneFourth | | |
| prach-RootSequenceIndex-r18 CHOICE { | | | |
| l839 | Set according to TS 38.508-1 [14] table 4.4.2-2 | | |
| l139 | Set according to TS 38.508-1 [14] table 4.4.2-2 | | |
| } | | | |
| ltm-PRACH-SubcarrierSpacing-r18 | SubcarrierSpacing | | |
| n-TimingAdvanceOffset-r18 | n25600 | | |
| ltm-tdd-UL-DL-ConfigurationCommon-r18 | Not present | | FDD |
| | TDD-UL-DL-ConfigCommon | | TDD |
| ltm-restrictedSetConfig-r18 | unrestrictedSet | | |
| } | | | |

PathlossReferenceRS-r17

Configuration for pathloss of reference RS.

**Table H.3.12-13: PathlossReferenceRS-r17: Configuration for pathloss of reference RS**

| Derivation path: TS 38.508-1 [14], Table 4.6.3-89AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PathlossReferenceRS-r17 ::= SEQUENCE { | | | |
| pathlossReferenceRS-Id-r17 | PathlossReferenceRS-Id-r17 | | |
| referenceSignal-r17 CHOICE { | | | |
| ssb-Index | SSB-Index | | |
| } | | | |
| additionalPCI-r17 | Not present | | |
| } | | | |

ReferenceConfiguration-r18

Configuration for LTM reference.

**Table H.3.12-14: ReferenceConfiguration-r18: Void**

TDD-UL-DL-ConfigCommon

Configuration for cell specific Uplink/Downlink TDD configuration.

**Table H.3.12-15: TDD-UL-DL-ConfigCommon: Configuration for cell specific Uplink/Downlink TDD configuration**

| Derivation Path: TS 38.508-1 [14] Table 4.6.3-192 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |

| | | | |
|---|---|---|---|
| TDD-UL-DL-ConfigCommon ::= SEQUENCE { | | | |
| SubcarrierSpacing | kHz15 | | TDDConf.1.1, TDDConf.1.2 |
| | kHz30 | | TDDConf.2.1, TDDConf.2.2, TDDConf.2.3 |
| | kHz120 | | TDDConf.3.1, TDDConf.3.2 |
| pattern1 | Refer to Table A.1.5-1 | | TDDConf.1.1 |
| | Refer to Table A.1.5-1 | | TDDConf.1.2 |
| | Refer to Table A.1.5-2 | | TDDConf.2.1 |
| | Refer to Table A.1.5-2 | | TDDConf.2.2 |
| | Refer to Table A.1.5-2 | | TDDConf.2.3 |
| | Refer to Table A.1.5-3 | | TDDConf.3.1 |
| | Refer to Table A.1.5-3 | | TDDConf.3.2 |
| pattern2 | Refer to Table A.1.5-1 | | TDDConf.1.1 |
| | Refer to Table A.1.5-1 | | TDDConf.1.2 |
| | Refer to Table A.1.5-2 | | TDDConf.2.1 |
| | Refer to Table A.1.5-2 | | TDDConf.2.3 |
| } | | | |

| Condition | Explanation |
|---|---|
| TDDConf.1.1 | TDD UL/DL configuration #1 for SCS=15kHz as defined in Table A.1.5-1 |
| TDDConf.1.2 | TDD UL/DL configuration #2 for SCS=15kHz as defined in Table A.1.5-1 |
| TDDConf.2.1 | TDD UL/DL configuration #1 for SCS=30kHz as defined in Table A.1.5-2 |
| TDDConf.2.2 | TDD UL/DL configuration #2 for SCS=30kHz as defined in Table A.1.5-2 |
| TDDConf.2.3 | TDD UL/DL configuration #3 for SCS=30kHz as defined in Table A.1.5-2 |
| TDDConf.3.1 | TDD UL/DL configuration #1 for SCS=120kHz as defined in Table A.1.5-3 |
| TDDConf.3.2 | TDD UL/DL configuration #2 for SCS=120kHz as defined in Table A.1.5-3 |

## H.3.13 RRC messages and information elements contents exceptions for Satellite Access

**Table H.3.13-1: *ServingCellConfigCommon* for Handover for Satellite Access**

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-168 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| ntn-Config-r17 | NTN-Config-r17 | Table H.3.13-2 | |
| } | | | |

**Table H.3.13-2: *NTN-Config* for Handover for Satellite Access**

| Derivation Path: TS 38.508-1 [14], clause 4.6.3-84C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NTN-Config-r17 ::= SEQUENCE { | | | |
| epochTime-r17 | Not present | | |
| ntn-UlSyncValidityDuration-r17 | s900 | | GSO |
| | s5 | | NGSO |
| | s10 | | NGSO_T_CHO |
| | s20 | | NGSO_D_CHO |
| cellSpecificKoffset-r17 | 239 | | GSO |
| | 4 | | NGSO or NGSO_T_CHO or NGSO_D_CHO |
| kmac-r17 | 0 | | |
| ta-Info-r17 SEQUENCE { | | | |
| ta-Common-r17 | 0 | | |
| ta-CommonDrift-r17 | 0 | | |
| ta-CommonDriftVariant-r17 | 0 | | |
| } | | | |
| ntn-PolarizationDL-r17 | linear | | |

| | | | |
|---|---|---|---|
| ntn-PolarizationUL-r17 | linear | | |
| ephemerisInfo-r17 | EphemerisInfo | Ephemeris info in TS 38.508-1 [14] section 7.6.2 | |
| ta-Report-r17 | Not present | | |
| } | | | |

| Condition | Explanation |
|---|---|
| GSO | Geosynchronous Orbit scenario |
| NGSO | Non-geosynchronous Orbit scenario |
| NGSO_T_CHO | Time-based Conditional Handover for NGSO scenario |
| NGSO_D_CHO | Distance-based Conditional Handover for NGSO scenario |

# Annex I (normative): RRM OTA procedures

Annex I defines the RRM OTA procedures for the permitted testing methodologies defined in [32].

## I.0 Test applicability per permitted test method

The applicability of each permitted test method for the different RRM Angle of Arrival (AoA) setups as defined in Clause A.9 is defined in Table I.0-1.

**Table I.0-1: AoA Test Setup applicability per permitted test method**

| AoA Test Setup | D > 5cm or No declaration | D ≤ 5cm |
|---|---|---|
| Setup 1 | IFF, Enhanced IFF | DFF, IFF, Enhanced IFF, IFF+DFF |
| Setup 2a | IFF, Enhanced IFF | DFF, IFF, Enhanced IFF, IFF+DFF |
| Setup 2b | IFF, Enhanced IFF | DFF, IFF, Enhanced IFF, IFF+DFF |
| Setup 3 | Enhanced IFF | DFF, Enhanced IFF, IFF+DFF |
| Setup 4a | Enhanced IFF | DFF, Enhanced IFF, IFF+DFF |
| Setup 4b | Enhanced IFF | DFF, Enhanced IFF, IFF+DFF |
| NOTE1: D =The diameter of the smallest sphere that encloses the radiating parts of the phase coherent array antenna(s) active at any one time during the test., declared by UE vendor as per Table 4.3.9-9 in TS 38.508-2<br>NOTE2: DFF indicates both DFF and DFF simplification in TR 38.810.<br>NOTE3: For DFF and DFF part of IFF+DFF, minimum range length needs to meet the requirement as specified in TS.38.508-1 Annex B.2.2-4 with the declared D | | |

## I.1 Direct far field (DFF)

### I.1.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.1.2 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

### I.1.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

## I.2 Direct far field (DFF) simplification

### I.2.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.2.2 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

### I.2.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

## I.3 Indirect far field (IFF)

### I.3.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.3.2 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

### I.3.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

## I.3A Enhanced indirect far field (Enhanced IFF)

### I.3A.1 RX beam peak direction search

Same as in clause I.3.1 for IFF.

### I.3A.2 Search for directions corresponding to the EIS spherical coverage percentile

Same as in clause I.3.2 for IFF.

## I.4 Procedures to search test directions for RRM FR2

### I.4.1 RSRPB-based scan with fallback option to Rx beam peak direction search

This clause provides RSRPB-based scan to find the Rx beam peak of the UE for Setup 1, single AoA cases and one of the test directions for Setup 4. It also provides a method to find test directions fulfilling the EIS Spherical Coverage (TS 38.521-2 [18] clause 7.3.4.3) for Setup 2, 3 and 4. Other approaches are not precluded. RSRPB-based peak beam scan greatly reduces the time to find the peak beam position compared to traditional EIS scan using either constant step size or constant density. The procedure can be used with DFF as well as IFF methodology. The procedure is achieved implementing the following steps:

1. Enable periodic RSRPB reporting from the UE
2. Set of grid points for the UE scan can be user defined set or entire sphere.

3. Set the DL SSB_RP (at the centre of the QZ) to -95 dBm / SCS. For each grid point, record RSRPB first by connecting SS to the DUT through the measurement antenna with $Pol_{Link}$= θ polarization to form the Rx beam towards the measurement antenna.

4. Wait for BEAM_SELECT_WAIT_TIME before recording the RSRPB reports.

4a For each of the grid points, calculate the RSRPB result for $Pol_{Link}$= θ as the linear sum of the 2 RSRPB reports (one per receiver branch).

4b Repeat Steps 3, 4 and 4a with $Pol_{Link}$= ϕ.

5. Once the grid points scan is completed, sort the grid points based on the linear sum of the RSRPB results for $Pol_{Link}$= θ and $Pol_{Link}$= ϕ.

6. For the top 10 grid points, run the REFSENS throughput test as per the test condition defined in TS 38.521-2 [18] clause 7.3.2.

7. Select the grid point with the best REFSENS result among the 10 points from Step 6 as the Rx beam peak for RRM test cases using AoA Setup 1 or 4.

8. Use the EIS result for the RRM beam peak to offset the RSRPB results to obtain an estimate of the EIS Spherical coverage (SC) map.

9. From the EIS map in Step 8, select all the points meeting the EIS SC criteria (as defined in TS 38.521-2 [18] Clause 7.3.4.3) as potential test directions for AoA Setup 2a, 2b, 3 and 4. In order to confirm that the grid point is suitable, run the REFSENS throughput test as per the test condition defined in TS 38.521-2 [18] clause 7.3.2 and verify that the EIS SC criteria is met.

If not enough grid points are found using this method, fallback to using the method in Annex I.1, I.2, I.3 or I.3A as applicable.

## I.5 Re-Positioning Approach for RRM FR2

This clause provides guidance on the applicability of the re-positioning approach which was originally introduced to reduce measurement uncertainties due to positioner blocking as described in Annex N.3 of [18]. Illustrations of the applicability in the following clauses are based on example 1-AoA and 2-AoA capable RRM test systems shown in Figure I.5-1. The probes shown in blue and red are shown for simplicity as typical microwave probes antennas; any of these probes could be implemented as probe&reflector combinations to yield applicable IFF, Enhanced IFF, IFF+DFF test setups, see Clause I.0. The number of locations of the 2 AoA probes are chosen arbitrarily, i.e., systems with fewer and different probe locations are applicable.

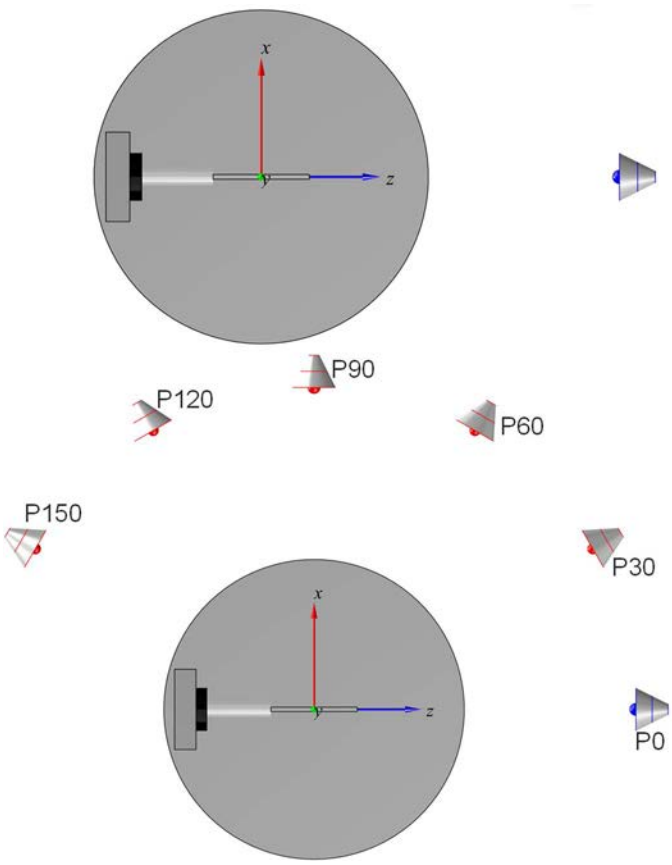


**Figure I.5-1: Example combined-axes RRM system setup to support 1 AoA (top) and 1 AoA & 2 AoA test cases (bottom)**

The re-positioning approach is applicable to RRM test cases if, during the test case, the pedestal is not obstructing the beam path and it is not in closer proximity to the measurement antenna/reflector than the DUT [18], i.e., for the selected DUT alignment options and orientations only the directions of test (AoA) in the upper hemisphere away from the positioner are tested.

## I.5.1 1 AoA Test Cases

The 1 AoA test cases follow Setups 1 and 2, see Clauses A.9.1 and A.9.2, respectively. Here, the re-positioning approach is applicable only when the pedestal is not obstructing the beam path and that the pedestal is not in closer proximity to the measurement antenna/reflector than the DUT. Therefore, for the selected DUT alignment option and orientation, only the upper hemisphere away from the positioner shall be tested for all the test iterations (if applicable), i.e., the positioner shall always be in the back hemisphere of the 1 AoA probe for each test iteration.

This requirement is illustrated next using the example 1 AoA RRM systems from Figure I.5-1. For the example systems in Figure I.5-1 with P0 (shown in blue) used as active probe, the directions of testing (AoA) within the yellow highlighted upper hemisphere shall be considered so the pedestal is not obstructing the beam path. In this case, the re-positioning approach applies and the optimized QoQZ MU is applicable to the assessed MU of the test system. The different test conditions and orientations from Clause N.2 of [18] can be used for each test iteration to prevent the pedestal from obstructing the beam path.

When the directions of testing (AoA) are outside the yellow highlighted upper hemisphere, i.e. the pedestal is obstructing the beam path, the re-positioning approach no longer applies. In this case, the calculated MU for QoQZ shall include the full range of rotation angles described in the QoQZ procedure, Annex O of [18].

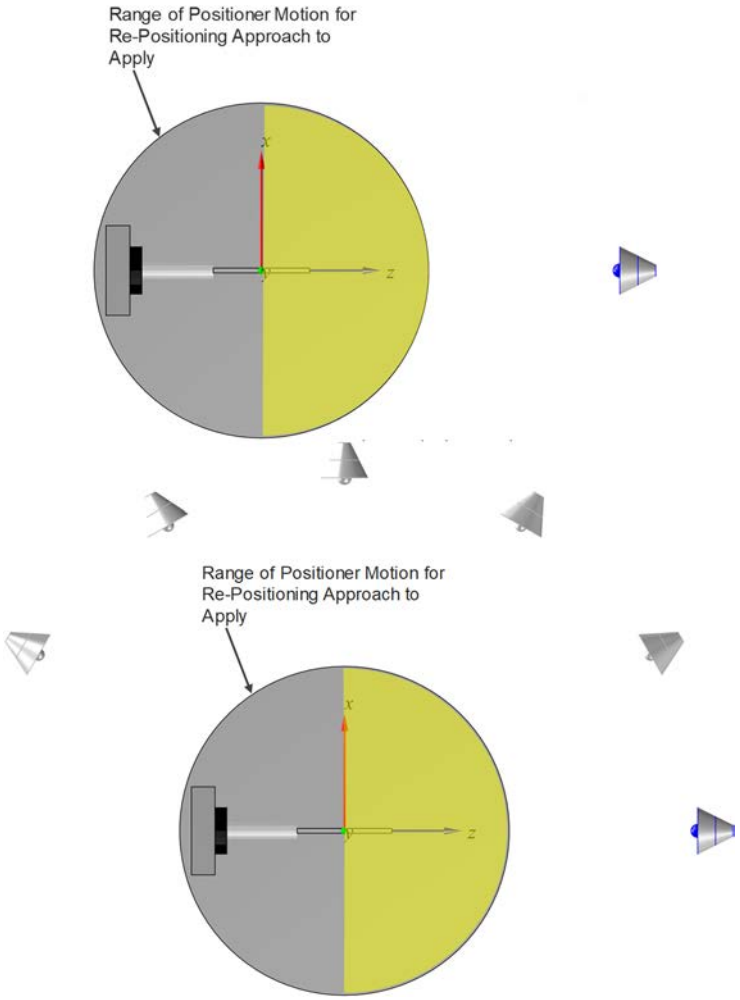


**Figure I.5.1-1: Ranges of possible directions of testing (AoA) for 1 AoA TCs that are applicable with re-positioning concept**

## I.5.2 2 AoA Test Cases

The 2 AoA test cases follow Setups 3 and 4, see Clauses A.9.3 and A.9.4, respectively. Here, the re-positioning approach is applicable only when the pedestal is not obstructing the beam paths between each of the 2 active AoA probes and the pedestal is not in closer proximity to the measurement antennas/reflectors than the DUT. Therefore, for the selected DUT alignment option and orientation, the positioner shall always be in the back hemispheres of each of the active AoA probe for each test iteration.

This requirement is illustrated next using the example 2 AoA RRM system from Figure I.5-1. Figure I.5.2-1 shows the acceptable directions of test for the re-positioner concept separately for each active probe. The directions of testing (AoAs) within the respective yellow highlighted upper hemisphere shall be considered so the pedestal is not obstructing any of the beam paths. In this case, the re-positioning approach applies and the optimized QoQZ MU is applicable to the assessed MU of the test system. The different test conditions and orientations from Clause N.2 of TS 38.521-2 [18] can be used for each test iteration to prevent the pedestal from obstructing the beam paths.

When the directions of testing (AoAs) are outside the yellow highlighted upper hemisphere for at least one active probe, i.e., the pedestal is obstructing at least one beam path, the re-positioning approach no longer applies. In this case, the calculated MU for QoQZ shall include the full range of rotation angles described in the QoQZ procedure, Annex O of [18].

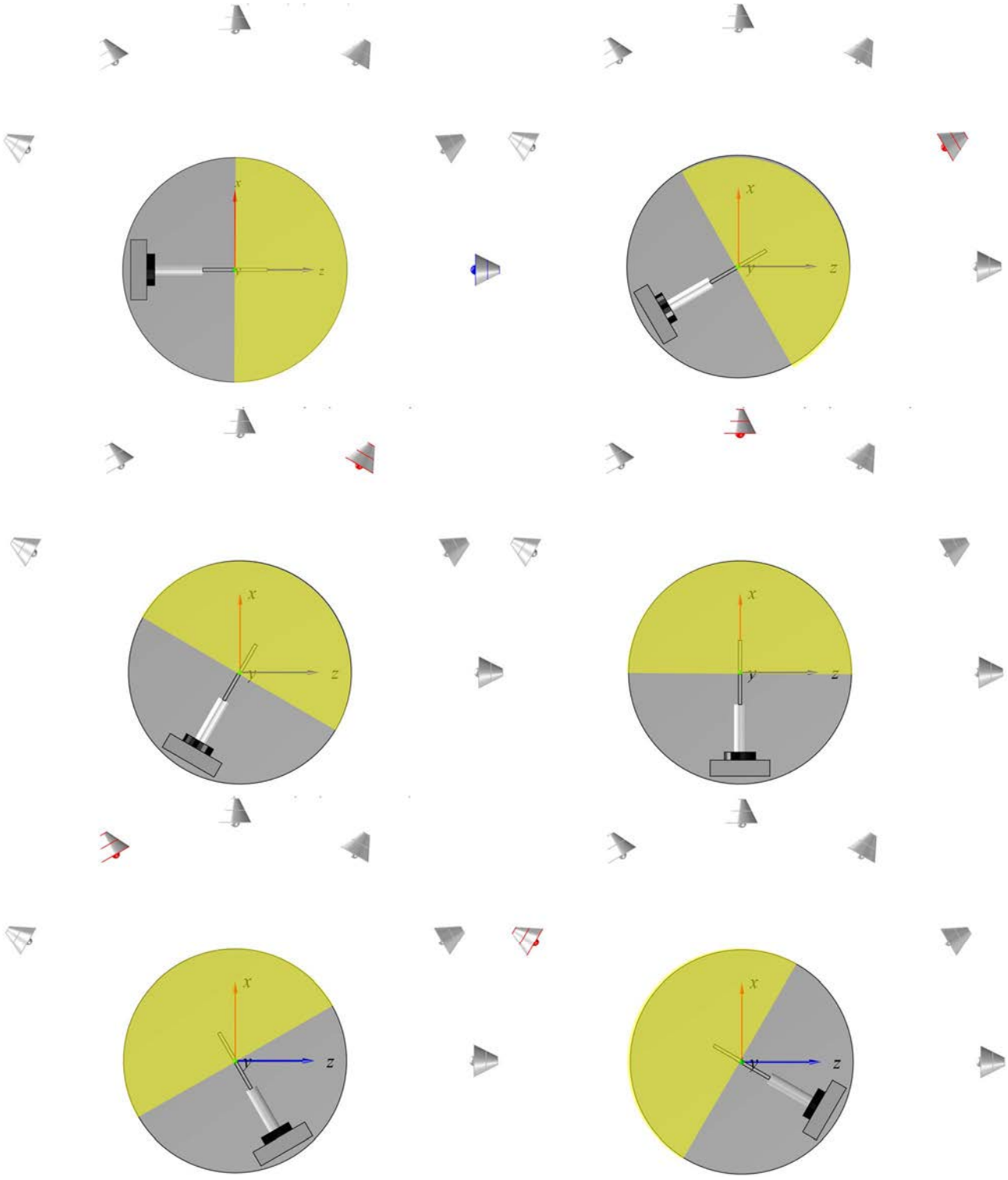


**Figure I.5.2-1: Ranges of possible directions of testing (AoAs) for each active probe**

# Annex J (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2017-08 | RAN5#76 | R5-175205 | - | - | - | Introduction of TS 38.533 | 0.0.1 |
| 2018-08 | RAN5#80 | R5-184115 | - | - | - | Added specification structure including headers up to third level | 0.0.2 |
| 2018-11 | RAN5#81 | R5-186706 | - | - | - | Added references and common sections | 0.1.0 |
| 2018-11 | RAN5#81 | R5-187847 | - | - | - | Added RMCs, OCGN, SMTC and SSB configurations to Annex A | 0.1.0 |
| 2018-11 | RAN5#81 | R5-187996 | - | - | - | Added test cases 6.7.1.1.1 to 6.7.1.2.2 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-187997 | - | - | - | Added test cases 4.6.2.1 to 4.6.2.8 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-187998 | - | - | - | Added test cases 5.6.2.1 to 5.6.2.4 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-187999 | - | - | - | Added test cases 6.6.2.1 to 6.6.2.8 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-188000 | - | - | - | Added test cases 7.6.2.1 to 7.6.2.4 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-188001 | - | - | - | Added test case 4.4.1.1 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-188002 | - | - | - | Added test cases 4.7.1.1.1 to 4.7.1.2.2 | 0.1.0 |
| 2018-11 | RAN5#81 | R5-188005 | - | - | - | Added Annexes B to H | 0.1.0 |
| 2018-11 | RAN5#81 | R5-188011 | - | - | - | Added test case 4.4.3.1 | 0.1.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190448 | - | - | - | Updating FR1 MU for timing measurements | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190476 | - | - | - | Addition of band group power offsets | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190477 | - | - | - | Update of the annexes | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190478 | - | - | - | Changes to 4.7.1.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190479 | - | - | - | Addition of 4.7.2.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190480 | - | - | - | Addition of 4.7.4.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190481 | - | - | - | Changes to 6.7.1.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190482 | - | - | - | Addition of 6.7.2.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190483 | - | - | - | Addition of 6.7.4.x tests | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190512 | - | - | - | Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode test case 4.5.1.5 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190513 | - | - | - | Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in non-DRX mode test case 4.5.1.6 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190514 | - | - | - | Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode test case 4.5.1.7 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190515 | - | - | - | Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM-RS in DRX mode test case 4.5.1.8 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190516 | - | - | - | Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test case 4.5.2.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190517 | - | - | - | Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test case 4.5.2.2 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190518 | - | - | - | Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test case 4.5.2.3 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190519 | - | - | - | Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test case 4.5.2.4 | 0.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-01 | RAN5#4 5G-NR AH | R5-190520 | - | - | - | Addition of EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test case 4.5.2.5 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190582 | - | - | - | Annex F correction | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190803 | - | - | - | Update Annex G in TS 38.533 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190874 | - | - | - | Addition of NR test case 6.6.1.1-reporting without gap non-DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190875 | - | - | - | Addition of NR test case 6.6.1.2-reporting without gap DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190876 | - | - | - | Addition of NR test case 6.6.1.3-with gap non DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190877 | - | - | - | Addition of NR test case 6.6.1.4-with gap DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190878 | - | - | - | Addition of NR test case 6.6.1.5-without gap non DRX SBI reading | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190879 | - | - | - | Addition of NR test case 6.6.1.6-with gap non DRX SBI reading | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190880 | - | - | - | CR to 38.533 annex for event triggered reporting test cases | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190881 | - | - | - | Addition of EN-DC FR1 event triggered reporting test case 4.6.1.5 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190882 | - | - | - | Addition of EN-DC FR1 event triggered reporting test case 4.6.1.6 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190883 | - | - | - | Addition of EN-DC FR1 event triggered reporting test case 4.6.1.3 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190884 | - | - | - | Addition of EN-DC FR1 event triggered reporting test case 4.6.1.4 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190885 | - | - | - | Addition of default config for event triggered test cases | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190886 | - | - | - | Introduction of 5G RRM TC 4.5.3.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190887 | - | - | - | Introduction of 5G RRM TC 4.5.3.2 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190888 | - | - | - | Introduction of 5G RRM TC 4.5.3.3 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190889 | - | - | - | Introduction of 5G RRM TC 4.6.1.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190890 | - | - | - | Introduction of 5G RRM TC 4.6.1.2 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190891 | - | - | - | Introduction of 5G RRM TC 5.5.3.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190892 | - | - | - | Introduction of 5G RRM TC 6.6.3.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190893 | - | - | - | pCR for Addition of TC 6.5.1.3 NR SA FR1 RLM OOS in DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190894 | - | - | - | pCR for Addition of TC 6.4.3.1 NR SA FR1 TAA Accuracy | 0.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-01 | RAN5#4 5G-NR AH | R5-190895 | - | - | - | pCR for Modification of TC 4.4.3.1 EN-DC FR1 TAA accuracy | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190896 | - | - | - | pCR for Addition of TC 6.5.1.1 NR SA FR1 RLM OOS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190897 | - | - | - | pCR for Addition of TC 4.5.1.1 EN-DC FR1 RLM OOS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190898 | - | - | - | pCR for Addition of TC 4.5.1.3 EN-DC FR1 RLM OOS in DRX | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190899 | - | - | - | Update to EN-DC FR1 transmit timing accuracy test | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190900 | - | - | - | Addition of EN-DC FR1 RLM IS non-DRX test with SSB-based RLM-RS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190901 | - | - | - | Addition of EN-DC FR1 RLM IS DRX test with SSB-based RLM-RS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190902 | - | - | - | Addition of NR SA FR1 RLM IS non-DRX test with SSB-based RLM-RS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190903 | - | - | - | Addition of NR SA FR1 RLM IS DRX test with SSB-based RLM-RS | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190904 | - | - | - | Correction of RRM 5G Test Cases 4.6.2 - EN-DC FR1-FR1 Inter-frequency measurements | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190905 | - | - | - | Correction of RRM 5G Test Cases 6.6.2 - NR SA FR1-FR1 Inter-frequency measurements | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190906 | - | - | - | Correction of RRM 5G Test Cases 7.6.2 - NR SA FR2-FR2 Inter-frequency measurements | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190907 | - | - | - | Addition of RRM Test Cases 4.5.2.6: EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190908 | - | - | - | Addition of RRM Test Cases 5.5.2.1: EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190909 | - | - | - | Addition of RRM Test Cases 5.5.2.2: EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190910 | - | - | - | Addition of RRM Test Cases 5.5.2.3: EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190911 | - | - | - | Addition of RRM Test Cases 5.5.2.4: EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190912 | - | - | - | Addition of RRM Test Cases 5.5.2.5: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190913 | - | - | - | Addition of RRM Test Cases 5.5.2.6: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190914 | - | - | - | Addition of RRM Test Cases 6.1.1.1: NR SA FR1 cell re-selection | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190915 | - | - | - | Addition of RRM Test Cases 6.1.1.2: NR SA FR1-FR1 cell re-selection | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190916 | - | - | - | Addition of cell re-selection to higher priority E-UTRAN test case 6.1.2.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190917 | - | - | - | Addition of cell re-selection to lower priority E-UTRAN test case 6.1.2.2 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190918 | - | - | - | Addition of SA NR to E-UTRAN handover test case 6.3.1.4 | 0.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-01 | RAN5#4 5G-NR AH | R5-190919 | - | - | - | Addition of SA NR to E-UTRAN handover test case 6.3.1.5 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190920 | - | - | - | Addition of NR SA FR1 UE UL carrier RRC reconfiguration delay test case 6.5.4.1 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190921 | - | - | - | Addition of NR SA FR1 CSI-RS based RLM out-of-sync non-DRX test case 6.5.1.5 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190922 | - | - | - | Addition of NR SA FR1 CSI-RS based RLM in-sync non-DRX test case 6.5.1.6 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190923 | - | - | - | Addition of NR SA FR1 CSI-RS based RLM out-of-sync in DRX test case 6.5.1.7 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190924 | - | - | - | Addition of NR SA FR1 CSI-RS based RLM in-sync in DRX test case 6.5.1.8 | 0.2.0 |
| 2019-01 | RAN5#4 5G-NR AH | R5-190987 | - | - | - | 38.533 Common Section updates to clarify leverage across architecture options | 0.2.0 |
| 2019-03 | RAN5#82 | R5-191484 | - | - | - | Correction Annex G | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191485 | - | - | - | Correction NSA Options | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191486 | - | - | - | Modifications NSA FR1 SS-RSRP tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191487 | - | - | - | Modifications NSA FR1 SS-RSRQ tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191488 | - | - | - | Modifications NSA FR1 L1-RSRP tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191489 | - | - | - | Modifications SA FR1 SS-RSRP tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191490 | - | - | - | Modifications SA FR1 SS-RSRQ tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191491 | - | - | - | Modifications SA FR1 L1-RSRP tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191492 | - | - | - | Addition NSA FR1 BWP switch tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191493 | - | - | - | Addition SA FR1 BWP switch tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191494 | - | - | - | Addition NSA FR2 BWP switch tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191495 | - | - | - | Addition SA FR2 BWP switch tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191720 | - | - | - | addition of cell mapping for BFD and measurement | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191924 | - | - | - | Correction of default message contents for RRM | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191926 | - | - | - | Addition of event-triggered reporting Test Cases to Cell configuration mapping in Annex E | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191930 | - | - | - | Correction of 5G RRM Test Case 4.6.2.3 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191931 | - | - | - | Correction of 5G RRM Test Case 4.6.2.4 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191934 | - | - | - | Correction of 5G RRM Test Case 4.6.2.7 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191935 | - | - | - | Correction of 5G RRM Test Case 4.6.2.8 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191936 | - | - | - | Addition of Minimum conformance requirements 5.6.2.0 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191937 | - | - | - | Correction of 5G RRM Test Case 5.6.2.1 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191938 | - | - | - | Correction of 5G RRM Test Case 5.6.2.2 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191939 | - | - | - | Correction of 5G RRM Test Case 5.6.2.3 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191940 | - | - | - | Correction of 5G RRM Test Case 5.6.2.4 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191945 | - | - | - | Addition of Minimum conformance requirements 7.6.2.0 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191946 | - | - | - | Correction of 5G RRM Test Case 7.6.2.1 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191947 | - | - | - | Correction of 5G RRM Test Case 7.6.2.2 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191948 | - | - | - | Correction of 5G RRM Test Case 7.6.2.3 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191949 | - | - | - | Correction of 5G RRM Test Case 7.6.2.4 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191950 | - | - | - | Correction of 5G RRM Test Case 7.6.2.5 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191951 | - | - | - | Correction of 5G RRM Test Case 7.6.2.6 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191952 | - | - | - | Correction of 5G RRM Test Case 7.6.2.7 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-191953 | - | - | - | Correction of 5G RRM Test Case 7.6.2.8 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192062 | - | - | - | Update of EN-DC FR1 event triggered reporting test case 4.6.1.6 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192063 | - | - | - | Update of EN-DC FR1 event triggered reporting test case 4.6.1.3 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192064 | - | - | - | Update of EN-DC FR1 event triggered reporting test case 4.6.1.4 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192221 | - | - | - | Update on RRC_Connected generic procedure within RRM tests | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192477 | - | - | - | Introduction of FR1 EN-DC Contention based random access Test case | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192478 | - | - | - | Introduction of FR1 EN-DC non-Contention based random access Test case | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192479 | - | - | - | Introduction of FR1 standalone Contention based random access Test case | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192480 | - | - | - | Introduction of FR1 standalone Non-contention based random access Test case | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192481 | - | - | - | Updated to 5G RRM TC 4.6.1.1 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192482 | - | - | - | Updated to 5G RRM TC 4.6.1.2 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192483 | - | - | - | Addition of NR test case 6.7.1.3.1-absolute RSRP | 0.3.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-03 | RAN5#82 | R5-192484 | - | - | - | Addition of NR test case 6.7.1.3.2-relative RSRP | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192485 | - | - | - | Addition of NR test case 6.5.5.3 FR1 CSI-RS BFD nonDRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192486 | - | - | - | Addition of NR test case 6.5.5.4 FR1 CSI-RS BFD DRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192487 | - | - | - | Addition of NR test case 7.5.5.1 FR2 SSB BFD nonDRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192488 | - | - | - | Addition of NR test case 7.5.5.2 FR2 SSB BFD DRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192489 | - | - | - | Addition of NR test case 7.5.5.3 FR2 CSI-RS BFD nonDRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192490 | - | - | - | Addition of NR test case 7.5.5.4 FR2 CSI-RS BFD DRX | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192492 | - | - | - | Correction of 5G RRM Test Case 4.6.2.1 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192493 | - | - | - | Correction of 5G RRM Test Case 4.6.2.2 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192494 | - | - | - | Correction of 5G RRM Test Case 4.6.2.5 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192495 | - | - | - | Correction of 5G RRM Test Case 4.6.2.6 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192496 | - | - | - | Correction of 5G RRM Test Case 6.6.2.1 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192497 | - | - | - | Correction of 5G RRM Test Case 6.6.2.2 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192498 | - | - | - | Correction of 5G RRM Test Case 6.6.2.3 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192499 | - | - | - | Correction of 5G RRM Test Case 6.6.2.4 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192500 | - | - | - | Update of EN-DC FR1 event triggered reporting test case 4.6.1.5 | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192503 | - | - | - | Update to EN-DC FR1 transmit timing accuracy test | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192674 | - | - | - | Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM-RS | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192675 | - | - | - | Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM-RS | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192676 | - | - | - | Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM-RS | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192677 | - | - | - | Update to NR SA FR1 RLM IS DRX test with SSB-based RLM-RS | 0.3.0 |
| 2019-03 | RAN5#82 | R5-192678 | - | - | - | pCR for modification of TAAA TC for EN-DC FR1 | 0.3.0 |
| 2019-03 | RAN#83 | RP-190161 | - | - | - | Presented to the RAN#83 plenary for 1-step approval | 1.0.0 |
| 2019-03 | RAN#83 | - | - | - | - | Upgraded to Rel-15 with small editorial changes | 15.0.0 |
| 2019-06 | RAN#84 | R5-193578 | 0100 | - | F | Update the test case number of TC 4.3.2.2.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193755 | 0102 | - | F | Update of Minimum conformance requirements 6.6.1.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193758 | 0104 | - | F | Update of EN-DC RLM in-sync in non-DRX test case 4.5.1.6 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193759 | 0105 | - | F | Update of EN-DC RLM out-of-sync in DRX test case 4.5.1.7 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193760 | 0106 | - | F | Update of EN-DC RLM in-sync in DRX test case 4.5.1.8 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193761 | 0107 | - | F | Addition of Minimum conformance requirements 6.3.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193762 | 0108 | - | F | Addition of NR RRM TC 6.3.2.1.1-Intra Freq RRC Re-establishment | 15.1.0 |
| 2019-06 | RAN#84 | R5-193763 | 0109 | - | F | Addition of FR1-FR1 re-establishment test case 6.3.2.1.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193764 | 0110 | - | F | Addition of FR1 RRC connection release with redirection test case 6.3.2.3.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193765 | 0111 | - | F | Addition of FR1-E-UTRA RRC connection release with redirection test case 6.3.2.3.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193766 | 0112 | - | F | Update of TC 6.5.1.5 SA FR1 CSI-RS RLM OOS non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193767 | 0113 | - | F | Update of TC 6.5.1.6 SA FR1 CSI-RS RLM IS non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193768 | 0114 | - | F | Update of TC 6.5.1.7 SA FR1 CSI-RS RLM OOS DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193769 | 0115 | - | F | Update of TC 6.5.1.8 SA FR1 CSI-RS RLM IS DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193770 | 0116 | - | F | Addition of Minimum conformance requirements 6.5.5.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193771 | 0117 | - | F | Update of TC 6.5.5.3 SA FR1 CSI-RS BFD non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193772 | 0118 | - | F | Update of TC 6.5.5.4 SA FR1 CSI-RS BFD DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193773 | 0119 | - | F | Addition of Minimum conformance requirements 7.5.5.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193774 | 0120 | - | F | Update of TC 7.5.5.1 SA FR2 SSB BFD non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193775 | 0121 | - | F | Update of TC 7.5.5.2 SA FR2 SSB BFD DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193776 | 0122 | - | F | Update of TC 7.5.5.3 SA FR2 CSI-RS BFD non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193777 | 0123 | - | F | Update of TC 7.5.5.4 SA FR2 CSI-RS BFD DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193778 | 0124 | - | F | Addition of Minimum conformance requirements 7.6.1.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193779 | 0125 | - | F | Addition of 7.6.1.1 SA FR2 RRM measurement no-gap non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193780 | 0126 | - | F | Addition of 7.6.1.2 SA FR2 RRM measurement no-gap DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193781 | 0127 | - | F | Addition of 7.6.1.3 SA FR2 RRM measurement gap non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193782 | 0128 | - | F | Addition of 7.6.1.4 SA FR2 RRM measurement gap DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193784 | 0130 | - | F | Update of FR1 cell re-selection test case 6.1.1.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193785 | 0131 | - | F | Update of FR1-FR1 cell re-selection test case 6.1.1.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193786 | 0132 | - | F | Update of FR1-EUTRA higher priority cell re-selection test case 6.1.2.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193787 | 0133 | - | F | Update of FR1-EUTRA lower priority cell re-selection test case 6.1.2.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193788 | 0134 | - | F | Update of FR1-EUTRA handover known cell test case 6.3.1.4 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193790 | 0136 | - | F | Update of 6.6.1.1 SA FR1 RRM measurement no-gap non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193791 | 0137 | - | F | Update of 6.6.1.2 SA FR1 RRM measurement no-gap DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193792 | 0138 | - | F | Update of 6.6.1.3 SA FR1 RRM measurement gap non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193793 | 0139 | - | F | Update of 6.6.1.4 SA FR1 RRM measurement gap DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193794 | 0140 | - | F | Update of FR1 event-triggered without gap with SSB index test case 6.6.1.5 | 15.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-06 | RAN#84 | R5-193795 | 0141 | - | F | Update of FR1 event-triggered with gap with SSB index test case 6.6.1.6 | 15.1.0 |
| 2019-06 | RAN#84 | R5-193812 | 0145 | - | F | Addition of 6.3.2.2 minimum conformance requirements | 15.1.0 |
| 2019-06 | RAN#84 | R5-193872 | 0146 | - | F | Introduction of TC 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-193949 | 0148 | - | F | Correction of PRACH Configurations | 15.1.0 |
| 2019-06 | RAN#84 | R5-194328 | 0153 | - | F | Additional of new reference used in RRM test spec | 15.1.0 |
| 2019-06 | RAN#84 | R5-194329 | 0154 | - | F | Correction of reference spec number in RRM spec | 15.1.0 |
| 2019-06 | RAN#84 | R5-194494 | 0165 | - | F | Addition missing Editor's note 4.5.2.5 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194549 | 0173 | - | F | Correction of 5G RRM Test Case 5.6.2.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194550 | 0174 | - | F | Correction of 5G RRM Test Case 5.6.2.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194551 | 0175 | - | F | Correction of 5G RRM Test Case 5.6.2.3 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194552 | 0176 | - | F | Correction of 5G RRM Test Case 5.6.2.4 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194553 | 0177 | - | F | Correction of 5G RRM Test Case 5.6.2.5 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194555 | 0179 | - | F | Correction of 5G RRM Test Case 5.6.2.7 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194556 | 0180 | - | F | Correction of 5G RRM Test Case 5.6.2.8 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194557 | 0181 | - | F | Correction of Minimum conformance requirements 6.6.2.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194562 | 0186 | - | F | Correction of Minimum conformance requirements 7.6.2.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194564 | 0188 | - | F | Correction of 5G RRM Test Case 7.6.2.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194565 | 0189 | - | F | Correction of 5G RRM Test Case 7.6.2.3 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194566 | 0190 | - | F | Correction of 5G RRM Test Case 7.6.2.4 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194567 | 0191 | - | F | Correction of 5G RRM Test Case 7.6.2.5 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194568 | 0192 | - | F | Correction of 5G RRM Test Case 7.6.2.6 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194569 | 0193 | - | F | Correction of 5G RRM Test Case 7.6.2.7 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194570 | 0194 | - | F | Correction of 5G RRM Test Case 7.6.2.8 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194571 | 0195 | - | F | Correction of Minimum conformance requirements 7.3.2.1.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194572 | 0196 | - | F | Correction of 5G RRM Test Case 7.3.2.1.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194573 | 0197 | - | F | Correction of 5G RRM Test Case 7.3.2.1.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-194700 | 0208 | - | F | Clean-up in EN-DC FR1 transmit timing accuracy test | 15.1.0 |
| 2019-06 | RAN#84 | R5-194702 | 0210 | - | F | Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-194703 | 0211 | - | F | Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-194704 | 0212 | - | F | Update to NR SA FR1 RLM IS DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-194710 | 0214 | - | F | Update to E-UTRA configuration for RRM EN-DC tests to align with core spec update | 15.1.0 |
| 2019-06 | RAN#84 | R5-194713 | 0216 | - | F | Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195013 | 0156 | 1 | F | Updated to EN-DC FR1 RRM tests in clause 4.5.3 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195016 | 0198 | 1 | F | Test tolerance and measurement uncertainty in Annex F for Inter-Freq measurement test cases | 15.1.0 |
| 2019-06 | RAN#84 | R5-195017 | 0129 | 1 | F | Addition of default configuration in Annex H | 15.1.0 |
| 2019-06 | RAN#84 | R5-195018 | 0143 | 1 | F | Update of 6.3.2.2.1 random access | 15.1.0 |
| 2019-06 | RAN#84 | R5-195019 | 0144 | 1 | F | Update of 6.3.2.2.2 non-contention random access | 15.1.0 |
| 2019-06 | RAN#84 | R5-195020 | 0151 | 1 | F | Updated to EN-DC FR1 RRM tests in clause 4.6.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195021 | 0207 | 1 | F | Modification of EN-DC FR1 TAAA | 15.1.0 |
| 2019-06 | RAN#84 | R5-195024 | 0199 | 1 | F | Modification of EN-DC FR1 SSB RLM OOS in non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195025 | 0200 | 1 | F | Modification of EN-DC FR1 SSB RLM OOS in DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195026 | 0201 | 1 | F | Modification of NR SA FR1 TAAA | 15.1.0 |
| 2019-06 | RAN#84 | R5-195027 | 0202 | 1 | F | Modification of SA FR1 SSB RLM OOS in non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195028 | 0203 | 1 | F | Modification of SA FR1 SSB RLM OOS in DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195029 | 0204 | 1 | F | Modification of EN-DC FR2 TAAA | 15.1.0 |
| 2019-06 | RAN#84 | R5-195030 | 0205 | 1 | F | Modification of EN-DC FR2 SSB RLM OOS in non-DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195031 | 0206 | 1 | F | Modification of EN-DC FR2 SSB RLM OOS in DRX | 15.1.0 |
| 2019-06 | RAN#84 | R5-195032 | 0219 | 1 | F | Update to EN-DC FR2 RLM IS non-DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195033 | 0220 | 1 | F | Update to EN-DC FR2 RLM IS DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195034 | 0221 | 1 | F | Addition of EN-DC FR2 Transmit Timing Accuracy tests | 15.1.0 |
| 2019-06 | RAN#84 | R5-195035 | 0209 | 1 | F | Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195036 | 0150 | 1 | F | Correction to EN-DC FR1 UE transmit timing accuracy TC 4.4.1.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195037 | 0155 | 1 | F | Updated to cell configuration mapping table for RRM tests | 15.1.0 |
| 2019-06 | RAN#84 | R5-195038 | 0147 | 1 | F | Introduction of TC 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC | 15.1.0 |
| 2019-06 | RAN#84 | R5-195039 | 0178 | 1 | F | Correction of 5G RRM Test Case 5.6.2.6 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195040 | 0166 | 1 | F | Correction of default message content for RRM in Annex H | 15.1.0 |
| 2019-06 | RAN#84 | R5-195041 | 0217 | 1 | F | Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195042 | 0218 | 1 | F | Update to NR SA FR1 RLM IS DRX test with SSB-based RLM-RS | 15.1.0 |
| 2019-06 | RAN#84 | R5-195043 | 0215 | 1 | F | Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM-RS | 15.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-06 | RAN#84 | R5-195044 | 0187 | 1 | F | Correction of 5G RRM Test Case 7.6.2.1 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195045 | 0103 | 1 | F | Update of EN-DC RLM out-of-sync in non-DRX test case 4.5.1.5 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195099 | 0223 | - | F | RRM implementation of FR2 UL demod OTA tests using single pol Rx TE | 15.1.0 |
| 2019-06 | RAN#84 | R5-195173 | 0167 | 1 | F | Correction of Minimum conformance requirements 4.6.2.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195174 | 0168 | 1 | F | Correction of 5G RRM Test Case 4.6.2.1 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195175 | 0169 | 1 | F | Correction of 5G RRM Test Case 4.6.2.2 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195176 | 0170 | 1 | F | Correction of 5G RRM Test Case 4.6.2.3 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195177 | 0171 | 1 | F | Correction of 5G RRM Test Case 4.6.2.4 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195179 | 0172 | 1 | F | Correction of Minimum conformance requirements 5.6.2.0 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195182 | 0142 | 1 | F | Addition of FR1-E-UTRAN event-triggered reporting in DRX test case 6.6.3.2 | 15.1.0 |
| 2019-06 | RAN#84 | R5-195185 | 0158 | 1 | F | Update of FR1 Test tolerance and uncertainties in AnnexF | 15.1.0 |
| 2019-06 | RAN#84 | R5-195186 | 0182 | 1 | F | Correction of 5G RRM Test Case 6.6.2.1 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195187 | 0183 | 1 | F | Correction of 5G RRM Test Case 6.6.2.2 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195188 | 0184 | 1 | F | Correction of 5G RRM Test Case 6.6.2.3 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195189 | 0185 | 1 | F | Correction of 5G RRM Test Case 6.6.2.4 with FR1 Test tolerance | 15.1.0 |
| 2019-06 | RAN#84 | R5-195445 | 0152 | 2 | F | Updated to SA FR1 RRM tests in clause 6.6.3 | 15.1.0 |
| 2019-06 | RAN#84 | - | - | - | - | Administrative release upgrade to match the release of 3GPP TS 38.508-1 and TS 38.521-1 which were upgraded at RAN#84 to Rel-16 due to Rel-16 relevant CR(s) | 16.0.0 |
| 2019-09 | RAN#85 | R5-195563 | 0228 | - | F | Addition of 5.6.1.0 minimum requirements | 16.1.0 |
| 2019-09 | RAN#85 | R5-195568 | 0233 | - | F | Update of 6.1.1.2 inter-freq cell re-selection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195569 | 0234 | - | F | Update of 6.1.2.1 inter-RAT cell re-selection to higher priority | 16.1.0 |
| 2019-09 | RAN#85 | R5-195571 | 0236 | - | F | Update of 6.3.1.4 inter-RAT handover to known cell | 16.1.0 |
| 2019-09 | RAN#85 | R5-195573 | 0238 | - | F | Update Test Tolerance of 6.3.2.1.1 intra-freq RRC re-establishment | 16.1.0 |
| 2019-09 | RAN#85 | R5-195574 | 0239 | - | F | Update Test Tolerance of 6.3.2.1.2 inter-freq RRC re-establishment | 16.1.0 |
| 2019-09 | RAN#85 | R5-195575 | 0240 | - | F | Update Test Tolerance of 6.3.2.3.1 NR RRC redirection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195576 | 0241 | - | F | Update Test Tolerance of 6.3.2.3.2 inter-RAT RRC redirection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195577 | 0242 | - | F | Update of 6.5.1.5 RLM out-of-sync non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195578 | 0243 | - | F | Update of 6.5.1.6 RLM in-sync non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195579 | 0244 | - | F | Update of 6.5.1.7 RLM out-of-sync in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195580 | 0245 | - | F | Update of 6.5.1.8 RLM in-sync in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195581 | 0246 | - | F | Update of 6.5.5.3 CSI-RS-based BFD non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195582 | 0247 | - | F | Update of 6.5.5.4 CSI-RS-based BFD in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195596 | 0248 | - | F | Addition of minimum conformance requirements for FR2 EN-DC CSI-RS based RLM | 16.1.0 |
| 2019-09 | RAN#85 | R5-195601 | 0253 | - | F | Addition of minimum conformance requirements for FR2 EN-DC CSI-RS based BFD | 16.1.0 |
| 2019-09 | RAN#85 | R5-195604 | 0256 | - | F | Addition of minimum conformance requirements for SA FR2 reselection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195605 | 0257 | - | F | Addition of NR test case 7.1.1.1-intra freq reselection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195606 | 0258 | - | F | Addition of NR test case 7.1.1.2-inter freq reselection | 16.1.0 |
| 2019-09 | RAN#85 | R5-195608 | 0260 | - | F | Addition of NR test case 8.4.2.1-without SBI non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195609 | 0261 | - | F | Addition of NR test case 8.4.2.2-without SBI DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195610 | 0262 | - | F | Addition of NR test case 8.4.2.3-with SBI non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195611 | 0263 | - | F | Addition of NR test case 8.4.2.4-with SBI DRX | 16.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-09 | RAN#85 | R5-195612 | 0264 | - | F | Addition of minimum conformance requirements for FR1 EN-DC CSI-RS based RLM | 16.1.0 |
| 2019-09 | RAN#85 | R5-195623 | 0275 | - | F | Correction of NR test case 5.5.2.1-interruption transition DRX sync | 16.1.0 |
| 2019-09 | RAN#85 | R5-195624 | 0276 | - | F | Correction of NR test case 5.5.2.2-interruption transition DRX async | 16.1.0 |
| 2019-09 | RAN#85 | R5-195625 | 0277 | - | F | Correction of NR test case 5.5.2.3-interruption NR deactivated SCell sync | 16.1.0 |
| 2019-09 | RAN#85 | R5-195626 | 0278 | - | F | Correction of NR test case 5.5.2.4-interruption NR deactivated SCell async | 16.1.0 |
| 2019-09 | RAN#85 | R5-195627 | 0279 | - | F | Correction of NR test case 5.5.2.5-interruption LTE deactivated SCell sync | 16.1.0 |
| 2019-09 | RAN#85 | R5-195628 | 0280 | - | F | Correction of NR test case 5.5.2.6-interruption LTE deactivated SCell async | 16.1.0 |
| 2019-09 | RAN#85 | R5-195629 | 0281 | - | F | Correction of NR test case 7.5.5.1-SSB BFD non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195630 | 0282 | - | F | Correction of NR test case 7.5.5.2-SSB BFD DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195631 | 0283 | - | F | Correction of NR test case 7.5.5.3-CSI-RS BFD non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195632 | 0284 | - | F | Correction of NR test case 7.5.5.4-CSI-RS BFD DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195633 | 0285 | - | F | Correction of NR test case 7.6.1.1-without gap non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195634 | 0286 | - | F | Correction of NR test case 7.6.1.2-without gap DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-195636 | 0288 | - | F | Correction of NR test case 7.6.1.4-with gap DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-196140 | 0295 | - | F | Update NR operating band groups | 16.1.0 |
| 2019-09 | RAN#85 | R5-196250 | 0296 | - | F | Correction to EN-DC FR1 event-triggered reporting without gap TC 4.6.1.1 and 4.6.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196503 | 0301 | - | F | Updated to EN-DC FR1 RRM tests in clause 4.5.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196504 | 0302 | - | F | Updated to EN-DC FR2 RRM tests in clause 5.5.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196547 | 0304 | - | F | Update of FR1 Test tolerance and uncertainties in AnnexF | 16.1.0 |
| 2019-09 | RAN#85 | R5-196601 | 0306 | - | F | Correction of the reference for test frequencies and test mode - Chapter 4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196602 | 0307 | - | F | Correction of the reference for test frequencies and test mode - Chapter 6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196603 | 0308 | - | F | Editorial Corrections to section 5.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196659 | 0309 | - | F | Editorial corrections of Annex A | 16.1.0 |
| 2019-09 | RAN#85 | R5-196660 | 0310 | - | F | Correction of RRM Test Case 7.3.2.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196661 | 0311 | - | F | Correction of RRM Test Case 7.3.2.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196662 | 0312 | - | F | Correction of cell configuration mapping for RRM Test Cases in Annex E.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196666 | 0316 | - | F | Correction of RRM Test Case 5.6.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196667 | 0317 | - | F | Correction of RRM Test Case 5.6.2.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196668 | 0318 | - | F | Correction of RRM Test Case 5.6.2.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196669 | 0319 | - | F | Correction of RRM Test Case 5.6.2.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196670 | 0320 | - | F | Correction of RRM Test Case 5.6.2.5 | 16.1.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-09 | RAN#85 | R5-196671 | 0321 | - | F | Correction of RRM Test Case 5.6.2.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196672 | 0322 | - | F | Correction of RRM Test Case 5.6.2.7 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196673 | 0323 | - | F | Correction of RRM Test Case 5.6.2.8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196674 | 0324 | - | F | Addition of minimum conformance requirements for L1-RSRP measurement RRM FR1 test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-196675 | 0325 | - | F | Addition of SSB based L1-RSRP measurement RRM test case 4.6.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196676 | 0326 | - | F | Addition of SSB based L1-RSRP measurement RRM test case 4.6.3.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196677 | 0327 | - | F | Addition of CSI-RS based L1-RSRP measurement RRM test case 4.6.3.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196679 | 0329 | - | F | Addition of minimum conformance requirements for L1-RSRP measurement RRM FR2 test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-196680 | 0330 | - | F | Addition of SSB based L1-RSRP measurement RRM test case 5.6.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196681 | 0331 | - | F | Addition of SSB based L1-RSRP measurement RRM test case 5.6.3.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196682 | 0332 | - | F | Addition of CSI-RS based L1-RSRP measurement RRM test case 5.6.3.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196735 | 0334 | - | F | Editorial to fix conversion issues with two equations | 16.1.0 |
| 2019-09 | RAN#85 | R5-196736 | 0335 | - | F | Adding Chapter 8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196737 | 0336 | - | F | New test 4.5.7.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196738 | 0337 | - | F | New test 4.5.5.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196739 | 0338 | - | F | New test 4.5.5.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196740 | 0339 | - | F | New test 4.7.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196741 | 0340 | - | F | New test 4.7.3.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196742 | 0341 | - | F | New test 6.7.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196743 | 0342 | - | F | New test 6.7.3.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196925 | 0351 | - | F | Modification of EN-DC FR2 TAAA Section 5.4.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196943 | 0360 | - | F | Addition of CSI-RS based L1-RSRP measurement RRM test case 5.6.3.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197361 | 0357 | 1 | F | Modification of SA FR1 TAAA Section 6.4.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197364 | 0290 | 1 | F | Update of NR UE Tx Timing Accuracy Test | 16.1.0 |
| 2019-09 | RAN#85 | R5-197366 | 0235 | 1 | F | Update Test Tolerance of 6.1.2.2 inter-RAT cell re-selection to lower priority | 16.1.0 |
| 2019-09 | RAN#85 | R5-197396 | 0346 | 1 | F | Update NSA Event trigger reporting test case | 16.1.0 |
| 2019-09 | RAN#85 | R5-197397 | 0352 | 1 | F | Modification of EN-DC FR2 SSB-RLM OOS Section 5.5.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197398 | 0353 | 1 | F | Modification of EN-DC FR2 SSB-RLM OOS in DRX Section 5.5.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197399 | 0354 | 1 | F | Modification of Synchronous EN-DC FR2 RRC DL BWP Switch in non-DRX Section 5.5.6.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197400 | 0355 | 1 | F | Modification of SA FR1 Handover with unknown Target Cell Section 6.3.1.2 | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197401 | 0356 | 1 | F | Modification of SA FR1-FR1 Handover with unknown Target Cell Section 6.3.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197402 | 0224 | 1 | F | Update of 4.6.1.3 event with gap non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197403 | 0225 | 1 | F | Update of 4.6.1.4 event with gap in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197404 | 0226 | 1 | F | Update of 4.6.1.5 event without gap with ssb index | 16.1.0 |
| 2019-09 | RAN#85 | R5-197405 | 0227 | 1 | F | Update of 4.6.1.6 event with gap with ssb index | 16.1.0 |
| 2019-09 | RAN#85 | R5-197406 | 0314 | 1 | F | Correction of 5G RRM Inter Frequency measurements EN-DC test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197407 | 0229 | 1 | F | Addition of 5.6.1.1 event without gap non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197408 | 0230 | 1 | F | Addition of 5.6.1.2 event without gap in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197409 | 0231 | 1 | F | Addition of 5.6.1.3 event with gap non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197410 | 0232 | 1 | F | Addition of 5.6.1.4 event with gap in DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197411 | 0249 | 1 | F | Addition of NR test case 5.5.1.5-CSI-RS RLM OOS non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197412 | 0250 | 1 | F | Addition of NR test case 5.5.1.6-CSI-RS RLM IS non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197413 | 0251 | 1 | F | Addition of NR test case 5.5.1.7-CSI-RS RLM OOS DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197414 | 0252 | 1 | F | Addition of NR test case 5.5.1.8-CSI-RS RLM IS DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197415 | 0254 | 1 | F | Addition of NR test case 5.5.5.3-CSI-RS BFD non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197416 | 0255 | 1 | F | Addition of NR test case 5.5.5.4-CSI-RS BFD DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197417 | 0259 | 1 | F | Addition of minimum conformance requirements for inter-RAT NR measurements | 16.1.0 |
| 2019-09 | RAN#85 | R5-197418 | 0289 | 1 | F | Correction of default configuration in annex H | 16.1.0 |
| 2019-09 | RAN#85 | R5-197419 | 0303 | 1 | F | Updated to cell configuration mapping table for RRM tests | 16.1.0 |
| 2019-09 | RAN#85 | R5-197420 | 0313 | 1 | F | Correction of default message content for RRM in Annex H | 16.1.0 |
| 2019-09 | RAN#85 | R5-197422 | 0305 | 1 | F | Clarification on NE-DC tests for RRM | 16.1.0 |
| 2019-09 | RAN#85 | R5-197423 | 0343 | 1 | F | Addition RRM FR2 test setups into TS 38.533 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197424 | 0345 | 1 | F | Update TDD UL-DL Config based on TS 38.133 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197425 | 0347 | 1 | F | Modification of EN-DC FR1 UE Transmit Timing Section 4.4.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197426 | 0265 | 1 | F | Correction of NR test case 4.5.1.5-CSI-RS RLM OOS non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197427 | 0266 | 1 | F | Correction of NR test case 4.5.1.6-CSI-RS RLM IS non-DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197428 | 0267 | 1 | F | Correction of NR test case 4.5.1.7-CSI-RS RLM OOS DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197429 | 0268 | 1 | F | Correction of NR test case 4.5.1.8-CSI-RS RLM IS DRX | 16.1.0 |
| 2019-09 | RAN#85 | R5-197430 | 0269 | 1 | F | Correction of NR test case 4.5.2.1-interruption transition DRX sync | 16.1.0 |
| 2019-09 | RAN#85 | R5-197431 | 0270 | 1 | F | Correction of NR test case 4.5.2.2-interruption transition DRX async | 16.1.0 |
| 2019-09 | RAN#85 | R5-197432 | 0271 | 1 | F | Correction of NR test case 4.5.2.3-interruption NR deactivated SCell sync | 16.1.0 |
| 2019-09 | RAN#85 | R5-197433 | 0272 | 1 | F | Correction of NR test case 4.5.2.4-interruption NR deactivated SCell async | 16.1.0 |
| 2019-09 | RAN#85 | R5-197434 | 0273 | 1 | F | Correction of NR test case 4.5.2.5-interruption LTE deactivated SCell sync | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197435 | 0274 | 1 | F | Correction of NR test case 4.5.2.6-interruption LTE deactivated SCell async | 16.1.0 |
| 2019-09 | RAN#85 | R5-197436 | 0328 | 1 | F | Addition of CSI-RS based L1-RSRP measurement RRM test case 4.6.3.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197437 | 0315 | 1 | F | Correction of 5G RRM Inter Frequency measurements SA test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197570 | 0294 | 1 | F | Annex E and F FR1 Test tolerance update for SS-RSRP | 16.1.0 |
| 2019-09 | RAN#85 | R5-197584 | 0344 | 1 | F | Addition Annex for RRM OTA procedures in TS 38.533 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197607 | 0287 | 1 | F | Correction of NR test case 7.6.1.3-with gap non-DRX. | 16.1.0 |
| 2019-09 | RAN#85 | R5-197611 | 0237 | 1 | F | Update of 6.3.1.5 inter-RAT handover to unknown cell | 16.1.0 |
| 2019-09 | RAN#85 | R5-197612 | 0291 | 1 | F | Update of SSB-based RLM in-sync test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197624 | 0297 | 1 | F | Correction to PRACH configurations for FR1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197651 | 0348 | 2 | F | Modification of EN-DC FR1 TAAA Section 4.4.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197652 | 0349 | 2 | F | Modification of EN-DC FR1 SSB-RLM OOS Section 4.5.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197653 | 0350 | 2 | F | Modification of EN-DC FR1 SSB-RLM OOS DRX Section 4.5.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197654 | 0358 | 2 | F | Modification of SA FR1 SSB RLM OOS in non-DRX Section 6.5.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197655 | 0359 | 2 | F | Modification of SA FR1 SSB RLM OOS in DRX Section 6.5.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197656 | 0292 | 2 | F | FR1 Test tolerance update for SS-RSRP NSA FR1 test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197657 | 0300 | 2 | F | Correction to EN-DC FR1 radio link monitoring TC 4.5.1.1 and 4.5.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197658 | 0293 | 2 | F | FR1 Test tolerance update for SS-RSRP SA FR1 test cases | 16.1.0 |
| 2019-12 | RAN#86 | R5-197794 | 0369 | - | F | Update Test Tolerance of 4.5.2.1 interruptions active and non-active in sync | 16.2.0 |
| 2019-12 | RAN#86 | R5-197795 | 0370 | - | F | Update Test Tolerance of 4.5.2.2 interruptions active and non-active in async | 16.2.0 |
| 2019-12 | RAN#86 | R5-197804 | 0379 | - | F | Update Test Tolerance of 6.6.3.1 inter-RAT measurement non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-197805 | 0380 | - | F | Update Test Tolerance of 6.6.3.2 inter-RAT measurement DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-197813 | 0382 | - | F | Addition of minimum conformance requirements 5.5.5.0.1-SSB based BFD | 16.2.0 |
| 2019-12 | RAN#86 | R5-197814 | 0383 | - | F | Addition of minimum conformance requirements 8.2.1.0-inter-RAT reselection | 16.2.0 |
| 2019-12 | RAN#86 | R5-197815 | 0384 | - | F | Addition of minimum conformance requirements 8.3.1.0-inter-RAT handover | 16.2.0 |
| 2019-12 | RAN#86 | R5-197816 | 0385 | - | F | Addition of minimum conformance requirements 8.4.1.0-inter-RAT SFTD delay | 16.2.0 |
| 2019-12 | RAN#86 | R5-197817 | 0386 | - | F | Addition of minimum conformance requirements 8.5.1.0-inter-RAT SFTD accuracy | 16.2.0 |
| 2019-12 | RAN#86 | R5-197820 | 0389 | - | F | Addition of NR test case 8.2.1.1-high priority NR reselection | 16.2.0 |
| 2019-12 | RAN#86 | R5-198029 | 0394 | - | F | Update NSA SS-RSRP tests for 4Rx connection diagram | 16.2.0 |
| 2019-12 | RAN#86 | R5-198032 | 0397 | - | F | Align Annex D to TS 38.133 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198289 | 0400 | - | F | Correction of PRACH index in 6.1.1.1, 6.3.2.2.1 and 6.3.2.2.2 | 16.2.0 |

| Change history | | | | | | | |
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| 2019-12 | RAN#86 | R5-198415 | 0404 | - | F | Correction to NR SA FR1 timing advance adjustment accuracy TC 6.4.3.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198416 | 0405 | - | F | Correction to intra-frequency event-triggered reporting TC 6.6.1.1, 6.6.1.2, 6.6.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198421 | 0410 | - | F | Correction to FR1 SA random access test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-198472 | 0412 | - | F | Correct message contents for 5.6.2.x tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-198477 | 0416 | - | F | Correction to Annex E | 16.2.0 |
| 2019-12 | RAN#86 | R5-198518 | 0418 | - | F | Update PUSCH symbol length as message exception in 6.4.1.1 in TS 38.533 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198519 | 0419 | - | F | Update 4.4.3.1 test requirements | 16.2.0 |
| 2019-12 | RAN#86 | R5-198545 | 0420 | - | F | Update 4.7.1.1.1 test requirements in TS 38.533 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198549 | 0421 | - | F | Updated to cell configuration mapping table for RRM tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-198550 | 0422 | - | F | Minimum conformance requirements updated for 5G RRM Inter-RAT measurements tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-198551 | 0423 | - | F | Minimum conformance requirements updated for 5G RRM SCell activation and deactivation delay tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-198558 | 0428 | - | F | 5G RRM Spec 3GPP style correction in clause 4 and 5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198572 | 0429 | - | F | Correction of minimum conformance requirements 4.6.2.0 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198575 | 0432 | - | F | Correction of minimum conformance requirements 5.6.3.0 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198577 | 0434 | - | F | Correction of clause 3 definitions, symbols and abbreviations | 16.2.0 |
| 2019-12 | RAN#86 | R5-198578 | 0435 | - | F | Correction of RRM Test Case 4.6.3.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198581 | 0438 | - | F | Correction of RRM Test Case 4.6.3.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198582 | 0439 | - | F | Correction of RRM Test Case 5.6.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198583 | 0440 | - | F | Correction of RRM Test Case 5.6.2.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198584 | 0441 | - | F | Correction of RRM Test Case 5.6.2.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198585 | 0442 | - | F | Correction of RRM Test Case 5.6.2.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198586 | 0443 | - | F | Correction of RRM Test Case 5.6.2.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198587 | 0444 | - | F | Correction of RRM Test Case 5.6.2.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198588 | 0445 | - | F | Correction of RRM Test Case 5.6.2.7 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198589 | 0446 | - | F | Correction of RRM Test Case 5.6.2.8 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198594 | 0451 | - | F | Correction of RRM Test Case 7.6.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198595 | 0452 | - | F | Correction of RRM Test Case 7.6.2.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198596 | 0453 | - | F | Correction of RRM Test Case 7.6.2.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198597 | 0454 | - | F | Correction of RRM Test Case 7.6.2.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198598 | 0455 | - | F | Correction of RRM Test Case 7.6.2.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198599 | 0456 | - | F | Correction of RRM Test Case 7.6.2.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198601 | 0458 | - | F | Correction of RRM Test Case 7.6.2.8 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198692 | 0471 | - | F | Addition of RRM Test Case 6.6.4.1 | 16.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-12 | RAN#86 | R5-198693 | 0472 | - | F | Addition of RRM Test Case 6.6.4.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198694 | 0473 | - | F | Addition of RRM Test Case 6.6.4.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198695 | 0474 | - | F | Addition of RRM Test Case 6.6.4.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198696 | 0475 | - | F | Addition of RRM Test Case 7.6.3.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198697 | 0476 | - | F | Addition of RRM Test Case 7.6.3.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198698 | 0477 | - | F | Addition of RRM Test Case 7.6.3.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198699 | 0478 | - | F | Addition of RRM Test Case 7.6.3.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199364 | 0365 | 1 | F | Update Test Tolerance of 4.5.1.5 RLM OOS non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199365 | 0367 | 1 | F | Update Test Tolerance of 4.5.1.7 RLM OOS DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199366 | 0375 | 1 | F | Update Test Tolerance of 6.5.1.5 SA RLM OOS non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199367 | 0377 | 1 | F | Update Test Tolerance of 6.5.1.7 SA RLM OOS DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199368 | 0366 | 1 | F | Update Test Tolerance of 4.5.1.6 RLM in-sync non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199369 | 0368 | 1 | F | Update Test Tolerance of 4.5.1.8 RLM in-sync DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199370 | 0376 | 1 | F | Update Test Tolerance of 6.5.1.6 SA RLM in-sync non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199371 | 0378 | 1 | F | Update Test Tolerance of 6.5.1.8 SA RLM in-sync DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199379 | 0417 | 1 | F | Update 4.4.1.1 test procedure in TS 38.533 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199380 | 0479 | 1 | F | Update 4.5.1.1 and 4.5.1.2 in TS 38.533 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199381 | 0406 | 1 | F | Correction to NR SA FR1 SS-RSRP absolute and relative measurement accuracy Intra-frequency measurements | 16.2.0 |
| 2019-12 | RAN#86 | R5-199389 | 0402 | 1 | F | Correction to NR SA Cell re-selection tests | 16.2.0 |
| 2019-12 | RAN#86 | R5-199390 | 0436 | 1 | F | Correction of RRM Test Case 4.6.3.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199391 | 0437 | 1 | F | Correction of RRM Test Case 4.6.3.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199392 | 0387 | 1 | F | Addition of NR test case 5.5.5.1-ENDC FR2 SSB BFD no-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199393 | 0388 | 1 | F | Addition of NR test case 5.5.5.2-ENDC FR2 SSB BFD DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199394 | 0431 | 1 | F | Correction of minimum conformance requirements 5.6.2.0 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199395 | 0395 | 1 | F | Update SA SS-RSRP tests for 4Rx connection diagram | 16.2.0 |
| 2019-12 | RAN#86 | R5-199396 | 0403 | 1 | F | Correction to NR SA FR1 UE transmit timing accuracy TC 6.4.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199397 | 0457 | 1 | F | Correction of RRM Test Case 7.6.2.7 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199398 | 0361 | 1 | F | Add AoA Setup 4 for FR2 RRM Test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199399 | 0390 | 1 | F | Addition of NR test case 8.3.1.1-known handover | 16.2.0 |
| 2019-12 | RAN#86 | R5-199400 | 0391 | 1 | F | Addition of NR test case 8.4.1.1-SFTD delay non-DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199401 | 0392 | 1 | F | Addition of NR test case 8.4.1.2-SFTD delay DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199402 | 0393 | 1 | F | Addition of NR test case 8.5.1.1-SFTD accuracy | 16.2.0 |
| 2019-12 | RAN#86 | R5-199403 | 0396 | 1 | F | Align Annex A to TS 38.133 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199404 | 0413 | 1 | F | Clean up RRM message contents in Annex H | 16.2.0 |
| 2019-12 | RAN#86 | R5-199405 | 0424 | 1 | F | New 5G RRM Inter-RAT measurement TC 8.4.2.5 | 16.2.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2019-12 | RAN#86 | R5-199406 | 0425 | 1 | F | New 5G RRM Inter-RAT measurement TC 8.4.2.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199407 | 0426 | 1 | F | New 5G RRM Inter-RAT measurement TC 8.4.2.7 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199408 | 0427 | 1 | F | New 5G RRM Inter-RAT measurement TC 8.4.2.8 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199409 | 0433 | 1 | F | Correction of message content in Annex H | 16.2.0 |
| 2019-12 | RAN#86 | R5-199436 | 0470 | 1 | F | Introduction of n29 and n65 to 38.533 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199499 | 0401 | 1 | F | Correction to EN-DC FR1 UE transmit timing accuracy TC 4.4.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199515 | 0381 | 1 | F | Update Test Tolerance in Annex F | 16.2.0 |
| 2019-12 | RAN#86 | R5-199517 | 0481 | 1 | F | Update General parameters in test case 4.5.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199533 | 0482 | 1 | F | Update NSA FR2 RLM IS non-DRX test | 16.2.0 |
| 2019-12 | RAN#86 | R5-199534 | 0483 | 1 | F | Update NSA FR2 RLM IS test with DRX | 16.2.0 |
| 2019-12 | RAN#86 | R5-199535 | 0484 | 1 | F | Update NSA FR2 Timing Accuracy Test | 16.2.0 |
| 2019-12 | RAN#86 | R5-199544 | 0399 | 1 | F | Add applicable test methods for RRM FR2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199550 | 0463 | 1 | F | Addition of NR SA FR1 Handover with known Target Cell Section 6.3.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199551 | 0464 | 1 | F | Modification of NR SA FR1 Handover with unknown Target Cell Section 6.3.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199552 | 0465 | 1 | F | Modification of NR SA FR1-FR1 Handover with unknown Target Cell Section 6.3.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199583 | 0409 | 1 | F | Correction to FR1 NSA random access test cases | 16.2.0 |
| 2020-03 | RAN#87 | R5-200822 | 0544 | - | F | Correction to Test Applicability for 4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC | 16.3.0 |
| 2020-03 | RAN#87 | R5-200823 | 0545 | - | F | Correction to SRS Configuration for 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy | 16.3.0 |
| 2020-03 | RAN#87 | R5-200829 | 0551 | - | F | Correction to Message Exception for 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-200833 | 0555 | - | F | Correction to Test Applicability for 6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone | 16.3.0 |
| 2020-03 | RAN#87 | R5-200834 | 0556 | - | F | Correction to SRS Configuration for 6.4.3.1 NR SA FR1 timing advance adjustment accuracy | 16.3.0 |
| 2020-03 | RAN#87 | R5-200839 | 0561 | - | F | Correction to Message Exception for 6.6.1.5 NR SA FR1 event-triggered reporting without gap in non-DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-200277 | 0488 | - | F | Test tolerance update intra-frequency SS-SINR NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200278 | 0489 | - | F | Test tolerance update inter-frequency SS-SINR NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200279 | 0490 | - | F | Test tolerance update inter-frequency SS-RSRP SA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200281 | 0492 | - | F | Test tolerance update inter-frequency SS-RSRQ SA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200282 | 0493 | - | F | Test tolerance update intra-frequency SS-SINR SA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200283 | 0494 | - | F | Test tolerance update inter-frequency SS-SINR SA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200306 | 0497 | - | F | Reference SSB configuration correction | 16.3.0 |
| 2020-03 | RAN#87 | R5-200421 | 0508 | - | F | Correction to Active UL BWP for intra-frequency event triggered reporting with gap | 16.3.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-03 | RAN#87 | R5-200422 | 0509 | - | F | Correction to EN-DC FR1 event-triggered reporting test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200423 | 0510 | - | F | Correction to FR1 NR SA E-UTRA cell re-selection test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200425 | 0512 | - | F | Correction to NR SA FR1 SS-RSRP measurement accuracy tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200427 | 0514 | - | F | Correction to the simulated cell for cell-reselection test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200428 | 0515 | - | F | Correction to UE transmit timing accuracy test case | 16.3.0 |
| 2020-03 | RAN#87 | R5-200564 | 0524 | - | F | Correction to Statistical testing of delay and UE measurement performance in RRM tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200606 | 0526 | - | F | Cell mapping update measurement tests Annex E | 16.3.0 |
| 2020-03 | RAN#87 | R5-200607 | 0527 | - | F | Re-submission R5-197804 not implemented | 16.3.0 |
| 2020-03 | RAN#87 | R5-200608 | 0528 | - | F | Corrections to SS-RSRP meas accuracy NSA tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200610 | 0530 | - | F | Correct message contents measurement tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-200705 | 0533 | - | F | Correction to TC 6.1.1.2 FR1 inter-freq re-selection | 16.3.0 |
| 2020-03 | RAN#87 | R5-200708 | 0536 | - | F | Update of TC 6.3.2.3.1 FR1 RRC redirection | 16.3.0 |
| 2020-03 | RAN#87 | R5-200709 | 0537 | - | F | Update of TC 6.3.2.3.2 inter-freq RRC redirection | 16.3.0 |
| 2020-03 | RAN#87 | R5-200785 | 0539 | - | F | Update of EN-DC SSB-based RLM TC 4.5.1.1, 4.5.1.2, 4.5.1.3 and 4.5.1.4 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200786 | 0540 | - | F | Update of EN-DC CSI-RS-based RLM TC 4.5.1.5, 4.5.1.6, 4.5.1.7 and 4.5.1.8 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200787 | 0541 | - | F | Update of NR CSI-RS-based RLM TC 6.5.1.5, 6.5.1.6, 6.5.1.7 and 6.5.1.8 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200818 | 0543 | - | F | Correction to cell mapping Annex E | 16.3.0 |
| 2020-03 | RAN#87 | R5-200858 | 0569 | - | F | Corrections to Table H.3.1-8 | 16.3.0 |
| 2020-03 | RAN#87 | R5-200916 | 0538 | 1 | F | Update to test applicability per permitted test method | 16.3.0 |
| 2020-03 | RAN#87 | R5-200986 | 0507 | 1 | F | Core alignment for event-triggered reporting test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-200987 | 0534 | 1 | F | Update of TC 6.3.2.1.1 FR1 RRC re-establishment | 16.3.0 |
| 2020-03 | RAN#87 | R5-200988 | 0535 | 1 | F | Update of TC 6.3.2.1.2 inter-freq RRC re-establishment | 16.3.0 |
| 2020-03 | RAN#87 | R5-201030 | 0529 | 1 | F | Corrections to SS-RSRP meas accuracy SA tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-201039 | 0485 | 1 | F | Test tolerance update inter-frequency SS-RSRP NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-201040 | 0486 | 1 | F | Test tolerance update intra-frequency SS-RSRQ NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-201041 | 0491 | 1 | F | Test tolerance update intra-frequency SS-RSRQ SA | 16.3.0 |
| 2020-03 | RAN#87 | R5-201056 | 0511 | 1 | F | Correction to message contents in 6.6.1.5 and 6.6.1.6 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201057 | 0513 | 1 | F | Correction to test description of RRM TC 4.6.1.3 and 4.6.1.6 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201058 | 0516 | 1 | F | Update of maximum test system uncertainty for FR1 RRM Test | 16.3.0 |
| 2020-03 | RAN#87 | R5-201063 | 0517 | 1 | F | Update FR1 Test Tolerance of 4.5.2.3 interruptions on NR SCC in sync | 16.3.0 |
| 2020-03 | RAN#87 | R5-201064 | 0518 | 1 | F | Update FR1 Test Tolerance of 4.5.2.4 interruptions on NR SCC in async | 16.3.0 |
| 2020-03 | RAN#87 | R5-201071 | 0552 | 1 | F | Correction to Test Applicability for 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX | 16.3.0 |

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| 2020-03 | RAN#87 | R5-201072 | 0553 | 1 | F | Correction to Test Applicability for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-201073 | 0554 | 1 | F | Correction to Test Applicability for 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-201078 | 0562 | 1 | F | Correction to Test Applicability for 6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX | 16.3.0 |
| 2020-03 | RAN#87 | R5-201080 | 0564 | 1 | F | Correction to Test Applicability for 6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-201081 | 0565 | 1 | F | Correction to Test Applicability for 6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection | 16.3.0 |
| 2020-03 | RAN#87 | R5-201082 | 0571 | 1 | F | Correction to Test Parameters for 4.6.1.1 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201083 | 0572 | 1 | F | Correction to Test Parameters for 4.6.1.2 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201160 | 0531 | 1 | F | Correct message contents event triggered measurement tests | 16.3.0 |
| 2020-03 | RAN#87 | R5-201166 | 0567 | 1 | F | Update RLM non DRX test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-201167 | 0568 | 1 | F | Update 4.5.1.4 test case | 16.3.0 |
| 2020-03 | RAN#87 | R5-201168 | 0570 | 1 | F | Clarification 4.4.1.1 test procedure | 16.3.0 |
| 2020-03 | RAN#87 | R5-201169 | 0521 | 1 | F | Update of FR1 Test Tolerance in Annex F | 16.3.0 |
| 2020-03 | RAN#87 | R5-201190 | 0542 | 1 | F | Update of NR SSB-based RLM TC 6.5.1.1, 6.5.1.2, 6.5.1.3 and 6.5.1.4 | 16.3.0 |
| 2020-03 | RAN#87 | R5-201240 | 0563 | 2 | F | Correction to Test Applicability for 6.6.2.2 NA SA FR1-FR1 event-triggered reporting in DRX | 16.3.0 |
| 2020-03 | RAN#87 | R5-201242 | 0532 | 2 | F | Correction to Test Applicability for 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX | 16.3.0 |
| 2020-03 | RAN#87 | R5-200276 | 0487 | - | F | Test tolerance update inter-frequency SS-RSRQ NSA | 16.3.0 |
| 2020-03 | RAN#87 | R5-200284 | 0495 | - | F | Test tolerance update measurement tests Annex F | 16.3.0 |
| 2020-03 | RAN#87 | R5-201044 | 0496 | - | F | Test Tolerance and Measurement Uncertainty in Annex F for L1-RSRP measurement test cases | 16.3.0 |
| 2020-03 | RAN#87 | R5-201045 | 0499 | 1 | F | Correction of RRM Test Case 4.6.3.1 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201046 | 0500 | 1 | F | Correction of RRM Test Case 4.6.3.2 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201047 | 0501 | 1 | F | Correction of RRM Test Case 4.6.3.3 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201048 | 0502 | 1 | F | Correction of RRM Test Case 4.6.3.4 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201049 | 0503 | 1 | F | Correction of RRM Test Case 6.6.4.1 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201050 | 0504 | 1 | F | Correction of RRM Test Case 6.6.4.2 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201051 | 0505 | 1 | F | Correction of RRM Test Case 6.6.4.3 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201052 | 0506 | 1 | F | Correction of RRM Test Case 6.6.4.4 including FR1 Test Tolerance | 16.3.0 |
| 2020-03 | RAN#87 | R5-201070 | 0548 | 1 | F | Correction to Message Exception for 4.5.1.3 EN-DC FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | 16.3.0 |
| 2020-03 | RAN#87 | R5-201074 | 0557 | 1 | F | Correction to Test Parameter for 6.5.1.1 NR SA FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | 16.3.0 |

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| 2020-03 | RAN#87 | R5-201075 | 0558 | 1 | F | Correction to Test Procedure for 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM-RS in non-DRX mode | 16.3.0 |
| 2020-03 | RAN#87 | R5-201076 | 0559 | 1 | F | Correction to Message Exception for 6.5.1.3 NR SA FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | 16.3.0 |
| 2020-03 | RAN#87 | R5-201077 | 0560 | 1 | F | Correction to Message Exception for 6.5.1.4 NR SA FR1 radio link monitoring In-sync test for PSCell configured with SSB-based RLM-RS in DRX mode | 16.3.0 |
| 2020-03 | RAN#87 | R5-201105 | 0546 | 1 | F | Correction to Test Parameters for 4.5.1.1 EN-DC FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | 16.3.0 |
| 2020-03 | RAN#87 | R5-201106 | 0547 | 1 | F | Correction to Test Procedure for 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM-RS in non-DRX mode | 16.3.0 |
| 2020-06 | RAN#88 | R5-201395 | 0576 | - | F | Correction to NR test case 7.7.1.3.2 SS-RSRP relative accuracy | 16.4.0 |
| 2020-06 | RAN#88 | R5-201396 | 0577 | - | F | Correction to NR test case 8.2.1.1 higher priority NR cell reselection | 16.4.0 |
| 2020-06 | RAN#88 | R5-201398 | 0579 | - | F | Correction to NR test case 8.4.1.1 SFTD non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201399 | 0580 | - | F | Correction to NR test case 8.4.1.2 SFTD DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201400 | 0581 | - | F | Correction to NR test case 8.4.2.1 event-triggered without SSB index non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201401 | 0582 | - | F | Correction to NR test case 8.4.2.2 event-triggered without SSB index DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201402 | 0583 | - | F | Correction to NR test case 8.4.2.3 event-triggered with SSB index non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201403 | 0584 | - | F | Correction to NR test case 8.4.2.4 event-triggered with SSB index DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201404 | 0585 | - | F | Correction to NR test case 8.5.1.1 SFTD accuracy | 16.4.0 |
| 2020-06 | RAN#88 | R5-201405 | 0586 | - | F | Addition to minimum conformance requirement 5.5.5.0.3 - scheduling restriction for BFD and CBD | 16.4.0 |
| 2020-06 | RAN#88 | R5-201407 | 0588 | - | F | Addition to minimum conformance requirement 5.5.8.0 - TCI-state switch | 16.4.0 |
| 2020-06 | RAN#88 | R5-201408 | 0589 | - | F | Addition to NR test case 5.5.8.1 MAC-CE based TCI switch | 16.4.0 |
| 2020-06 | RAN#88 | R5-201409 | 0590 | - | F | Addition to NR test case 5.5.8.2 RRC based TCI switch | 16.4.0 |
| 2020-06 | RAN#88 | R5-201412 | 0593 | - | F | Addition to minimum conformance requirements 7.5.1.0.5 - Scheduling restriction for RLM | 16.4.0 |
| 2020-06 | RAN#88 | R5-201414 | 0595 | - | F | Addition to minimum Conformance Requirements 7.5.6.1.0 - DCI-based DL active BWP switch | 16.4.0 |
| 2020-06 | RAN#88 | R5-201415 | 0596 | - | F | Addition to NR test case 7.5.6.1.3 FR2 DCI-based DL active BWP switch non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201619 | 0603 | - | F | Corrections to 6.7.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-201676 | 0614 | - | F | Correction to inter-freq measurement TCs for SSB configuration | 16.4.0 |
| 2020-06 | RAN#88 | R5-201677 | 0615 | - | F | Correction to TC 6.3.2.3.1 for the test procedure | 16.4.0 |
| 2020-06 | RAN#88 | R5-201679 | 0617 | - | F | Update of TC 5.6.1.1 event-triggered without gap non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201680 | 0618 | - | F | Update of TC 5.6.1.2 event-triggered without gap DRX | 16.4.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-06 | RAN#88 | R5-201681 | 0619 | - | F | Update of TC 5.6.1.3 event-triggered with gap non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201682 | 0620 | - | F | Update of TC 5.6.1.4 event-triggered with gap DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201686 | 0624 | - | F | Update of TC 8.4.2.5 FR2 event-triggered without SSB index non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201687 | 0625 | - | F | Update of TC 8.4.2.6 FR2 event-triggered without SSB index DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201688 | 0626 | - | F | Update of TC 8.4.2.7 FR2 event-triggered with SSB index non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201689 | 0627 | - | F | Update of TC 8.4.2.8 FR2 event-triggered with SSB index DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-201821 | 0634 | - | F | Correction of SS-SINR applicability -NSA | 16.4.0 |
| 2020-06 | RAN#88 | R5-201822 | 0635 | - | F | Correction of SS-SINR applicability -SA | 16.4.0 |
| 2020-06 | RAN#88 | R5-201824 | 0637 | - | F | Corrections to 4.7.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202054 | 0644 | - | F | Minimum Requirements SS-RSRP iRAT | 16.4.0 |
| 2020-06 | RAN#88 | R5-202055 | 0645 | - | F | Addition 8.5.2.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202056 | 0646 | - | F | Addition 8.5.2.1.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202057 | 0647 | - | F | Minimum Requirements SS-RSRQ iRAT | 16.4.0 |
| 2020-06 | RAN#88 | R5-202058 | 0648 | - | F | Addition 8.5.2.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202059 | 0649 | - | F | Addition 8.5.2.2.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202060 | 0650 | - | F | Minimum Requirements SS-SINR iRAT | 16.4.0 |
| 2020-06 | RAN#88 | R5-202061 | 0651 | - | F | Addition 8.5.2.3.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202062 | 0652 | - | F | Addition 8.5.2.3.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202063 | 0653 | - | F | Minimum requirements SS-RSRP NSA FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202064 | 0654 | - | F | Addition 5.7.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202065 | 0655 | - | F | Addition 5.7.1.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202066 | 0656 | - | F | Addition 5.7.1.3 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202067 | 0657 | - | F | Minimum requirements SS-RSRQ NSA FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202068 | 0658 | - | F | Addition 5.7.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202069 | 0659 | - | F | Addition 5.7.2.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202070 | 0660 | - | F | Minimum requirements SS-SINR NSA FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202071 | 0661 | - | F | Addition 5.7.3.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202072 | 0662 | - | F | Addition 5.7.3.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202073 | 0663 | - | F | Minimum requirements SS-RSRP SA FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202074 | 0664 | - | F | Addition 7.7.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202075 | 0665 | - | F | Addition 7.7.1.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202076 | 0666 | - | F | Minimum requirements SS-RSRQ SA FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202077 | 0667 | - | F | Addition 7.7.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202078 | 0668 | - | F | Addition 7.7.2.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202079 | 0669 | - | F | Minimum requirements SS-SINR SA FR2 | 16.4.0 |

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| 2020-06 | RAN#88 | R5-202080 | 0670 | - | F | Addition 7.7.3.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202081 | 0671 | - | F | Addition 7.7.3.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202091 | 0672 | - | F | Correction of OCNG configurations and CSI-RS for tracking in Annex A | 16.4.0 |
| 2020-06 | RAN#88 | R5-202092 | 0673 | - | F | Cell configuration for SA FR2 event-triggered reporting test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202093 | 0674 | - | F | Correction of MeasGapConfig in Annex H | 16.4.0 |
| 2020-06 | RAN#88 | R5-202095 | 0676 | - | F | Correction of AoA configuration for FR2 SA Inter-freq measurement test cases in clause 5.6.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202096 | 0677 | - | F | Correction of RRM Test Case 7.6.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202097 | 0678 | - | F | Correction of RRM Test Case 7.6.2.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202098 | 0679 | - | F | Correction of RRM Test Case 7.6.2.3 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202099 | 0680 | - | F | Correction of RRM Test Case 7.6.2.4 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202100 | 0681 | - | F | Correction of RRM Test Case 7.6.2.5 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202101 | 0682 | - | F | Correction of RRM Test Case 7.6.2.6 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202102 | 0683 | - | F | Correction of RRM Test Case 7.6.2.7 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202103 | 0684 | - | F | Correction of RRM Test Case 7.6.2.8 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202263 | 0704 | - | F | Core alignment in 4.6.1.5 and 4.6.1.6 Event Triggered Reporting with SSB time index detection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202265 | 0706 | - | F | Correction on EN-DC FR1 radio link monitoring out-of-sync test | 16.4.0 |
| 2020-06 | RAN#88 | R5-202273 | 0714 | - | F | Correction to NR SA FR1 - E-UTRA RRC Connection release with redirection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202277 | 0718 | - | F | Editorial Correction to FR2 Interruption test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202385 | 0720 | - | F | Addition of RRM Cell configuration mapping table for EN-DC FR1 Test Case 4.5.4.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202387 | 0721 | - | F | Addition of RRC message content exceptions for UE UL Carrier Reconfiguration Delay | 16.4.0 |
| 2020-06 | RAN#88 | R5-202389 | 0722 | - | F | Addition of RRM Test Case 4.5.4.1 in Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202415 | 0728 | - | F | Alignment 5.4.1.1 test procedure with 4.4.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202418 | 0730 | - | F | Update 6.5.1.1 and CSI-ReportConfig in Annex H | 16.4.0 |
| 2020-06 | RAN#88 | R5-202488 | 0736 | - | F | Correction to the simulated cell for cell-reselection test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202496 | 0744 | - | F | Correction of RRM Test Case 6.4.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202497 | 0745 | - | F | Title Correction of Annex D.4.2.4 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202700 | 0723 | 1 | F | Addition of new RRM Test Case 4.5.4.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202701 | 0675 | 1 | F | Editorial correction of RRM TT in Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202744 | 0708 | 1 | F | Correction to EN-DC FR1 radio link monitoring tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202745 | 0727 | 1 | F | Clarification cell2 SS-RSRP in 4.7.1.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202746 | 0587 | 1 | F | Addition to NR test case 5.5.5.5 scheduling available restriction | 16.4.0 |
| 2020-06 | RAN#88 | R5-202747 | 0707 | 1 | F | Correction on NR SA FR1 - E-UTRAN event-triggered reporting tests | 16.4.0 |

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| 2020-06 | RAN#88 | R5-202748 | 0731 | 1 | F | Update 6.5.1.2 message content exception and test procedure | 16.4.0 |
| 2020-06 | RAN#88 | R5-202749 | 0737 | 1 | F | Correction of RRM Test Case 6.1.1.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202750 | 0738 | 1 | F | Correction of RRM Test Case 6.1.1.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202751 | 0621 | 1 | F | Update of TC 7.1.1.1 intra-freq cell re-selection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202752 | 0622 | 1 | F | Update of TC 7.1.1.2 inter-freq cell re-selection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202753 | 0724 | 1 | F | Addition of new RRM Test Cases in clause 7.5.3 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202754 | 0725 | 1 | F | Addition of new RRM Test Cases in clause 7.5.7 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202812 | 0685 | 1 | F | Correction to Test Applicability for 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202813 | 0686 | 1 | F | Correction to Test Applicability for 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202814 | 0687 | 1 | F | Correction to Test Applicability & Message Exception for 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202815 | 0688 | 1 | F | Correction to Test Applicability for 6.6.1.3 NR SA FR1 event-triggered reporting with gap in non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202816 | 0689 | 1 | F | Correction to Test Applicability for 6.6.1.4 NR SA FR1 event-triggered reporting with gap in DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202817 | 0732 | 1 | F | Correction to Test Requirement for 4.4.3.1 by updating TT values from Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202833 | 0591 | 1 | F | Addition to NR test case 6.3.2.1.3 FR1-FR1 RRC re-establishment without serving cell timing | 16.4.0 |
| 2020-06 | RAN#88 | R5-202834 | 0575 | 1 | F | Correction to NR test case 7.7.1.3.1 SA FR2 SS-RSRP absolute accuracy | 16.4.0 |
| 2020-06 | RAN#88 | R5-202835 | 0592 | 1 | F | Addition to NR test case 7.3.2.1.3 FR2-FR2 RRC re-establishment without serving cell timing | 16.4.0 |
| 2020-06 | RAN#88 | R5-202836 | 0594 | 1 | F | Addition to NR test case 7.5.1.9 FR2 RLM scheduling restrictions | 16.4.0 |
| 2020-06 | RAN#88 | R5-202837 | 0578 | 1 | F | Correction to NR test case 8.3.1.1 handover to known cell | 16.4.0 |
| 2020-06 | RAN#88 | R5-202838 | 0597 | 1 | F | Addition of Default Configuration in Annex H | 16.4.0 |
| 2020-06 | RAN#88 | R5-202839 | 0628 | 1 | F | Update of Annex D.4.1.1 for parameters of BFD with 4RX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202840 | 0630 | 1 | F | Update of Cell mapping in Annex E | 16.4.0 |
| 2020-06 | RAN#88 | R5-202841 | 0633 | 1 | F | Add auxiliary bands for RRM inter-frequency SA tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202909 | 0697 | 1 | F | Correction to Test Requirements in 4.4.1.1, Table 4.4.1.1.5-5 to include TT values from Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202910 | 0698 | 1 | F | Correction to Test Requirements in 6.4.1.1, Table 6.4.1.1.5-5 to include TT values from Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202911 | 0734 | 1 | F | Correction to Test Requirement for 6.4.3.1 by updating TT values from Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-202912 | 0735 | 1 | F | Annex I RRM OTA procedures update to add RSRPB based UE Positioning Method for FR2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202913 | 0703 | 1 | F | Clarification of disabling Tx diversity for FR2 UE for FR2 RRM testing | 16.4.0 |
| 2020-06 | RAN#88 | R5-202914 | 0719 | 1 | F | Updates of FR2 MU and TT in TS 38.533 | 16.4.0 |

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| 2020-06 | RAN#88 | R5-202950 | 0693 | 1 | F | Correction to Message Exception for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202951 | 0694 | 1 | F | Correction to Message Exception for 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection | 16.4.0 |
| 2020-06 | RAN#88 | R5-202961 | 0690 | 1 | F | Correction to Test Applicability and Message Exception for 6.6.1.6 NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading | 16.4.0 |
| 2020-06 | RAN#88 | R5-202969 | 0639 | 1 | F | Corrections to 4.7.2.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202970 | 0641 | 1 | F | Corrections to 4.7.3.1 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202971 | 0642 | 1 | F | Corrections to 4.7.3.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202972 | 0598 | 1 | F | Corrections to 6.7.1.2 and core spec alignment | 16.4.0 |
| 2020-06 | RAN#88 | R5-202973 | 0599 | 1 | F | Corrections to 6.7.2.1 and core spec alignment | 16.4.0 |
| 2020-06 | RAN#88 | R5-202974 | 0600 | 1 | F | Corrections to 6.7.2.2 and core spec alignment | 16.4.0 |
| 2020-06 | RAN#88 | R5-202975 | 0601 | 1 | F | Corrections to 6.7.3.1 and core spec alignment | 16.4.0 |
| 2020-06 | RAN#88 | R5-202976 | 0602 | 1 | F | Corrections to 6.7.3.2 and core spec alignment | 16.4.0 |
| 2020-06 | RAN#88 | R5-202977 | 0638 | 1 | F | Corrections to 4.7.1.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202978 | 0640 | 1 | F | Corrections to 4.7.2.2 | 16.4.0 |
| 2020-06 | RAN#88 | R5-202982 | 0710 | 1 | F | Correction to FR1 UE transmit timing accuracy | 16.4.0 |
| 2020-06 | RAN#88 | R5-202983 | 0709 | 1 | F | Correction to EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous ENDC | 16.4.0 |
| 2020-06 | RAN#88 | R5-202984 | 0711 | 1 | F | Correction to FR2 UE transmit timing accuracy | 16.4.0 |
| 2020-06 | RAN#88 | R5-202985 | 0705 | 1 | F | Core alignment in 6.6.1.2 NR SA FR1 event-triggered reporting without gap in DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-202986 | 0713 | 1 | F | Correction to NR E-UTRA reselection tests | 16.4.0 |
| 2020-06 | RAN#88 | R5-202987 | 0715 | 1 | F | Correction to NR SA FR1 handover test cases | 16.4.0 |
| 2020-06 | RAN#88 | R5-202996 | 0604 | 1 | F | Update FR1 Test Tolerance of 4.5.2.5 E-UTRAN SCC in sync | 16.4.0 |
| 2020-06 | RAN#88 | R5-202997 | 0605 | 1 | F | Update FR1 Test Tolerance of 4.5.2.6 E-UTRAN SCC in async | 16.4.0 |
| 2020-06 | RAN#88 | R5-202998 | 0606 | 1 | F | Update FR1 Test Tolerance of 4.5.3.1 SCell activation 160ms | 16.4.0 |
| 2020-06 | RAN#88 | R5-202999 | 0607 | 1 | F | Update FR1 Test Tolerance of 4.5.3.2 SCell activation 320ms | 16.4.0 |
| 2020-06 | RAN#88 | R5-203000 | 0608 | 1 | F | Update FR1 Test Tolerance of 4.5.3.3 unknown SCell activation | 16.4.0 |
| 2020-06 | RAN#88 | R5-203091 | 0623 | 1 | F | Update of 4.5.3.0 minimum requirements for SCell activation | 16.4.0 |
| 2020-06 | RAN#88 | R5-203092 | 0613 | 1 | F | Update FR1 Test Tolerance of 6.5.4.1 UL carrier RRC reconfiguration delay | 16.4.0 |
| 2020-06 | RAN#88 | R5-203093 | 0629 | 1 | F | Update of FR1 Test Tolerance in Annex F | 16.4.0 |
| 2020-06 | RAN#88 | R5-203095 | 0609 | 1 | F | Addition FR1 Test Tolerance of 6.5.5.1 SSB BFD non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-203096 | 0610 | 1 | F | Addition FR1 Test Tolerance of 6.5.5.2 SSB BFD DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-203097 | 0611 | 1 | F | Update FR1 Test Tolerance of 6.5.5.3 CSI-RS BFD non-DRX | 16.4.0 |
| 2020-06 | RAN#88 | R5-203098 | 0612 | 1 | F | Update FR1 Test Tolerance of 6.5.5.4 CSI-RS BFD DRX | 16.4.0 |
| 2020-09 | RAN#89 | R5-203234 | 0747 | - | F | Update TC 8.5.2.1.1.1 with TT results and message contents | 16.5.0 |

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| 2020-09 | RAN#89 | R5-203235 | 0748 | - | F | Update TC 8.5.2.2.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-203249 | 0758 | - | F | Annex E and F update with TT results for 8.5.2.x.x iRAT periodic reporting test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-203250 | 0759 | - | F | Annex E and F update with TT results for 4.7.4.x.x EN-DC L1-RSRP periodic reporting test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-203252 | 0761 | - | F | Void unnecessary TC 8.5.2.1.1.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203267 | 0765 | - | F | [EDITORIAL] Fix formatting issues throwing DOCX conversion errors in TS 38.533 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203268 | 0766 | - | F | Correction of test applicability for EN-DC event-triggered tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-203269 | 0767 | - | F | Correction of test applicability for NR SA event-triggered tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-203270 | 0768 | - | F | Adding annex table for iRAT measurement configuration | 16.5.0 |
| 2020-09 | RAN#89 | R5-203271 | 0769 | - | F | Clarification on the usage of auxiliary bands | 16.5.0 |
| 2020-09 | RAN#89 | R5-203272 | 0770 | - | F | Remove IE includeBeamMeasurements from 6.6.1.5 and 6.6.1.6 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203280 | 0772 | - | F | n26 addition to group of bands in TS.38.533 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203299 | 0773 | - | F | Corrected test description in non-DRX test case 6.5.1.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203300 | 0774 | - | F | Correction of comment for monitoringSymbolsWithinSlot | 16.5.0 |
| 2020-09 | RAN#89 | R5-203301 | 0775 | - | F | Correction of delta offset application for Cell 2 in test case 4.7.1.2.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203303 | 0777 | - | F | PUSCH allocation correction in test case 6.4.3.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203304 | 0778 | - | F | Correction to the RRC Reconfiguration message for measurements | 16.5.0 |
| 2020-09 | RAN#89 | R5-203306 | 0779 | - | F | Update extreme conditions limits in TC 4.7.1.2.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203307 | 0780 | - | F | Update extreme conditions limits in TC 6.7.1.2.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-203308 | 0781 | - | F | Update extreme conditions limits in TC 4.7.1.2.1 and TC 6.7.1.2.1 - Annex F | 16.5.0 |
| 2020-09 | RAN#89 | R5-203309 | 0782 | - | F | Correction power offset for Band Group F | 16.5.0 |
| 2020-09 | RAN#89 | R5-203317 | 0786 | - | F | Removing SearchSpaceId and ControlResourceSetId modification | 16.5.0 |
| 2020-09 | RAN#89 | R5-203319 | 0788 | - | F | Unification of cell frequency for FR1-FR1 test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-203732 | 0790 | - | F | Set ss-sinr request to false for EN-DC RRM measurement accuracy tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-203733 | 0791 | - | F | Set ss-sinr request to false for NR SA RRM measurement accuracy tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-203832 | 0798 | - | F | Update of 4.5.6.1.0 minimum requirement for DCI-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-203835 | 0801 | - | F | Update of 4.5.6.2.0 minimum requirement for RRC-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-203837 | 0803 | - | F | Update of FR1 Test Tolerance in 6.3.2.1.3 RRC re-establishment without serving cell timing | 16.5.0 |
| 2020-09 | RAN#89 | R5-203838 | 0804 | - | F | Addition of 6.5.2.0 minimum requirement for interruptions during measurements on NR SCC | 16.5.0 |
| 2020-09 | RAN#89 | R5-203839 | 0805 | - | F | Update of 6.5.2.1 interruptions during measurements on deactivated NR SCC | 16.5.0 |
| 2020-09 | RAN#89 | R5-203840 | 0806 | - | F | Addition of new Test Case 6.5.3.1 SCell activation and deactivation for 160ms cycle | 16.5.0 |

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| 2020-09 | RAN#89 | R5-203841 | 0807 | - | F | Addition of new Test Case 6.5.3.2 SCell activation and deactivation for 320ms cycle | 16.5.0 |
| 2020-09 | RAN#89 | R5-203842 | 0808 | - | F | Addition of new Test Case 6.5.3.3 SCell activation and deactivation of unknown SCell | 16.5.0 |
| 2020-09 | RAN#89 | R5-203847 | 0813 | - | F | Update of 6.5.6.1.0 minimum requirement for DCI-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-203850 | 0816 | - | F | Update of 6.5.6.2.0 minimum requirement for RRC-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-203853 | 0819 | - | F | Correction to FR1 intra-frequency measurement with gap test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-203855 | 0821 | - | F | Update of Cell mapping in Annex E | 16.5.0 |
| 2020-09 | RAN#89 | R5-204034 | 0827 | - | F | CR to 38.533 on RRM Test Cases in clause 7.5.3 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204036 | 0828 | - | F | CR to 38.533 on RRM Test Cases in clause 7.5.7 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204068 | 0829 | - | F | Correction to FR2 timing advance adjustment accuracy | 16.5.0 |
| 2020-09 | RAN#89 | R5-204069 | 0830 | - | F | Correction to EN-DC FR2 interruptions at transitions between active and non-active during DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204070 | 0831 | - | F | Addition of E-UTRA Test frequency selection rule for IRAT test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-204071 | 0832 | - | F | Correction on event-triggered reporting with gap in DRX and DRX configuration settings for NR serving cell | 16.5.0 |
| 2020-09 | RAN#89 | R5-204072 | 0833 | - | F | Correction to EN-DC and SA FR1-FR1 SS-RSRP and SS-RSRQ periodical measurement accuracy | 16.5.0 |
| 2020-09 | RAN#89 | R5-204073 | 0834 | - | F | Correction to SS-RSRQ periodical measurement accuracy | 16.5.0 |
| 2020-09 | RAN#89 | R5-204075 | 0836 | - | F | Correction to message configuration for radio link monitoring tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204076 | 0837 | - | F | Correction to NR SA FR1 E-UTRA RRC connection release with redirection | 16.5.0 |
| 2020-09 | RAN#89 | R5-204077 | 0838 | - | F | Correction to SRS PeriodicityAndOffset for Timing Advance tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204079 | 0840 | - | F | Correction to CSI-RS for tracking for TDD FR2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204116 | 0841 | - | F | Correction of EN-DC FR2 SSB-based L1-RSRP measurement test case 5.6.3.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204118 | 0843 | - | F | Correction of EN-DC FR2 CSI-RS-based L1-RSRP measurement test case 5.6.3.3 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204119 | 0844 | - | F | Correction of EN-DC FR2 CSI-RS-based L1-RSRP measurement test case 5.6.3.4 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204122 | 0847 | - | F | Correction of NR SA FR2 SSB-based L1-RSRP measurement test case 7.6.3.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204123 | 0848 | - | F | Correction of NR SA FR2 SSB-based L1-RSRP measurement test case 7.6.3.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204124 | 0849 | - | F | Correction of NR SA FR2 CSI-RS-based L1-RSRP measurement test case 7.6.3.3 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204125 | 0850 | - | F | Correction of NR SA FR2 CSI-RS-based L1-RSRP measurement test case 7.6.3.4 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204126 | 0851 | - | F | Correction of minimum conformance requirements 4.6.4.0 for EN-DC FR1 L1-RSRP measurement test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-204127 | 0852 | - | F | Correction of minimum conformance requirements 5.6.3.0 for EN-DC FR2 L1-RSRP measurement test cases | 16.5.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-09 | RAN#89 | R5-204128 | 0853 | - | F | Correction of minimum conformance requirements 7.6.3.0 for SA FR2 L1-RSRP measurement test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-204220 | 0854 | - | F | Update missing SMTC and SSB configurations in H.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204221 | 0855 | - | F | Update missing SMTC and SSB configurations in H.3 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204222 | 0856 | - | F | Editorial: correct table placement in H.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204285 | 0859 | - | F | Correction to Message Exceptions for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection | 16.5.0 |
| 2020-09 | RAN#89 | R5-204337 | 0874 | - | F | Addition of 4.5.5.0 minimum requirement for BFR | 16.5.0 |
| 2020-09 | RAN#89 | R5-204730 | 0792 | 1 | F | Update of PDSCH RMC in Annex A.1.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204733 | 0793 | 1 | F | Correction of RRM Test Case 6.1.1.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204734 | 0824 | 1 | F | Correction of RRM Test Case 6.1.1.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204735 | 0825 | 1 | F | Correction of RRM Test Case 7.1.1.1 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204736 | 0826 | 1 | F | Correction of RRM Test Case 7.1.1.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204775 | 0751 | 1 | F | Update TC 4.7.4.1.2 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204776 | 0753 | 1 | F | Update TC 4.7.4.2.2 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204777 | 0771 | 1 | F | Correction of measurement gap configuration for intra-frequency even-triggered tests needing gap | 16.5.0 |
| 2020-09 | RAN#89 | R5-204778 | 0755 | 1 | F | Update TC 6.7.4.1.2 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204779 | 0757 | 1 | F | Update TC 6.7.4.2.2 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204780 | 0762 | 1 | F | Correction to the test procedure of NR SA event triggered tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204781 | 0763 | 1 | F | Correction to the test procedure of NR SA event triggered tests inter-freq | 16.5.0 |
| 2020-09 | RAN#89 | R5-204782 | 0764 | 1 | F | Correction to the test procedure of NR SA event triggered tests inter-RAT | 16.5.0 |
| 2020-09 | RAN#89 | R5-204783 | 0749 | 1 | F | Update TC 8.5.2.3.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204784 | 0760 | 1 | F | Annex E and F update with TT results for 6.7.4.x.x NR SA L1-RSRP periodic reporting test cases | 16.5.0 |
| 2020-09 | RAN#89 | R5-204785 | 0785 | 1 | F | Correction in A.1.4 CSI-RS for nzp-CSI-RS-ResourceId values | 16.5.0 |
| 2020-09 | RAN#89 | R5-204786 | 0820 | 1 | F | Update of FR1 Test Tolerance in Annex F | 16.5.0 |
| 2020-09 | RAN#89 | R5-204787 | 0823 | 1 | F | Correction to default configurations in Annex H | 16.5.0 |
| 2020-09 | RAN#89 | R5-204872 | 0857 | 1 | F | Correction to Test Procedure and sync to latest RAN4 in 4.4.1.1 EN-DC FR1 UE transmit timing accuracy | 16.5.0 |
| 2020-09 | RAN#89 | R5-204873 | 0858 | 1 | F | Correction to Test Procedure and sync to latest RAN4 in 6.4.1.1 NR SA FR1 UE transmit timing accuracy | 16.5.0 |
| 2020-09 | RAN#89 | R5-204874 | 0866 | 1 | F | Correction to 6.5.1.1 NR SA FR1 RLM OOS test with SSB-based RLM-RS in non-DRX mode, sync to latest RAN4 Core Spec | 16.5.0 |
| 2020-09 | RAN#89 | R5-204875 | 0867 | 1 | F | Correction to 6.5.1.2 NR SA FR1 RLM IS test with SSB-based RLM-RS in non-DRX mode, sync to latest RAN4 Core Spec | 16.5.0 |
| 2020-09 | RAN#89 | R5-204876 | 0868 | 1 | F | Correction to 6.5.1.3 NR SA FR1 RLM OOS test with SSB-based RLM-RS in DRX mode, sync to latest RAN4 Core Spec | 16.5.0 |
| 2020-09 | RAN#89 | R5-204877 | 0869 | 1 | F | Correction to 6.5.1.4 NR SA FR1 RLM IS test with SSB-based RLM-RS in DRX mode, sync to latest RAN4 Core Spec | 16.5.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-09 | RAN#89 | R5-204878 | 0750 | 1 | F | Update TC 4.7.4.1.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204879 | 0752 | 1 | F | Update TC 4.7.4.2.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204880 | 0754 | 1 | F | Update TC 6.7.4.1.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204881 | 0756 | 1 | F | Update TC 6.7.4.2.1 with TT results and message contents | 16.5.0 |
| 2020-09 | RAN#89 | R5-204882 | 0776 | 1 | F | Gap Pattern Id correction in section 6.6.2 to align to core spec 38.133 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204883 | 0787 | 1 | F | Test Procedure correction in test case 6.5.1.3 for definition of Point C | 16.5.0 |
| 2020-09 | RAN#89 | R5-204884 | 0789 | 1 | F | Addition of new RRM Test Cases in clause 7.5.5 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204885 | 0783 | 1 | F | CR to update the RRM FR2 MUs in Annex F | 16.5.0 |
| 2020-09 | RAN#89 | R5-204886 | 0784 | 1 | F | Add information on the AoA change during test for RRM FR2 tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204941 | 0835 | 1 | F | Correction to connection diagram for radio link monitoring tests | 16.5.0 |
| 2020-09 | RAN#89 | R5-204942 | 0842 | 1 | F | Correction of EN-DC FR2 SSB-based L1-RSRP measurement test case 5.6.3.2 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204943 | 0845 | 1 | F | Correction of FR2 condition tables in Annex B | 16.5.0 |
| 2020-09 | RAN#89 | R5-204944 | 0846 | 1 | F | Introduction of band n259 in clause 3 | 16.5.0 |
| 2020-09 | RAN#89 | R5-204985 | 0794 | 1 | F | Update of FR1 Test Tolerance in 4.5.5.1 SSB based BFR in non-DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204986 | 0795 | 1 | F | Update of FR1 Test Tolerance in 4.5.5.2 SSB based BFR in DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204987 | 0796 | 1 | F | Addition of new Test Case 4.5.5.3 CSI-RS based BFR non-DRX with FR1 Test Tolerance | 16.5.0 |
| 2020-09 | RAN#89 | R5-204988 | 0797 | 1 | F | Update of FR1 Test Tolerance in 4.5.5.4 CSI-RS based BFR in DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204989 | 0799 | 1 | F | Update of FR1 Test Tolerance in 4.5.6.1.1 DCI-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-204990 | 0800 | 1 | F | Update of FR1 Test Tolerance in 4.5.6.1.2 DCI-based BWP switch with SCell | 16.5.0 |
| 2020-09 | RAN#89 | R5-204991 | 0802 | 1 | F | Update of FR1 Test Tolerance in 4.5.6.2.1 RRC-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-204992 | 0809 | 1 | F | Update of FR1 Test Tolerance in 6.5.5.1 SSB based BFR in non-DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204993 | 0810 | 1 | F | Update of FR1 Test Tolerance in 6.5.5.2 SSB based BFR in DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204994 | 0811 | 1 | F | Update of FR1 Test Tolerance in 6.5.5.3 CSI-RS based BFR in non-DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204995 | 0812 | 1 | F | Update of FR1 Test Tolerance in 6.5.5.4 CSI-RS based BFR in DRX | 16.5.0 |
| 2020-09 | RAN#89 | R5-204996 | 0814 | 1 | F | Update of FR1 Test Tolerance in 6.5.6.1.1 DCI-based BWP switch with SCell | 16.5.0 |
| 2020-09 | RAN#89 | R5-204997 | 0815 | 1 | F | Addition of new Test Case 6.5.6.1.2 DCI-based BWP switch with FR1 Test Tolerance | 16.5.0 |
| 2020-09 | RAN#89 | R5-204998 | 0817 | 1 | F | Update of FR1 Test Tolerance in 6.5.6.2.1 RRC-based BWP switch | 16.5.0 |
| 2020-09 | RAN#89 | R5-204999 | 0818 | 1 | F | Update of test parameters in 6.3.1.4 inter-RAT handover | 16.5.0 |
| 2020-09 | RAN#89 | R5-205000 | 0822 | 1 | F | Update of default configurations for RMC scheduling in Annex A | 16.5.0 |
| 2020-12 | RAN#90 | R5-205051 | 0879 | - | F | Message contents for RRM iRAT | 16.6.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-12 | RAN#90 | R5-205059 | 0884 | - | F | Message contents for RRM PSCell addition | 16.6.0 |
| 2020-12 | RAN#90 | R5-205063 | 0885 | - | F | Update RRM 8.5.2.1.2 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-205068 | 0890 | - | F | Correction of the measObjectID, measID and reportConfigID in Annex H | 16.6.0 |
| 2020-12 | RAN#90 | R5-205070 | 0892 | - | F | Remove includeBeamMeasurements requirement for TC4.6.1.5 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205257 | 0907 | - | F | NR Band n53 addition to RRM group of bands | 16.6.0 |
| 2020-12 | RAN#90 | R5-205296 | 0914 | - | F | Add FR2 Fading MU values | 16.6.0 |
| 2020-12 | RAN#90 | R5-205813 | 0920 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205814 | 0921 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205815 | 0922 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.3 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205816 | 0923 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.4 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205817 | 0924 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.5 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205818 | 0925 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.6 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205819 | 0926 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.7 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205820 | 0927 | - | F | Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.8 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205821 | 0928 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205822 | 0929 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205823 | 0930 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.3 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205824 | 0931 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.4 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205826 | 0933 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.6 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205827 | 0934 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.7 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205828 | 0935 | - | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.8 | 16.6.0 |
| 2020-12 | RAN#90 | R5-205834 | 0939 | - | F | Correction of message content exceptions in Annex H | 16.6.0 |
| 2020-12 | RAN#90 | R5-205953 | 0946 | - | F | Update of FR1 TT in 8.4.1.1 inter-RAT SFTD in non-DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-205954 | 0947 | - | F | Update of FR1 TT in 8.4.1.2 inter-RAT SFTD in DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-205960 | 0953 | - | F | Addition of test case 5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions | 16.6.0 |
| 2020-12 | RAN#90 | R5-205961 | 0954 | - | F | Update of test case 5.5.3.1 EN-DC FR2 SCell activation and deactivation | 16.6.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-12 | RAN#90 | R5-205963 | 0956 | - | F | Update of 7.3.2.1.3 SA FR2 RRC re-establishment without serving cell timing | 16.6.0 |
| 2020-12 | RAN#90 | R5-205967 | 0960 | - | F | Update of Annex E for cell mapping | 16.6.0 |
| 2020-12 | RAN#90 | R5-205975 | 0964 | - | F | Correction to default configuration in Annex H | 16.6.0 |
| 2020-12 | RAN#90 | R5-205976 | 0965 | - | F | Correction to SSB reference configuration | 16.6.0 |
| 2020-12 | RAN#90 | R5-206100 | 0968 | - | F | Correction to EN-DC FR1 interruptions at transitions between active and non-active during DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-206102 | 0970 | - | F | Correction to FR1 NSA SS-SINR measurement TCs | 16.6.0 |
| 2020-12 | RAN#90 | R5-206105 | 0973 | - | F | Correction to message exception for inter-RAT reselection TCs | 16.6.0 |
| 2020-12 | RAN#90 | R5-206106 | 0974 | - | F | Editorial correction of RSRP tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206111 | 0976 | - | F | Update of Annex C.1.3 of default connection setup | 16.6.0 |
| 2020-12 | RAN#90 | R5-206156 | 0977 | - | F | Addition of missing PRACH configuration 4 for FR1 and FR2 applicability | 16.6.0 |
| 2020-12 | RAN#90 | R5-206214 | 0979 | - | F | Alignment test parameter table with TS 38.133 in SA cell reselection test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206215 | 0980 | - | F | Alignment test parameter table with TS 38.133 in SA handover test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206216 | 0981 | - | F | Addition RLM IE into event trigger reporting CSI-RS based RLM | 16.6.0 |
| 2020-12 | RAN#90 | R5-206217 | 0982 | - | F | Addition RLM IE into event trigger reporting SSB based | 16.6.0 |
| 2020-12 | RAN#90 | R5-206219 | 0984 | - | F | Update message content section in SS-SINR test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206221 | 0985 | - | F | Update to Section 5.4.1.1 NSA FR2 Transmit Timing Accuracy | 16.6.0 |
| 2020-12 | RAN#90 | R5-206222 | 0986 | - | F | Update to Section 5.4.3.1 NSA FR2 Timing Advance Accuracy | 16.6.0 |
| 2020-12 | RAN#90 | R5-206606 | 0998 | - | F | Update of CSI-RS RMC configuration in Annex A | 16.6.0 |
| 2020-12 | RAN#90 | R5-206672 | 0918 | 1 | F | Editorial CR to clarify SS-RSRP dBm / 15 kHz for PRACH tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206673 | 0941 | 1 | F | Correction of RRM TC 4.7.2.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206674 | 0943 | 1 | F | Update of message contents for EN-DC RLM test case | 16.6.0 |
| 2020-12 | RAN#90 | R5-206675 | 0969 | 1 | F | Correction to FR1 Inter frequency Event triggered Reporting test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206677 | 0987 | 1 | F | Update to Message Exceptions for 4.3.2.2.2 EN-DC Non Contention Based Random Access | 16.6.0 |
| 2020-12 | RAN#90 | R5-206678 | 0989 | 1 | F | Update to 4.5.1.1 NSA FR1 OOS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206679 | 0990 | 1 | F | Update to 4.5.1.2 NSA FR1 IS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206680 | 0991 | 1 | F | Update to 4.5.1.3 NSA FR1 OOS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206681 | 0992 | 1 | F | Update to 4.5.1.4 NSA FR1 IS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206682 | 0993 | 1 | F | Update to 6.5.1.1 SA FR1 OOS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206683 | 0994 | 1 | F | Update to 6.5.1.2 SA FR1 IS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-12 | RAN#90 | R5-206684 | 0995 | 1 | F | Update to 6.5.1.3 SA FR1 OOS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206685 | 0996 | 1 | F | Update to 6.5.1.4 SA FR1 IS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx | 16.6.0 |
| 2020-12 | RAN#90 | R5-206686 | 0952 | 1 | F | Update of 5.5.1 EN-DC FR2 radio link monitoring | 16.6.0 |
| 2020-12 | RAN#90 | R5-206687 | 0955 | 1 | F | Update of 5.5.5 EN-DC FR2 Beam failure detection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206688 | 0891 | 1 | F | Corrections to re-selection test procedure | 16.6.0 |
| 2020-12 | RAN#90 | R5-206689 | 0896 | 1 | F | Correction of RRM TC 6.1.1.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206690 | 0897 | 1 | F | Correction of RRM TC 6.1.2.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206691 | 0899 | 1 | F | Correction of RRM TC 6.3.2.2.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206692 | 0910 | 1 | F | Correction of RRM TC 6.5.5.3 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206693 | 0911 | 1 | F | Correction of RRM TC 6.5.5.4 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206694 | 0919 | 1 | F | Editorial CR to clarify SS-RSRP dBm / 15 kHz for SA PRACH tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206695 | 0942 | 1 | F | Correction of RRM TC 6.7.2.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206696 | 0961 | 1 | F | Update of FR1 TT in 6.1.1.1 intra-freq re-selection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206697 | 0962 | 1 | F | Correction of clause 6.1 cell re-selection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206698 | 0967 | 1 | F | Correction to NR SA RLM out-of-sync test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206699 | 0983 | 1 | F | Clarification in message exception for SA RLM out of synch test cases in non DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-206700 | 0900 | 1 | F | Correction of RRM TC 7.1.1.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206701 | 0932 | 1 | F | Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.5 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206702 | 0936 | 1 | F | Correction of NR SA FR2 RRC re-establishment test case 7.3.2.1.1 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206703 | 0937 | 1 | F | Correction of NR SA FR2-FR2 RRC re-establishment test case 7.3.2.1.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206704 | 0957 | 1 | F | Update of clause 7.5.5 SA FR2 Beam failure detection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206705 | 0958 | 1 | F | Update of clause 7.6.1 SA FR2 Intra-frequency measurements | 16.6.0 |
| 2020-12 | RAN#90 | R5-206706 | 0889 | 1 | F | Correction of the message contents for RRM re-selection test cases | 16.6.0 |
| 2020-12 | RAN#90 | R5-206707 | 0917 | 1 | F | Correction to the aggregation level in the CORESET for RMC scheduling | 16.6.0 |
| 2020-12 | RAN#90 | R5-206708 | 0938 | 1 | F | Correction of clause 3.3 Abbreviations | 16.6.0 |
| 2020-12 | RAN#90 | R5-206709 | 0963 | 1 | F | Update of Annex H for cell re-selection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206797 | 0882 | 1 | F | Complete RRM 4.5.7.1 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206798 | 0875 | 1 | F | Complete RRM 6.7.5.1 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206799 | 0916 | 1 | F | Add FR2 PRACH Test cases 7.3.2.2.1 and 7.3.2.2.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206800 | 0944 | 1 | F | Update of FR1 TT in 8.2.1.1 inter-RAT cell re-selection | 16.6.0 |
| 2020-12 | RAN#90 | R5-206801 | 0945 | 1 | F | Update of FR1 TT in 8.3.1.1 inter-RAT handover | 16.6.0 |
| 2020-12 | RAN#90 | R5-206802 | 0948 | 1 | F | Update of FR1 TT in 8.4.2.1 inter-RAT event-triggered reporting without SSB time index in non-DRX | 16.6.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2020-12 | RAN#90 | R5-206803 | 0949 | 1 | F | Update of FR1 TT in 8.4.2.2 inter-RAT event-triggered reporting without SSB time index in DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-206804 | 0950 | 1 | F | Update of FR1 TT in 8.4.2.3 inter-RAT event-triggered reporting with SSB time index in non-DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-206805 | 0951 | 1 | F | Update of FR1 TT in 8.4.2.4 inter-RAT event-triggered reporting with SSB time index in DRX | 16.6.0 |
| 2020-12 | RAN#90 | R5-206806 | 0878 | 1 | F | Annex E and F iRAT measurement accuracy tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206807 | 0888 | 1 | F | Annex E and F iRAT FR2 measurement accuracy tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206808 | 0959 | 1 | F | Update of Annex F for Test Tolerance | 16.6.0 |
| 2020-12 | RAN#90 | R5-206834 | 0915 | 1 | F | Update FR2 Downlink and Es/Noc MU values | 16.6.0 |
| 2020-12 | RAN#90 | R5-206843 | 0876 | 1 | F | Complete RRM 6.7.6.1 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206844 | 0886 | 1 | F | Update RRM 8.5.2.2.2 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206871 | 0894 | 1 | F | Correction of RRM TC 4.3.2.2.2 | 16.6.0 |
| 2020-12 | RAN#90 | R5-206872 | 0905 | 1 | F | New DRX configuration for RLM TC | 16.6.0 |
| 2020-12 | RAN#90 | R5-206895 | 0971 | 1 | F | Correction to message configuration for NSA radio link monitoring CSI-RS Based in DRX mode tests | 16.6.0 |
| 2020-12 | RAN#90 | R5-206906 | 0880 | 1 | F | Complete RRM 4.7.5.1 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206907 | 0877 | 1 | F | Complete RRM 6.7.7.1 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206908 | 0972 | 1 | F | Correction to message configuration for SA radio link monitoring CSI RS Based RLM-RS | 16.6.0 |
| 2020-12 | RAN#90 | R5-206909 | 0887 | 1 | F | Update RRM 8.5.2.3.2 including TT analysis results | 16.6.0 |
| 2020-12 | RAN#90 | R5-206910 | 0881 | 1 | F | Annex E and F 4.7.5.1 SFTD measurement accuracy test | 16.6.0 |
| 2021-03 | RAN#91 | R5-210134 | 0999 | - | F | Update of first preamble power for EN-DC TC 4.3.2.2.1 and 4.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210135 | 1000 | - | F | Update of first preamble power for SA TC 6.3.2.2.1 and 6.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210136 | 1001 | - | F | Update of UE initial state for SA RLM TC 6.5.1.x | 16.7.0 |
| 2021-03 | RAN#91 | R5-210137 | 1002 | - | F | Update of process delay for SFTD measurement TC 8.4.1.x | 16.7.0 |
| 2021-03 | RAN#91 | R5-210138 | 1003 | - | F | Update of cell frequency for TC 6.7.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210171 | 1004 | - | F | Editorial update of SS-RSRP for TC 6.7.1.2.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210173 | 1006 | - | F | Update of RRC message for TC 6.4.3.1 and 6.5.2.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210176 | 1009 | - | F | Update of SCell activation and CSI reporting time for EN-DC TC 5.5.3.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210177 | 1010 | - | F | Update of CSI reporting time for SA TC 7.5.3.1 and 7.5.3.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210178 | 1011 | - | F | Update of PRACH configuration for SA TC 7.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210179 | 1012 | - | F | Update of PRACH configuration for EN-DC TC 4.5.5.3 and 4.5.5.4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210180 | 1013 | - | F | Update of PRACH configuration for EN-DC TC 5.5.5.x | 16.7.0 |
| 2021-03 | RAN#91 | R5-210181 | 1014 | - | F | Update of PRACH configuration for SA TC 6.5.5.3 and 6.5.5.4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210182 | 1015 | - | F | Update of PRACH configuration for SA TC 7.5.5.x | 16.7.0 |
| 2021-03 | RAN#91 | R5-210183 | 1016 | - | F | Update of prach-ConfigurationIndex for FR1 PRACH configuration 4 in A.7 | 16.7.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-03 | RAN#91 | R5-210279 | 1017 | - | F | Addition of minimum conformance requirements for R16 NR HST cell re-selection in 6.1.1.0 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210281 | 1019 | - | F | Addition of minimum conformance requirements for R16 NR HST measurement in 6.6.1.0 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210283 | 1021 | - | F | Update of Annex H.2.1-3 for R16 NR HST | 16.7.0 |
| 2021-03 | RAN#91 | R5-210434 | 1025 | - | F | Correct cell mapping for 5.4.3.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210437 | 1027 | - | F | Annex E and F 4.5.7.1 PSCell addition test | 16.7.0 |
| 2021-03 | RAN#91 | R5-210440 | 1029 | - | F | Update of TT analysis results in Annex F for FR2 iRAT test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210442 | 1030 | - | F | Update TT results for SS-RSRP measurement accuracy test cases chapter 4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210443 | 1031 | - | F | Update TT results for SS-RSRP measurement accuracy test cases chapter 6 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210444 | 1032 | - | F | Update TT results for SS-RSRP measurement accuracy test cases Annex F | 16.7.0 |
| 2021-03 | RAN#91 | R5-210446 | 1033 | - | F | Update TT results for SS-RSRQ measurement accuracy test cases chapter 4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210447 | 1034 | - | F | Update TT results for SS-RSRQ measurement accuracy test cases chapter 6 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210448 | 1035 | - | F | Update TT results for SS-RSRQ measurement accuracy test cases Annex F | 16.7.0 |
| 2021-03 | RAN#91 | R5-210456 | 1039 | - | F | Update Annex I to TS 38.533 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210457 | 1040 | - | F | Update NR frequency band groups for FR1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210458 | 1041 | - | F | Correction RLM config for event triggered test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210465 | 1046 | - | F | Editorial correction of title of clause 6 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210466 | 1047 | - | F | Corrections to 6.3.2.2.1 and 6.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210467 | 1048 | - | F | Corrections to 4.3.2.2.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210470 | 1049 | - | F | Clarification on SSB Index to use in the PUxCH-PowerControl for RRM tests with more than one SSB | 16.7.0 |
| 2021-03 | RAN#91 | R5-210471 | 1050 | - | F | Clarification on SSB Index to use in the PUxCH-PowerControl for RRM tests with more than one SSB - EN-DC | 16.7.0 |
| 2021-03 | RAN#91 | R5-210472 | 1051 | - | F | Editorial: correct title of PRACH test cases to match RRM work plan - EN-DC FR1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210473 | 1052 | - | F | Editorial: correct title of PRACH test cases to match RRM work plan - SA FR1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210474 | 1053 | - | F | Editorial: correct title of PRACH test cases to match RRM work plan - SA FR2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210475 | 1054 | - | F | Editorial: correct title of PRACH test cases to match RRM work plan - Annexes | 16.7.0 |
| 2021-03 | RAN#91 | R5-210507 | 1056 | - | F | Correction of test applicability for long DRX cycle related test cases in section 4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210508 | 1057 | - | F | Correction of test applicability for long DRX cycle related test cases in section 5 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210509 | 1058 | - | F | Correction of test applicability for long DRX cycle related test cases in section 6 | 16.7.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-03 | RAN#91 | R5-210510 | 1059 | - | F | Correction of test applicability for long DRX cycle related test cases in section 7 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210511 | 1060 | - | F | Correction of test applicability for long DRX cycle related test cases in section 8 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210528 | 1062 | - | F | Correction to test procedure in test case 6.5.1.4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210529 | 1063 | - | F | Correction to Interruptions during measurements on deactivated NR SCC test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210530 | 1064 | - | F | Correction to message configuration for NSA CSI-RS-based RLM-RS test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210531 | 1065 | - | F | Correction to NR SA RLM out-of-sync test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210532 | 1066 | - | F | Correction to NR SA FR1 RRC Re-establishment test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210533 | 1067 | - | F | Correction to 4.5.1.2 and 6.5.1.2 PDCCH Aggregation Level | 16.7.0 |
| 2021-03 | RAN#91 | R5-210535 | 1069 | - | F | Correction to FR1 NSA SS-SINR measurement test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210536 | 1070 | - | F | Correction to L1-RSRP test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210537 | 1071 | - | F | Correction to the procedure to add a step for establishing SRB2 and DRB | 16.7.0 |
| 2021-03 | RAN#91 | R5-210538 | 1072 | - | F | Update of DRX configuration in FR1 Event-triggered Test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-210601 | 1073 | - | F | Clarification of BWP1 and BWP2 in 6.6.1.3, 6.6.1.4, 6.6.1.6 | 16.7.0 |
| 2021-03 | RAN#91 | R5-210608 | 1077 | - | F | Correction in 4.5.2.1 and 4.5.2.2 test procedure | 16.7.0 |
| 2021-03 | RAN#91 | R5-210613 | 1079 | - | F | Correction in SIB5 for iRAT cell reselection | 16.7.0 |
| 2021-03 | RAN#91 | R5-210614 | 1080 | - | F | Correction in 6.1.2.2 test procedure | 16.7.0 |
| 2021-03 | RAN#91 | R5-210814 | 1085 | - | F | Finalise FR2 Timing MU values | 16.7.0 |
| 2021-03 | RAN#91 | R5-210816 | 1086 | - | F | Update of FR2 Tx Timing Test case 5.4.1.1 Test Tolerances | 16.7.0 |
| 2021-03 | RAN#91 | R5-210851 | 1089 | - | F | Update of FR1 TT for 4.5.5.1 and 4.5.5.2 SSB based LR | 16.7.0 |
| 2021-03 | RAN#91 | R5-210852 | 1090 | - | F | Update of FR1 TT for 4.5.5.3 and 4.5.5.4 CSI-RS based LR | 16.7.0 |
| 2021-03 | RAN#91 | R5-210853 | 1091 | - | F | Correction to 4.6.4.3 and 4.6.4.4 L1-RSRP reporting delay | 16.7.0 |
| 2021-03 | RAN#91 | R5-210857 | 1095 | - | F | Update of FR1 TT for 6.5.5.1 and 6.5.5.2 SSB based LR | 16.7.0 |
| 2021-03 | RAN#91 | R5-210858 | 1096 | - | F | Update of FR1 TT for 6.5.5.3 and 6.5.5.4 CSI-RS based LR | 16.7.0 |
| 2021-03 | RAN#91 | R5-210860 | 1098 | - | F | Correction to 6.6.4.3 and 6.6.4.4 L1-RSRP reporting delay | 16.7.0 |
| 2021-03 | RAN#91 | R5-210863 | 1101 | - | F | Update of 6.5.3.1 SCell activation and deactivation | 16.7.0 |
| 2021-03 | RAN#91 | R5-210864 | 1102 | - | F | Update of D.4 antenna configuration | 16.7.0 |
| 2021-03 | RAN#91 | R5-210866 | 1104 | - | F | Correction to CSI-RS RMC | 16.7.0 |
| 2021-03 | RAN#91 | R5-210867 | 1105 | - | F | Correction to default configuration on L1-RSRP reporting in Annex H | 16.7.0 |
| 2021-03 | RAN#91 | R5-210959 | 1113 | - | F | Update to 6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay | 16.7.0 |
| 2021-03 | RAN#91 | R5-211049 | 1116 | - | F | Additional of default downlink level for FR2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211219 | 1124 | - | F | Correction of the minimum conformance requirements for Inter-RAT measurements 6.6.3.0 | 16.7.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-03 | RAN#91 | R5-211220 | 1125 | - | F | Addition of new RRM iRAT measurement Inter-RAT measurements test case 6.6.3.3 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211255 | 1131 | - | F | Clarification of BWP1 and BWP2 in 4.6.1.3, 4.6.1.4, 4.6.1.6 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211614 | 1007 | 1 | F | Update of SCell activation and CSI reporting time for EN-DC TC 4.5.3.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211615 | 1026 | 1 | F | Complete RRM 4.5.7.1 including TT analysis results | 16.7.0 |
| 2021-03 | RAN#91 | R5-211616 | 1087 | 1 | F | Update Test Tolerance for FR1 RLM Test Cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211617 | 1092 | 1 | F | Correction to EN-DC radio link monitoring | 16.7.0 |
| 2021-03 | RAN#91 | R5-211618 | 1093 | 1 | F | Update of 4.5.3.1 SCell activation and deactivation | 16.7.0 |
| 2021-03 | RAN#91 | R5-211619 | 1108 | 1 | F | Update to 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay | 16.7.0 |
| 2021-03 | RAN#91 | R5-211620 | 1109 | 1 | F | Update to 4.7.5.1 EN-DC FR1 SFTD measurement accuracy | 16.7.0 |
| 2021-03 | RAN#91 | R5-211621 | 1117 | 1 | F | Correction of applied TT for EN-DC FR1 L1-RSRP measurement test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211622 | 1023 | 1 | F | Update 5.4.3.1 with TT analysis results | 16.7.0 |
| 2021-03 | RAN#91 | R5-211623 | 1119 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.1 including TT | 16.7.0 |
| 2021-03 | RAN#91 | R5-211624 | 1120 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.3 including TT | 16.7.0 |
| 2021-03 | RAN#91 | R5-211625 | 1008 | 1 | F | Update of CSI reporting time for SA TC 6.5.3.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211626 | 1094 | 1 | F | Correction to SA radio link monitoring | 16.7.0 |
| 2021-03 | RAN#91 | R5-211627 | 1110 | 1 | F | Update to 6.3.2.2.1 Contention based random access test in FR1 for NR standalone | 16.7.0 |
| 2021-03 | RAN#91 | R5-211628 | 1111 | 1 | F | Update to 6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone | 16.7.0 |
| 2021-03 | RAN#91 | R5-211629 | 1112 | 1 | F | Update to 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC | 16.7.0 |
| 2021-03 | RAN#91 | R5-211630 | 1114 | 1 | F | Update to 6.6.3.1 NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX | 16.7.0 |
| 2021-03 | RAN#91 | R5-211631 | 1115 | 1 | F | Update to 6.6.3.2 NR SA FR1 - E-UTRAN event-triggered reporting in DRX | 16.7.0 |
| 2021-03 | RAN#91 | R5-211632 | 1118 | 1 | F | Correction of applied TT for SA FR1 L1-RSRP measurement test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211633 | 1121 | 1 | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.1 including TT | 16.7.0 |
| 2021-03 | RAN#91 | R5-211634 | 1122 | 1 | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.3 including TT | 16.7.0 |
| 2021-03 | RAN#91 | R5-211635 | 1028 | 1 | F | Complete FR2 iRAT measurement accuracy test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211636 | 1024 | 1 | F | Update Annex F for 5.4.3.1 and 7.4.3.1 with TT analysis results | 16.7.0 |
| 2021-03 | RAN#91 | R5-211637 | 1038 | 1 | F | Update DL AWGN MU for RRM FR2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211638 | 1084 | 1 | F | Update FR2 Downlink and Uplink MU values | 16.7.0 |
| 2021-03 | RAN#91 | R5-211639 | 1103 | 1 | F | Update of Annex F for Test Tolerance | 16.7.0 |
| 2021-03 | RAN#91 | R5-211640 | 1123 | 1 | F | Correction of MTSU and applied TT in Annex F | 16.7.0 |

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| 2021-03 | RAN#91 | R5-211641 | 1130 | 1 | F | Addition of new RMCs and OCNGs into Annex A | 16.7.0 |
| 2021-03 | RAN#91 | R5-211722 | 1042 | 1 | F | Correction EN-DC FR1 timing tests | 16.7.0 |
| 2021-03 | RAN#91 | R5-211723 | 1043 | 1 | F | Corrections to 5.4.1.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211724 | 1061 | 1 | F | Clarification of SNR for 4RX UE in RLM Test Cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211725 | 1076 | 1 | F | Correction in 4.7.3.2.1 test parameters | 16.7.0 |
| 2021-03 | RAN#91 | R5-211726 | 1005 | 1 | F | Update of RRC message for TC 6.3.1.4, 6.3.1.5 and 6.3.2.3.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211727 | 1045 | 1 | F | Corrections NR SA FR1 timing test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211728 | 1097 | 1 | F | Correction to NR TC 6.6.3.2-Inter-RAT DRX | 16.7.0 |
| 2021-03 | RAN#91 | R5-211729 | 1099 | 1 | F | Update of 6.5.1.2 and 6.5.1.4 SSB based RLM | 16.7.0 |
| 2021-03 | RAN#91 | R5-211730 | 1083 | 1 | F | Clarification of BWP1 and BWP2 in 7.6.1.3 and 7.6.1.4 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211731 | 1044 | 1 | F | Addition of Serving Cell Config for RRM timing test cases | 16.7.0 |
| 2021-03 | RAN#91 | R5-211827 | 1018 | 1 | F | Addition of new test case 6.1.1.7 for R16 NR HST | 16.7.0 |
| 2021-03 | RAN#91 | R5-211828 | 1020 | 1 | F | Addition of new test case 6.6.1.7 for R16 NR HST | 16.7.0 |
| 2021-03 | RAN#91 | R5-211829 | 1022 | 1 | F | Addition of cell configuration mapping in Annex E for R16 NR HST | 16.7.0 |
| 2021-03 | RAN#91 | R5-211830 | 1126 | 1 | F | Correction of the minimum conformance requirements for E-UTRA - NR FR1 Cell reselection 8.2.1.0 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211831 | 1127 | 1 | F | Addition of new RRM E-UTRA - NR FR1 Cell reselection test case 8.2.1.2 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211832 | 1128 | 1 | F | Correction of the minimum conformance requirements for E-UTRA - NR Inter-RAT event triggered reporting tests 8.4.2.0 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211833 | 1129 | 1 | F | Addition of new RRM E-UTRA - NR Inter-RAT event triggered reporting test case 8.4.2.9 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211889 | 1036 | 1 | F | Update TT results for 6.3.1.1 | 16.7.0 |
| 2021-03 | RAN#91 | R5-211890 | 1037 | 1 | F | Update TT results for 6.3.1.1 Annex F | 16.7.0 |
| 2021-06 | RAN#92 | R5-212024 | 1132 | - | F | Complete 5.7.1.1 with TT analysis results | 16.8.0 |
| 2021-06 | RAN#92 | R5-212025 | 1133 | - | F | Complete 5.7.2.1 with TT analysis results | 16.8.0 |
| 2021-06 | RAN#92 | R5-212026 | 1134 | - | F | Complete 5.7.3.1 with TT analysis results | 16.8.0 |
| 2021-06 | RAN#92 | R5-212256 | 1138 | - | F | Core alignment of TCI state of CSI-RS for TRS | 16.8.0 |
| 2021-06 | RAN#92 | R5-212257 | 1139 | - | F | Introducing additional band for n38 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212265 | 1147 | - | F | Updates to DRX configuration in FR1 Event-triggered Test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212266 | 1148 | - | F | Core alignment of BWP configuration parameter in 6.5.2.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212267 | 1149 | - | F | Correction to CSI-RS based L1-RSRP measurement tests | 16.8.0 |
| 2021-06 | RAN#92 | R5-212612 | 1153 | - | F | Addition of new test case 6.6.4.5 for R16 NR HST | 16.8.0 |
| 2021-06 | RAN#92 | R5-212613 | 1154 | - | F | Addition of cell configuration mapping in Annex E for TC 6.6.4.5 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212712 | 1158 | - | F | Remove obsolete message contents tables after Chapter 7 alignment | 16.8.0 |
| 2021-06 | RAN#92 | R5-212715 | 1161 | - | F | Correcting measurement accuracy iRAT test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212716 | 1162 | - | F | Corrections to 5.4.1.1 | 16.8.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-06 | RAN#92 | R5-212717 | 1163 | - | F | Corrections to 5.4.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212718 | 1164 | - | F | Corrections to 4.4.1.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212719 | 1165 | - | F | Corrections to 4.4.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212720 | 1166 | - | F | Corrections to 6.4.1.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212721 | 1167 | - | F | Corrections to 6.4.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212726 | 1171 | - | F | Correct applicability of Interruption EN-DC test cases with CA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212727 | 1172 | - | F | Correct applicability of SCell activation EN-DC test cases with CA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212728 | 1173 | - | F | Correct applicability of Interruption SA test cases with CA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212729 | 1174 | - | F | Correct applicability of SCell activation SA test cases with CA | 16.8.0 |
| 2021-06 | RAN#92 | R5-212731 | 1175 | - | F | Addition of RRM FR2 EN-DC PRACH test case 5.3.2.2.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212732 | 1176 | - | F | Addition of RRM FR2 EN-DC PRACH test case 5.3.2.2.2 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212737 | 1177 | - | F | Update to test applicability of RRM TC6.5.4.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-212745 | 1178 | - | F | Update to RRM Antenna connection for 4Rx capable Ues | 16.8.0 |
| 2021-06 | RAN#92 | R5-212895 | 1180 | - | F | Correction to FR1 EN-DC interruption during SCell measurement test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212896 | 1181 | - | F | Correction to FR1 EN-DC beam failure recovery test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212900 | 1185 | - | F | Correction to FR1 NR SA TC 6.5.3.1-SCell activation | 16.8.0 |
| 2021-06 | RAN#92 | R5-212901 | 1186 | - | F | Correction to FR1 NR SA beam failure recovery test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212904 | 1189 | - | F | Correction to RMSI CORESET reference configuration in Annex A | 16.8.0 |
| 2021-06 | RAN#92 | R5-212905 | 1190 | - | F | Correction to CSI-RS reference configuration in annex A | 16.8.0 |
| 2021-06 | RAN#92 | R5-212906 | 1191 | - | F | Correction to TRS reference configuration in annex A | 16.8.0 |
| 2021-06 | RAN#92 | R5-212909 | 1194 | - | F | Correction to BWP reference configuration in Annex A | 16.8.0 |
| 2021-06 | RAN#92 | R5-212910 | 1195 | - | F | Correction of minimum requirements for L1-RSRP reporting test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-212911 | 1196 | - | F | Addition of FR1 EN-DC TC 4.6.4.5-HST L1-RSRP | 16.8.0 |
| 2021-06 | RAN#92 | R5-213183 | 1205 | - | F | Extension of Annex I for EIS spherical coverage points | 16.8.0 |
| 2021-06 | RAN#92 | R5-213227 | 1212 | - | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.5 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213228 | 1213 | - | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.6 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213229 | 1214 | - | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.7 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213230 | 1215 | - | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.8 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213240 | 1219 | - | F | Test frequency selection for Inter-frequency RRM test cases in Annex E | 16.8.0 |
| 2021-06 | RAN#92 | R5-213345 | 1222 | - | F | Update on iRAT measurement 6.6.3.2 test case | 16.8.0 |
| 2021-06 | RAN#92 | R5-213346 | 1223 | - | F | Update on Annex H.3.1 for iRAT measurement | 16.8.0 |
| 2021-06 | RAN#92 | R5-213351 | 1224 | - | F | Correction to Coreset and Search Space RMC for FR2 RRM | 16.8.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-06 | RAN#92 | R5-213352 | 1225 | - | F | Correction to Message Exceptions for 6.3.2.2.2 Non-contention based random access test in FR1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-213353 | 1226 | - | F | Correction to PDSCH RMC when DRX is configured | 16.8.0 |
| 2021-06 | RAN#92 | R5-213354 | 1227 | - | F | Correction to intra and inter-frequency reselection test cases with asynchronous cells | 16.8.0 |
| 2021-06 | RAN#92 | R5-213847 | 1179 | 1 | F | Addition of inter-frequency measurements configuration for FR1 EN-DC BFD and RLM test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213848 | 1183 | 1 | F | Addition of inter-frequency measurements configuration for FR1 NR SA BFD and RLM test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213849 | 1184 | 1 | F | Correction to FR1 NR SA interruption during SCell measurement test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213850 | 1193 | 1 | F | Correction to PRACH reference configuration in Annex H | 16.8.0 |
| 2021-06 | RAN#92 | R5-213921 | 1145 | 1 | F | Correction to test procedure for SSB-based L1-RSRP measurement reporting | 16.8.0 |
| 2021-06 | RAN#92 | R5-213922 | 1159 | 1 | F | Remove obsolete message contents tables after Chapter 7 alignment - EN-DC | 16.8.0 |
| 2021-06 | RAN#92 | R5-213923 | 1168 | 1 | F | Corrections to RLM test cases EN-DC | 16.8.0 |
| 2021-06 | RAN#92 | R5-213924 | 1141 | 1 | F | Correction to FR2 RRM test channel reference for Event triggered reporting test | 16.8.0 |
| 2021-06 | RAN#92 | R5-213925 | 1142 | 1 | F | Correction to FR2 RRM test channel reference for RLM and BFD tests | 16.8.0 |
| 2021-06 | RAN#92 | R5-213926 | 1143 | 1 | F | Correction to FR2 RRM test channel reference for UL timing test | 16.8.0 |
| 2021-06 | RAN#92 | R5-213927 | 1208 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.5 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213928 | 1209 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.6 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213929 | 1210 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.7 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213930 | 1211 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.8 including TT | 16.8.0 |
| 2021-06 | RAN#92 | R5-213931 | 1156 | 1 | F | Correct reference to cell mapping for SA test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-213932 | 1160 | 1 | F | Correcting typos in PRACH test case | 16.8.0 |
| 2021-06 | RAN#92 | R5-213933 | 1169 | 1 | F | Corrections to RLM test cases SA | 16.8.0 |
| 2021-06 | RAN#92 | R5-213934 | 1135 | 1 | F | Annex F for EN-DC and SA FR2 Measurement Accuracy | 16.8.0 |
| 2021-06 | RAN#92 | R5-213935 | 1157 | 1 | F | Align Annex H of TS 38.533 to Clause 7 of TS 38.508-1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-213936 | 1202 | 1 | F | Correction to AoA Test Setup applicability per permitted test method | 16.8.0 |
| 2021-06 | RAN#92 | R5-213937 | 1204 | 1 | F | Adapt Annex F to indicate applicability of the RRM FR2 TT analysis results | 16.8.0 |
| 2021-06 | RAN#92 | R5-213938 | 1207 | 1 | F | Correction of MTSU and applied TT in Annex F for FR2 inter-freq measurement test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214009 | 1151 | 1 | F | Addition of 5G-SRVCC RRM TC 6.3.1.6-handover | 16.8.0 |
| 2021-06 | RAN#92 | R5-214010 | 1152 | 1 | F | Addition of 5G-SRVCC RRM TC 6.6.5.1-envent triggered reporting non-DRX | 16.8.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-06 | RAN#92 | R5-214060 | 1182 | 1 | F | Correction to FR1 EN-DC BWP switching test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214061 | 1198 | 1 | F | Update of CSI reporting time for EN-DC FR1 TC 4.5.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214062 | 1199 | 1 | F | Update of CSI reporting time for EN-DC FR2 TC 5.5.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214063 | 1203 | 1 | F | Adapt RRM FR2 test cases to indicate applicability of the TT analysis results | 16.8.0 |
| 2021-06 | RAN#92 | R5-214064 | 1146 | 1 | F | Corrections to NR SA FR1 RRC Re-establishment tests | 16.8.0 |
| 2021-06 | RAN#92 | R5-214065 | 1187 | 1 | F | Correction to FR1 NR SA BWP switch test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214066 | 1200 | 1 | F | Update of CSI reporting time for SA FR1 TC 6.5.3.1 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214067 | 1201 | 1 | F | Update of CSI reporting time for SA FR2 TC 7.5.3.1 and 7.5.3.2 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214068 | 1188 | 1 | F | Correction to NR inter-RAT measurement test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214090 | 1197 | 1 | F | Correction to Annex A.9 on the selection of test direction | 16.8.0 |
| 2021-06 | RAN#92 | R5-214091 | 1206 | 1 | F | Extension of the RSRPB Rx Beak Peak Search method | 16.8.0 |
| 2021-06 | RAN#92 | R5-214092 | 1221 | 1 | F | Update on test frequencies selection for inter-frequency test cases | 16.8.0 |
| 2021-06 | RAN#92 | R5-214108 | 1216 | 1 | F | Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.1 and 5.6.2.3 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214109 | 1217 | 1 | F | Correction of SA FR2 inter-freq measurement test case 7.6.2.1 and 7.6.2.3 | 16.8.0 |
| 2021-06 | RAN#92 | R5-214111 | 1144 | 1 | F | Correction to Interruptions during measurements on deactivated NR SCC | 16.8.0 |
| 2021-06 | RAN#92 | R5-214113 | 1140 | 1 | F | Correction to FR2 event-triggered reporting of intra-frequency cell | 16.8.0 |
| 2021-09 | RAN#93 | R5-214195 | 1232 | - | F | Completion 7.7.2.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-214197 | 1234 | - | F | Annex E and F update for FR2 inter-frequency periodic measurements tests | 16.9.0 |
| 2021-09 | RAN#93 | R5-214198 | 1235 | - | F | Completion 7.7.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214199 | 1236 | - | F | Completion 7.7.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214200 | 1237 | - | F | Completion 7.7.3.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214339 | 1239 | - | F | Correction to 4.5.1.1 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214342 | 1242 | - | F | Correction to 4.5.1.4 core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214343 | 1243 | - | F | Correction to 4.5.1.5 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214345 | 1245 | - | F | Correction to 4.4.1.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214347 | 1247 | - | F | Editorial corrections and core spec alignment for 5.7.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214348 | 1248 | - | F | Editorial corrections and core spec alignment for 5.7.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214349 | 1249 | - | F | Editorial corrections and core spec alignment for 5.7.3.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214350 | 1250 | - | F | Core spec alignment for 5.6.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214351 | 1251 | - | F | Core spec alignment for 5.6.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214352 | 1252 | - | F | Core spec alignment for 5.6.1.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214353 | 1253 | - | F | Core spec alignment for 5.6.1.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214354 | 1254 | - | F | Correction to 5.6.2.1 message contents | 16.9.0 |

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| 2021-09 | RAN#93 | R5-214355 | 1255 | - | F | Correction to 5.6.2.2 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214356 | 1256 | - | F | Correction to 5.6.2.3 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214357 | 1257 | - | F | Correction to 5.6.2.4 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214358 | 1258 | - | F | Correction to 5.6.2.5 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214359 | 1259 | - | F | Correction to 5.6.2.6 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214360 | 1260 | - | F | Correction to 5.6.2.7 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214361 | 1261 | - | F | Correction to 5.6.2.8 message contents | 16.9.0 |
| 2021-09 | RAN#93 | R5-214363 | 1263 | - | F | Correction to 6.5.1.1 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214365 | 1265 | - | F | Correction to 6.5.1.5 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214367 | 1267 | - | F | Correction to 6.3.1.6 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214368 | 1268 | - | F | Correction to 6.5.2.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214370 | 1270 | - | F | Correction to 6.7.5.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214371 | 1271 | - | F | Correction to 6.7.6.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214372 | 1272 | - | F | Correction to 6.7.7.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214373 | 1273 | - | F | Core spec alignment for 7.6.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214374 | 1274 | - | F | Core spec alignment for 7.6.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214375 | 1275 | - | F | Core spec alignment for 7.6.1.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214376 | 1276 | - | F | Core spec alignment for 7.6.1.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214378 | 1278 | - | F | Correction to 8.3.1.1 and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-214395 | 1280 | - | F | Addition of FR1 mobility enhancement TC 6.3.1.9-Intra-band inter-frequency sync DAPS HO in SA for FR1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214407 | 1281 | - | F | Clarification of test procedure for 4.3.2.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214408 | 1282 | - | F | Corrections to 4.7.1.x.y SS-RSRP test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214409 | 1283 | - | F | Corrections to 4.7.2.x SS-RSRQ test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214410 | 1284 | - | F | Corrections to 4.7.3.x SS-SINR test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214411 | 1285 | - | F | Corrections to 4.5.1.6 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214412 | 1286 | - | F | Corrections to 4.5.1.8 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214413 | 1287 | - | F | Core spec alignment of EN-DC FR2 PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-214414 | 1288 | - | F | Corrections to 6.5.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214415 | 1289 | - | F | Corrections to 6.5.1.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214416 | 1290 | - | F | Corrections to 6.7.1.x.y SS-RSRP test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214417 | 1291 | - | F | Corrections to 6.7.2.x SS-RSRQ test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214418 | 1292 | - | F | Corrections to 6.7.3.x SS-SINR test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214419 | 1293 | - | F | Corrections to 6.5.1.6 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214420 | 1294 | - | F | Corrections to 6.5.1.8 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214421 | 1295 | - | F | Align 6.3.2.2.x to core spec | 16.9.0 |

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| 2021-09 | RAN#93 | R5-214422 | 1296 | - | F | Align 6.4.3.1 to core spec | 16.9.0 |
| 2021-09 | RAN#93 | R5-214423 | 1297 | - | F | Align 6.6.2.x to core spec | 16.9.0 |
| 2021-09 | RAN#93 | R5-214424 | 1298 | - | F | Align 6.6.3.x to core spec | 16.9.0 |
| 2021-09 | RAN#93 | R5-214426 | 1300 | - | F | Correction to Table H.3.5-9 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214427 | 1301 | - | F | Clarification CSI-ReportConfig from Annex H | 16.9.0 |
| 2021-09 | RAN#93 | R5-214519 | 1302 | - | F | Addition of FR1 mobility enhancement TC 6.3.1.10-Intra-band inter-frequency asynchronous DAPS HO in SA for FR1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214520 | 1303 | - | F | Addition of FR1 mobility enhancement TC 6.3.1.11-Inter-band inter-frequency sync DAPS HO in SA for FR1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214521 | 1304 | - | F | Addition of FR1 mobility enhancement TC 6.3.1.12-Inter-band inter-frequency asynchronousDAPS HO in SA for FR1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214522 | 1305 | - | F | Update of applicability for RLM TC 4.6.1.3 and 4.6.1.6 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214525 | 1308 | - | F | Update of applicability for RLM TC 6.6.1.3 and 6.6.1.6 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214526 | 1309 | - | F | Correction of cell configuration for SA FR1 TC 6.3.2.1.2 and 6.3.2.1.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214527 | 1310 | - | F | Correction of specific message content for SA FR2 TC 7.6.1.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214528 | 1311 | - | F | Correction of cell configuration for SA FR2 TC 7.3.2.1.1, 7.3.2.1.2 and 7.3.2.1.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214529 | 1312 | - | F | Update of TCI configuration for SA FR2 TC 7.6.2.1 and 7.6.2.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214530 | 1313 | - | F | Correction of non-existent config for SA FR2 TC 7.7.1.3.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-214681 | 1319 | - | F | Core alignment for DRX configuration | 16.9.0 |
| 2021-09 | RAN#93 | R5-214682 | 1320 | - | F | Correction to FR2 event-triggered reporting in DRX test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214685 | 1323 | - | F | Correction to Inter-RAT SFTD measurement delay and event triggered reporting tests | 16.9.0 |
| 2021-09 | RAN#93 | R5-214687 | 1325 | - | F | Correction to 4.5.7.1EN-DC FR1 addition and release delay of known PSCell | 16.9.0 |
| 2021-09 | RAN#93 | R5-214688 | 1326 | - | F | Correction to NR SA FR1 - E-UTRAN event-triggered reporting tests | 16.9.0 |
| 2021-09 | RAN#93 | R5-214689 | 1327 | - | F | Correction to the number of entries in the measObjectToAddModList | 16.9.0 |
| 2021-09 | RAN#93 | R5-214693 | 1331 | - | F | Clean up on editor notes for FR2 test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214711 | 1335 | - | F | Add minimum conformance requirements for DAPS handover | 16.9.0 |
| 2021-09 | RAN#93 | R5-214832 | 1337 | - | F | Correction to 5G-SRVCC RRM TC 6.3.1.6-handover | 16.9.0 |
| 2021-09 | RAN#93 | R5-214833 | 1338 | - | F | Correction to 5G-SRVCC RRM TC 6.6.5.1-envent triggered reporting non-DRX | 16.9.0 |
| 2021-09 | RAN#93 | R5-214921 | 1340 | - | F | Alignment HO test case 6.3.1.2 with core requirements | 16.9.0 |
| 2021-09 | RAN#93 | R5-214922 | 1341 | - | F | Correction re-establishment test cases 6.3.2.1.x | 16.9.0 |
| 2021-09 | RAN#93 | R5-214923 | 1342 | - | F | Remove gapUE and gapFR1 from iRAT test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214924 | 1343 | - | F | Annex A.6.1 for iRAT test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214948 | 1344 | - | F | Addition of FR-1 NSA CLI Measurement test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-214983 | 1349 | - | F | Correction to FR1 EN-DC TCs-RLM | 16.9.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-09 | RAN#93 | R5-214985 | 1351 | - | F | Correction to FR2 EN-DC TCs-RLM | 16.9.0 |
| 2021-09 | RAN#93 | R5-214986 | 1352 | - | F | Correction to FR2 EN-DC TCs-SCell activation | 16.9.0 |
| 2021-09 | RAN#93 | R5-214987 | 1353 | - | F | Correction to FR1 NR SA TC 6.5.2.1-SCell interruption | 16.9.0 |
| 2021-09 | RAN#93 | R5-214989 | 1355 | - | F | Correction to FR1 NR SA TCs-cell reselection | 16.9.0 |
| 2021-09 | RAN#93 | R5-214991 | 1357 | - | F | Correction to FR1 NR SA TCs-RLM | 16.9.0 |
| 2021-09 | RAN#93 | R5-214993 | 1359 | - | F | Correction to FR2 NR SA TCs-cell reselection | 16.9.0 |
| 2021-09 | RAN#93 | R5-214994 | 1360 | - | F | Correction to FR2 NR SA TCs-SCell activation | 16.9.0 |
| 2021-09 | RAN#93 | R5-214996 | 1362 | - | F | Correction to LTE SA TCs-cell reselection | 16.9.0 |
| 2021-09 | RAN#93 | R5-214997 | 1363 | - | F | Correction to LTE SA TCs-inter-RAT delay | 16.9.0 |
| 2021-09 | RAN#93 | R5-214999 | 1365 | - | F | Correction to cell mapping for CA TCs | 16.9.0 |
| 2021-09 | RAN#93 | R5-215005 | 1367 | - | F | Addition of minimum requirements for FR1 CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215006 | 1368 | - | F | Addition of minimum requirements for FR2 CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215007 | 1369 | - | F | Addition of NR Mob_Enh RRM TC 6.3.1.7-intra freq sync DAPS HO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215008 | 1370 | - | F | Addition of NR Mob_Enh RRM TC 6.3.1.8-intra freq async DAPS HO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215009 | 1371 | - | F | Addition of NR Mob_Enh RRM TC 6.3.3.1-intra freq CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215010 | 1372 | - | F | Addition of NR Mob_Enh RRM TC 6.3.3.2-inter freq CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215011 | 1373 | - | F | Addition of NR Mob_Enh RRM TC 7.3.1.4-inter band sync DAPS HO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215012 | 1374 | - | F | Addition of NR Mob_Enh RRM TC 7.3.1.5-inter band async DAPS HO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215013 | 1375 | - | F | Addition of NR Mob_Enh RRM TC 7.3.3.1-intra freq CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215014 | 1376 | - | F | Addition of NR Mob_Enh RRM TC 7.3.3.2-inter freq CHO | 16.9.0 |
| 2021-09 | RAN#93 | R5-215020 | 1378 | - | F | Addition of minimum requirements for inter-freq relaxed measurement | 16.9.0 |
| 2021-09 | RAN#93 | R5-215022 | 1380 | - | F | Addition of minimum requirements for intra-freq relaxed measurement | 16.9.0 |
| 2021-09 | RAN#93 | R5-215023 | 1381 | - | F | Addition of NR PS RRM TC 6.1.1.3 - intra-freq cell reselection low mobility | 16.9.0 |
| 2021-09 | RAN#93 | R5-215024 | 1382 | - | F | Addition of NR PS RRM TC 6.1.1.4 - intra-freq cell reselection non-cell-edge | 16.9.0 |
| 2021-09 | RAN#93 | R5-215025 | 1383 | - | F | Addition of NR PS RRM TC 6.1.1.5 - inter-freq cell reselection low mobility | 16.9.0 |
| 2021-09 | RAN#93 | R5-215026 | 1384 | - | F | Addition of NR PS RRM TC 6.1.1.6 - inter-freq cell reselection non-cell-edge | 16.9.0 |
| 2021-09 | RAN#93 | R5-215036 | 1388 | - | F | Correction to minimum requirements for inter-RAT cell reselection with highSpeedMeasFlag | 16.9.0 |
| 2021-09 | RAN#93 | R5-215037 | 1389 | - | F | Correction to minimum requirements for intra-frequency measurement with highSpeedMeasFlag | 16.9.0 |
| 2021-09 | RAN#93 | R5-215038 | 1390 | - | F | Correction to NR HST RRM TC 6.1.1.7-HST intra-freq cell reselection | 16.9.0 |
| 2021-09 | RAN#93 | R5-215039 | 1391 | - | F | Addition of cell mapping for NR HST RRM TCs | 16.9.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-09 | RAN#93 | R5-215243 | 1398 | - | F | Update of test case 6.6.4.5 for R16 NR HST | 16.9.0 |
| 2021-09 | RAN#93 | R5-215244 | 1399 | - | F | Editorial change of RRM test case 6.6.1.7 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215352 | 1401 | - | F | Correction to test frequeny selection for intra-band EN-DC | 16.9.0 |
| 2021-09 | RAN#93 | R5-215354 | 1403 | - | F | Correction to test requirement for 8.4.2.4 and error in writing for 8.4.2.x | 16.9.0 |
| 2021-09 | RAN#93 | R5-215355 | 1404 | - | F | Correction to DRX configuration for eliminating overlap between DRX and SMTC | 16.9.0 |
| 2021-09 | RAN#93 | R5-215360 | 1405 | - | F | Correction to test case 6.3.1.1 and 6.3.1.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215365 | 1406 | - | F | Core spec alignment to add CCR configuration for EN-DC PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215366 | 1407 | - | F | Core spec alignment to add CCR configuration for EN-DC Timing | 16.9.0 |
| 2021-09 | RAN#93 | R5-215367 | 1408 | - | F | Core spec alignment to add CCR configuration for EN-DC event triggered | 16.9.0 |
| 2021-09 | RAN#93 | R5-215368 | 1409 | - | F | Addition of minimum conformance requirements of cell re-selection with relaxed measurement criterion in FR2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215392 | 1410 | - | F | Add test case 4.3.2.2.3 for EN-DC FR1 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215393 | 1411 | - | F | Add test case 4.3.2.2.4 for EN-DC FR1 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215394 | 1412 | - | F | Add test case 5.3.2.2.3 for EN-DC FR2 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215395 | 1413 | - | F | Add test case 5.3.2.2.4 for EN-DC FR2 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215396 | 1414 | - | F | Add test case 6.3.2.2.3 for SA FR1 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215397 | 1415 | - | F | Add test case 6.3.2.2.4 for SA FR1 2-step PRACH | 16.9.0 |
| 2021-09 | RAN#93 | R5-215398 | 1416 | - | F | Add 2-Step PRACH test cases to Annex E | 16.9.0 |
| 2021-09 | RAN#93 | R5-215412 | 1417 | - | F | Addition of cell configuration for RRM HST test cases in Annex E | 16.9.0 |
| 2021-09 | RAN#93 | R5-215413 | 1418 | - | F | Correction of RRM HST Inter-RAT measurements test case 6.6.3.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215414 | 1419 | - | F | Correction of RRM HST E-UTRA NR FR1 Cell reselection test case 8.2.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215415 | 1420 | - | F | Correction of RRM HST E-UTRA NR Inter-RAT event triggered reporting test case 8.4.2.9 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215420 | 1425 | - | F | Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX test case 5.6.3.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215425 | 1430 | - | F | Correction of RRM EN-DC FR2-FR2 event-triggered reporting in DRX test case 5.6.2.2 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215426 | 1431 | - | F | Correction of RRM EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection test case 5.6.2.4 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215427 | 1432 | - | F | Correction of RRM SA FR2-FR2 event-triggered reporting in DRX test case 7.6.2.2 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215428 | 1433 | - | F | Correction of RRM SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection test case 7.6.2.4 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-215429 | 1434 | - | F | Editorial correction of RRM FR2 EN-DC event triggered measurement test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215430 | 1435 | - | F | Editorial correction of RRM FR2 SA event triggered measurement test cases | 16.9.0 |

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|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-09 | RAN#93 | R5-215431 | 1436 | - | F | Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215436 | 1437 | - | F | Add MsgA configuration to the TS 38.533 annexes | 16.9.0 |
| 2021-09 | RAN#93 | R5-215614 | 1438 | - | F | Update on 6.3.1.1 to be aligned with TS 38.133 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215620 | 1439 | - | F | MTSU and TT mapping related to Max Device Size in TS 38.533 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215622 | 1441 | - | F | Updates on 5.6.1.3 and 5.6.1.4 CSI-RS RLM test cases test applicability | 16.9.0 |
| 2021-09 | RAN#93 | R5-215624 | 1443 | - | F | Correction in 5.6.1.1, 5.6.1.3 test procedure to configure iterations | 16.9.0 |
| 2021-09 | RAN#93 | R5-215625 | 1444 | - | F | Correction in 5.6.2.1, 5.6.2.2, 5.6.2.3, 5.6.2.4 test procedure to configure iterations | 16.9.0 |
| 2021-09 | RAN#93 | R5-215655 | 1451 | - | F | Update to applicability statement to include gap pattern id 13 for applicable NSA event triggered test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-215656 | 1452 | - | F | TRS configuration update to NSA FR1 TC 6.5.4.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215903 | 1238 | 1 | F | Change to EN-DC L1-RSRP test cases to add evaluation rules | 16.9.0 |
| 2021-09 | RAN#93 | R5-215904 | 1240 | 1 | F | Correction to 4.5.1.2 core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-215905 | 1241 | 1 | F | Correction to 4.5.1.3 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-215906 | 1244 | 1 | F | Correction to 4.5.1.7 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-215907 | 1329 | 1 | F | Correction to FR1 and FR2 event-triggered reporting with gap tests | 16.9.0 |
| 2021-09 | RAN#93 | R5-215908 | 1262 | 1 | F | Change to SA L1-RSRP test cases to add evaluation rules | 16.9.0 |
| 2021-09 | RAN#93 | R5-215909 | 1264 | 1 | F | Correction to 6.5.1.3 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-215910 | 1266 | 1 | F | Correction to 6.5.1.7 message contents and core spec alignment | 16.9.0 |
| 2021-09 | RAN#93 | R5-215911 | 1356 | 1 | F | Correction to FR1 NR SA TCs-inter-RAT accuracy | 16.9.0 |
| 2021-09 | RAN#93 | R5-215912 | 1402 | 1 | F | Correction to test procedure for 6.1.2.2 IRAT ReSelection | 16.9.0 |
| 2021-09 | RAN#93 | R5-215913 | 1277 | 1 | F | Change title of iRAT test cases for clarity | 16.9.0 |
| 2021-09 | RAN#93 | R5-215914 | 1361 | 1 | F | Correction to LTE SA TC 8.5.1.1-SFTD accuracy | 16.9.0 |
| 2021-09 | RAN#93 | R5-215915 | 1279 | 1 | F | Change title of iRAT test cases for clarity - Annexes | 16.9.0 |
| 2021-09 | RAN#93 | R5-215916 | 1333 | 1 | F | Update to Annex H.3.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-215917 | 1366 | 1 | F | Correction to default configuration-Annex H | 16.9.0 |
| 2021-09 | RAN#93 | R5-215918 | 1421 | 1 | F | Correction of CSI-ReportConfig in Annex H | 16.9.0 |
| 2021-09 | RAN#93 | R5-215932 | 1377 | 1 | F | Addition of cell mapping for Mob_Enh RRM TCs | 16.9.0 |
| 2021-09 | RAN#93 | R5-215938 | 1316 | 1 | F | Addition of NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-215939 | 1385 | 1 | F | Addition of cell mapping for NR PS RRM TCs | 16.9.0 |
| 2021-09 | RAN#93 | R5-215940 | 1392 | 1 | F | Addition of minimum conformance requirements of inter-RAT cell re-selection with relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-215941 | 1395 | 1 | F | Update of Annex E and Annex F for test cases with relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-215948 | 1386 | 1 | F | Addition of NR HST RRM TC 4.6.1.7-intra-freq DRX highSpeedMeasFlag | 16.9.0 |

| Change history | | | | | | | |
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| 2021-09 | RAN#93 | R5-215949 | 1387 | 1 | F | Addition of NR HST RRM TC 6.1.2.5-intra-freq cell reselection highSpeedMeasFlag | 16.9.0 |
| 2021-09 | RAN#93 | R5-216042 | 1328 | 1 | F | Correction to FR1 Beam Failure Detection and Link Recovery tests | 16.9.0 |
| 2021-09 | RAN#93 | R5-216043 | 1339 | 1 | F | Correction message contents 4.3.2.2.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216044 | 1345 | 1 | F | Update to applicability of test cases on CSI-RS based RLM | 16.9.0 |
| 2021-09 | RAN#93 | R5-216045 | 1445 | 1 | F | Updates to DCI based BWP switch NSA FR1 TC 4.5.6.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216046 | 1446 | 1 | F | Updates to DCI based BWP switch NSA FR1 2DLCA TC 4.5.6.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216047 | 1447 | 1 | F | Updates to RRC based BWP switch NSA FR1 TC 4.5.6.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216048 | 1228 | 1 | F | Completion 5.7.1.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-216049 | 1229 | 1 | F | Completion 5.7.2.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-216050 | 1230 | 1 | F | Completion 5.7.3.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-216051 | 1322 | 1 | F | Correction to 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell | 16.9.0 |
| 2021-09 | RAN#93 | R5-216052 | 1231 | 1 | F | Completion 7.7.1.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-216053 | 1233 | 1 | F | Completion 7.7.3.2 including TT analysis results | 16.9.0 |
| 2021-09 | RAN#93 | R5-216054 | 1346 | 1 | F | Update to applicability of test cases requiring gap pattern ID 4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216055 | 1299 | 1 | F | Completion Annex C.2.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216098 | 1336 | 1 | F | Correction to EN-DC FR2 interruptions at transitions between active and non-active during DRX | 16.9.0 |
| 2021-09 | RAN#93 | R5-216099 | 1324 | 1 | F | Correction to 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC | 16.9.0 |
| 2021-09 | RAN#93 | R5-216100 | 1330 | 1 | F | Correction to the propagation condition of NR cell for Inter RAT test cases | 16.9.0 |
| 2021-09 | RAN#93 | R5-216101 | 1318 | 1 | F | Addition of BWP definition for FR2 SSB SCS240kHz | 16.9.0 |
| 2021-09 | RAN#93 | R5-216123 | 1448 | 1 | F | Updates to DCI based BWP switch SA FR1 2DLCA TC 6.5.6.1.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216124 | 1449 | 1 | F | Updates to DCI based BWP switch SA FR1 TC 6.5.6.1.2 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216125 | 1450 | 1 | F | Updates to RRC based BWP switch SA FR1 TC 6.5.6.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216132 | 1347 | 1 | F | Correction to FR1 EN-DC TC 4.5.7.1-PSCell addition | 16.9.0 |
| 2021-09 | RAN#93 | R5-216133 | 1348 | 1 | F | Correction to FR1 EN-DC TCs-BWP switching | 16.9.0 |
| 2021-09 | RAN#93 | R5-216134 | 1350 | 1 | F | Correction to FR1 EN-DC TCs-SCell activation | 16.9.0 |
| 2021-09 | RAN#93 | R5-216135 | 1354 | 1 | F | Correction to FR1 NR SA TCs-BWP switching | 16.9.0 |
| 2021-09 | RAN#93 | R5-216136 | 1358 | 1 | F | Correction to FR1 NR SA TCs-SCell activation | 16.9.0 |
| 2021-09 | RAN#93 | R5-216137 | 1454 | 1 | F | Correction to UL BWP configuration for SA FR1 TC 6.5.2.1 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216138 | 1364 | 1 | F | Correction to LTE SA TCs-SFTD delay | 16.9.0 |
| 2021-09 | RAN#93 | R5-216143 | 1393 | 1 | F | Addition of 6.1.2.3 inter-RAT cell re-selection with relaxed measurement with low mobility | 16.9.0 |
| 2021-09 | RAN#93 | R5-216144 | 1394 | 1 | F | Addition of 6.1.2.4 inter-RAT cell re-selection with relaxed measurement with not at cell edge | 16.9.0 |

| Change history | | | | | | | |
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| 2021-09 | RAN#93 | R5-216145 | 1422 | 1 | F | Correction of RRM EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX test case 5.6.3.1 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-216146 | 1423 | 1 | F | Correction of RRM EN-DC FR2 SSB-based L1-RSRP measurement in DRX test case 5.6.3.2 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-216147 | 1424 | 1 | F | Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 5.6.3.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216148 | 1426 | 1 | F | Correction of RRM NR SA FR2 SSB-based L1-RSRP measurement in non-DRX test case 7.6.3.1 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-216149 | 1427 | 1 | F | Correction of RRM NR SA FR2 SSB-based L1-RSRP measurement in DRX test case 7.6.3.2 including Test Tolerance | 16.9.0 |
| 2021-09 | RAN#93 | R5-216360 | 1428 | 1 | F | Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 7.6.3.3 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216361 | 1429 | 1 | F | Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX test case 7.6.3.4 | 16.9.0 |
| 2021-09 | RAN#93 | R5-216364 | 1314 | 1 | F | Addition of NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-216365 | 1315 | 1 | F | Addition of NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-216366 | 1317 | 1 | F | Addition of NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion | 16.9.0 |
| 2021-09 | RAN#93 | R5-215968 | 1397 | 1 | B | Introduction of n24 | 17.0.0 |
| 2021-12 | RAN#94 | R5-216602 | 1455 | - | F | Update of TC 6.7.1.1.2 | 17.1.0 |
| 2021-12 | RAN#94 | R5-216839 | 1458 | - | F | Correction to CSI-RS based beam failure detection test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-216840 | 1459 | - | F | Correction to Initial DL and UL BWP for test case 6.3.2.1.2 | 17.1.0 |
| 2021-12 | RAN#94 | R5-216841 | 1460 | - | F | Correction to SRS configuration for FR1 timing test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-216842 | 1461 | - | F | Correction to SRS configuration for FR2 timing test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-216843 | 1462 | - | F | Correction to FR1 CA RRM tests for generic channel BW configurations | 17.1.0 |
| 2021-12 | RAN#94 | R5-216844 | 1463 | - | F | Correction to FR1 Active BWP Switch Delay TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-216845 | 1464 | - | F | Correction to FR1 Redirection test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-216846 | 1465 | - | F | Correction to message exceptions for CSI-RS based BFR tests | 17.1.0 |
| 2021-12 | RAN#94 | R5-216857 | 1470 | - | F | Correction to FR2 EN-DC RRM TCs - RLM | 17.1.0 |
| 2021-12 | RAN#94 | R5-216860 | 1473 | - | F | Correction to FR2 EN-DC RRM TCs using Table H.3.1-4 for event A4 | 17.1.0 |
| 2021-12 | RAN#94 | R5-216861 | 1474 | - | F | Correction to FR1 NR SA RRM TC 6.1.1.1 - intra-freq reselection | 17.1.0 |
| 2021-12 | RAN#94 | R5-216862 | 1475 | - | F | Correction to FR1 NR SA RRM TC 6.7.6.1 - inter-RAT meas | 17.1.0 |
| 2021-12 | RAN#94 | R5-216864 | 1477 | - | F | Correction to FR1 NR SA RRM TCs 6.5.2.1 - interruption | 17.1.0 |
| 2021-12 | RAN#94 | R5-216866 | 1479 | - | F | Correction to FR2 NR SA RRM TCs using Table H.3.1-4 for event A4 | 17.1.0 |
| 2021-12 | RAN#94 | R5-216868 | 1481 | - | F | Correction to SSB reference configurations | 17.1.0 |
| 2021-12 | RAN#94 | R5-216869 | 1482 | - | F | Correction to Annex H for RRM TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-216873 | 1485 | - | F | Correction to Mob_enh RRM TC 6.3.3.1 - FR1 intra CHO | 17.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-12 | RAN#94 | R5-216874 | 1486 | - | F | Correction to Mob_enh RRM TC 6.3.3.2 - FR1 inter CHO | 17.1.0 |
| 2021-12 | RAN#94 | R5-216876 | 1488 | - | F | Correction to Mob_enh RRM TC 7.3.1.5 - inter-FR DAPS async | 17.1.0 |
| 2021-12 | RAN#94 | R5-216886 | 1492 | - | F | Correction to PS RRM TC 6.1.1.3 - intra low mobility | 17.1.0 |
| 2021-12 | RAN#94 | R5-216887 | 1493 | - | F | Correction to PS RRM TC 6.1.1.4 - intra not cell edge | 17.1.0 |
| 2021-12 | RAN#94 | R5-216888 | 1494 | - | F | Correction to PS RRM TC 6.1.1.5 - inter low mobility | 17.1.0 |
| 2021-12 | RAN#94 | R5-216889 | 1495 | - | F | Correction to PS RRM TC 6.1.1.6 - inter not cell edge | 17.1.0 |
| 2021-12 | RAN#94 | R5-216890 | 1496 | - | F | Correction to Annex F for PS RRM TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-216900 | 1497 | - | F | Correction to SRVCC RRM TC 6.3.1.6 - UTRA handover | 17.1.0 |
| 2021-12 | RAN#94 | R5-216902 | 1499 | - | F | Correction to Annex F for SRVCC RRM TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-216912 | 1500 | - | F | Correction to HST RRM TC 4.6.1.7 - intra-freq meas | 17.1.0 |
| 2021-12 | RAN#94 | R5-216913 | 1501 | - | F | Correction to HST RRM TC 4.6.4.5 - L1-RSRP | 17.1.0 |
| 2021-12 | RAN#94 | R5-216914 | 1502 | - | F | Correction to HST RRM TC 6.1.2.5 - inter-RAT reselection | 17.1.0 |
| 2021-12 | RAN#94 | R5-216915 | 1503 | - | F | Correction to Annex F for HST RRM TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-217070 | 1505 | - | F | Correction of message configuration for EN-DC FR1 SFTD TC 4.7.5.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217122 | 1510 | - | F | Reinstate wrongly deleted Table H.3.5-4 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217123 | 1511 | - | F | Correct B2 Threshold in H.3.1-4A | 17.1.0 |
| 2021-12 | RAN#94 | R5-217124 | 1512 | - | F | Corrections to 4.3.2.2.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217131 | 1515 | - | F | Corrections to L1-RSRP EN-DC test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217132 | 1516 | - | F | Corrections to L1-RSRP NR SA test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217145 | 1517 | - | F | Correct reference to test frequencies | 17.1.0 |
| 2021-12 | RAN#94 | R5-217203 | 1519 | - | F | Addition of minimum requirements for EN-DC L1-SINR measurement for beam reporting | 17.1.0 |
| 2021-12 | RAN#94 | R5-217207 | 1523 | - | F | Addition of minimum requirements for NR SA FR1 L1-SINR measurement for beam reporting | 17.1.0 |
| 2021-12 | RAN#94 | R5-217211 | 1527 | - | F | Addition of the abbreviations for Rel-16 NR MIMO | 17.1.0 |
| 2021-12 | RAN#94 | R5-217213 | 1529 | - | F | Addition of Annex A.1.4B CSI-IM Reference Measurement Channels | 17.1.0 |
| 2021-12 | RAN#94 | R5-217214 | 1530 | - | F | Addition of Annex H.3.6A RRC messages and IE exceptions for L1-SINR measurement for beam reporting | 17.1.0 |
| 2021-12 | RAN#94 | R5-217228 | 1539 | - | F | Correct of RRM Test Cases for test applicability | 17.1.0 |
| 2021-12 | RAN#94 | R5-217229 | 1540 | - | F | Correct of RRM Test Cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217255 | 1541 | - | F | Addition of FR-1 NSA CLI accuracy test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217258 | 1542 | - | F | Corrections to event-triggered iRAT | 17.1.0 |
| 2021-12 | RAN#94 | R5-217395 | 1545 | - | F | Update of 6.1.2.3 and 6.1.2.4 for MU and TT | 17.1.0 |
| 2021-12 | RAN#94 | R5-217396 | 1546 | - | F | Update of Annex F for test cases with relaxed measurement criterion | 17.1.0 |
| 2021-12 | RAN#94 | R5-217436 | 1550 | - | F | Correction to E-UTRA - NR FR1 cell re-selection to higher priority NR target cell | 17.1.0 |

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| 2021-12 | RAN#94 | R5-217438 | 1551 | - | F | Correction to SIB4 exceptions in Annex H | 17.1.0 |
| 2021-12 | RAN#94 | R5-217439 | 1552 | - | F | Correction to FR2 event-triggered reporting with gap test | 17.1.0 |
| 2021-12 | RAN#94 | R5-217441 | 1553 | - | F | Correction to test procedure in 8.2.1.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217443 | 1555 | - | F | Correction to test requirement in 8.3.1.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217520 | 1559 | - | F | Addition of RMC CORESET to FR2 random access tests | 17.1.0 |
| 2021-12 | RAN#94 | R5-217570 | 1561 | - | F | Correction of RRM HST Inter-RAT measurements test case 6.6.3.3 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217572 | 1563 | - | F | Correction of RRM HST E-UTRA NR Inter-RAT event triggered reporting test case 8.4.2.9 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217573 | 1564 | - | F | Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 5.6.3.3 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217574 | 1565 | - | F | Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX test case 5.6.3.4 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217575 | 1566 | - | F | Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 7.6.3.3 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217576 | 1567 | - | F | Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX test case 7.6.3.4 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-217577 | 1568 | - | F | Correction of SA FR2 RRC re-establishment test case 7.3.2.1.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-217580 | 1571 | - | F | Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217585 | 1572 | - | F | Correction of Minimum conformance requirements for FR1 re-establishment test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217586 | 1573 | - | F | Correction of Minimum conformance requirements for FR2 re-establishment test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217661 | 1574 | - | F | Update on FR2 Radio Link monitoring SSB based RLM test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217663 | 1575 | - | F | Update on FR2 radio link monitoring CSI-RS based RLM test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-217736 | 1576 | - | F | Update to SA Handover delay requirements | 17.1.0 |
| 2021-12 | RAN#94 | R5-218207 | 1577 | - | F | Correct 5.7.3.2 / 7.7.3.2 test case limits based on TT analysis results | 17.1.0 |
| 2021-12 | RAN#94 | R5-218215 | 1457 | 1 | F | Correction to Mob_enh RRM TC 6.3.1.9 - inter-freq sync DAPS HO | 17.1.0 |
| 2021-12 | RAN#94 | R5-218216 | 1491 | 1 | F | Correction to Annex F for Mob_enh RRM TCs | 17.1.0 |
| 2021-12 | RAN#94 | R5-218217 | 1504 | 1 | F | Correction to Mob_enh RRM TC 6.3.1.10 - inter-freq async DAPS HO | 17.1.0 |
| 2021-12 | RAN#94 | R5-218250 | 1469 | 1 | F | Correction to FR1 EN-DC RRM TCs 4.5.2.X - interruption | 17.1.0 |
| 2021-12 | RAN#94 | R5-218251 | 1513 | 1 | F | Corrections to RLM EN-DC test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-218252 | 1548 | 1 | F | Correction to EN-DC FR1 addition and release delay of known PSCell | 17.1.0 |
| 2021-12 | RAN#94 | R5-218253 | 1471 | 1 | F | Correction to FR2 EN-DC RRM TCs - RRC based | 17.1.0 |
| 2021-12 | RAN#94 | R5-218254 | 1506 | 1 | F | Correction of T2 timer value for SA FR1 TC 6.3.2.1.3 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218255 | 1514 | 1 | F | Corrections to RLM NR SA test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-218256 | 1478 | 1 | F | Correction to FR2 NR SA RRM TCs - RLM | 17.1.0 |

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| 2021-12 | RAN#94 | R5-218257 | 1507 | 1 | F | Correction of RRC re-establishment delay for SA FR2 TC 7.3.2.1.1 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218258 | 1508 | 1 | F | Correction of T2 timer value for SA FR2 TC 7.3.2.1.2 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218259 | 1509 | 1 | F | Correction of T2 timer value for SA FR2 TC 7.3.2.1.3 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218260 | 1569 | 1 | F | Correction of SA FR2 - FR2 RRC re-establishment test case 7.3.2.1.2 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218261 | 1480 | 1 | F | Correction to LTE SA RRM TCs - NR inter-RAT accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218294 | 1544 | 1 | F | Update of Annex for 4.5.8.1 EN-DC FR1 DL interruptions at switching between two uplink carriers | 17.1.0 |
| 2021-12 | RAN#94 | R5-218296 | 1483 | 1 | F | Correction to Mob_enh RRM TC 6.3.1.7 - intra DAPS sync | 17.1.0 |
| 2021-12 | RAN#94 | R5-218297 | 1484 | 1 | F | Correction to Mob_enh RRM TC 6.3.1.8 - intra DAPS async | 17.1.0 |
| 2021-12 | RAN#94 | R5-218298 | 1487 | 1 | F | Correction to Mob_enh RRM TC 7.3.1.4 - inter-FR DAPS sync | 17.1.0 |
| 2021-12 | RAN#94 | R5-218299 | 1490 | 1 | F | Correction to Mob_enh RRM TC 7.3.3.2 - FR2 inter CHO | 17.1.0 |
| 2021-12 | RAN#94 | R5-218313 | 1520 | 1 | F | Addition of 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218314 | 1521 | 1 | F | Addition of 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218315 | 1522 | 1 | F | Addition of 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218316 | 1524 | 1 | F | Addition of 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218317 | 1525 | 1 | F | Addition of 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218318 | 1526 | 1 | F | Addition of 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218319 | 1528 | 1 | F | Addition of CSI-RS Reference Measurement Channels based on IMR | 17.1.0 |
| 2021-12 | RAN#94 | R5-218320 | 1531 | 1 | F | Addition of 4.5.5.5 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218321 | 1532 | 1 | F | Addition of 4.5.5.6 EN-DC FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218322 | 1533 | 1 | F | Addition of 4.7.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218323 | 1535 | 1 | F | Addition of 4.7.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218324 | 1536 | 1 | F | Addition of 6.7.9.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218325 | 1537 | 1 | F | Addition of 6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218326 | 1538 | 1 | F | Addition of 6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | 17.1.0 |
| 2021-12 | RAN#94 | R5-218327 | 1547 | 1 | F | Addition of cell configuration MU and TT for Enhancement on MIMO | 17.1.0 |
| 2021-12 | RAN#94 | R5-218336 | 1498 | 1 | F | Correction to SRVCC RRM TC 6.6.5.1 - UTRA meas | 17.1.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-12 | RAN#94 | R5-218351 | 1562 | 1 | F | Correction of RRM HST E-UTRA NR FR1 Cell reselection test case 8.2.1.2 including Test Tolerance | 17.1.0 |
| 2021-12 | RAN#94 | R5-218352 | 1570 | 1 | F | Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM HST test cases | 17.1.0 |
| 2021-12 | RAN#94 | R5-218372 | 1543 | 1 | F | Addition of 4.5.8.1 EN-DC FR1 DL interruptions at switching between two uplink carriers | 17.1.0 |
| 2021-12 | RAN#94 | R5-218439 | 1468 | 1 | F | Correction to FR1 EN-DC RRM TCs - RRC based | 17.1.0 |
| 2021-12 | RAN#94 | R5-218440 | 1560 | 1 | F | Test Procedure update for FR1 Event Triggered test cases with CDRX | 17.1.0 |
| 2021-12 | RAN#94 | R5-218441 | 1472 | 1 | F | Correction to FR2 EN-DC RRM TCs 5.5.2.X - interruption | 17.1.0 |
| 2021-12 | RAN#94 | R5-218442 | 1558 | 1 | F | Update to FR2 interruption tests 5.5.2.1 and 5.5.2.2 | 17.1.0 |
| 2021-12 | RAN#94 | R5-218443 | 1456 | 1 | F | Addition of clause 3A.6 for UE with Multiband Capability | 17.1.0 |
| 2021-12 | RAN#94 | R5-218444 | 1556 | 1 | F | Clarification on cl 3A.1.1 test coverage across 5G NR architecture options for RRM | 17.1.0 |
| 2021-12 | RAN#94 | R5-218461 | 1489 | 1 | F | Correction to Mob_enh RRM TC 7.3.3.1 - FR2 intra CHO | 17.1.0 |
| 2021-12 | RAN#94 | R5-218464 | 1534 | 1 | F | Addition of 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy | 17.1.0 |
| 2022-03 | RAN#95 | R5-220096 | 1578 | - | F | Correction to Mob_enh RRM TC 6.3.1.11 - inter-band sync DAPS HO including test tolerance | 17.2.0 |
| 2022-03 | RAN#95 | R5-220097 | 1579 | - | F | Correction to Mob_enh RRM TC 6.3.1.12 - inter-band async DAPS HO including test tolerance | 17.2.0 |
| 2022-03 | RAN#95 | R5-220109 | 1580 | - | F | Update of SA FR1 TC 4.5.3.1 and 4.5.3.3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220110 | 1581 | - | F | Update of SA FR1 TC 6.5.3.1 and 6.5.3.3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220136 | 1582 | - | F | Correction to Annex F for Mob_enh RRM TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220160 | 1583 | - | F | Add test case 7.3.2.2.4 for SA FR2 2-step PRACH | 17.2.0 |
| 2022-03 | RAN#95 | R5-220167 | 1584 | - | F | Updates to RRM HST Test Case 6.6.1.7 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220168 | 1585 | - | F | Updates to RRM HST Test Case 6.6.4.5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220196 | 1586 | - | F | Update to table E.5-1 to add the cell configurations for one 2-step RACH test case | 17.2.0 |
| 2022-03 | RAN#95 | R5-220278 | 1587 | - | F | Clarifications on 5G NR connectivity options for RRM | 17.2.0 |
| 2022-03 | RAN#95 | R5-220282 | 1588 | - | F | Test case update for FR1 CLI-RSSI measurement with non-DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220283 | 1589 | - | F | Annexure update for test tolerance for FR1 CLI-RSSI measurement with non-DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220689 | 1592 | - | F | Correction to FR1 EN-DC RRM TCs - SCell activation | 17.2.0 |
| 2022-03 | RAN#95 | R5-220697 | 1600 | - | F | Correction to FR2 EN-DC RRM TC 5.6.1.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220699 | 1602 | - | F | Correction to FR2 EN-DC RRM TC 5.6.1.4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220701 | 1604 | - | F | Correction to FR1 NR SA RRM TC 6.5.2.1 - interruption SCC | 17.2.0 |
| 2022-03 | RAN#95 | R5-220702 | 1605 | - | F | Correction to FR1 NR SA RRM TCs - SCell activation | 17.2.0 |
| 2022-03 | RAN#95 | R5-220726 | 1623 | - | F | Addition of band group for NR SL RRM test | 17.2.0 |
| 2022-03 | RAN#95 | R5-220727 | 1624 | - | F | Addition of minimum requirements for NR SL UE Tx timing TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220728 | 1625 | - | F | Addition of NR SL RRM TC 9.1.1.1 - Tx Timing GNSS | 17.2.0 |

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| 2022-03 | RAN#95 | R5-220729 | 1626 | - | F | Addition of NR SL RRM TC 9.1.1.2 - Tx Timing SyncRef UE | 17.2.0 |
| 2022-03 | RAN#95 | R5-220730 | 1627 | - | F | Addition of NR SL RRM TC 9.1.1.3 - Tx Timing NR Cell | 17.2.0 |
| 2022-03 | RAN#95 | R5-220731 | 1628 | - | F | Addition of minimum requirements for NR SL S-SSB Tx TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220734 | 1631 | - | F | Addition of minimum requirements for NR SL SyncRef reselection TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220737 | 1634 | - | F | Addition of minimum requirements for NR SL L1 SL-RSRP TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220738 | 1635 | - | F | Addition of NR SL RRM TC 9.1.4.1 - Resource sensing | 17.2.0 |
| 2022-03 | RAN#95 | R5-220741 | 1638 | - | F | Addition of minimum requirements for NR SL Congestion control TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220742 | 1639 | - | F | Addition of NR SL RRM TC 9.1.5.1 - SL-RSSI con-current | 17.2.0 |
| 2022-03 | RAN#95 | R5-220744 | 1641 | - | F | Addition of minimum requirements for NR SL interruption TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220745 | 1642 | - | F | Addition of NR SL RRM TC 9.1.6.1 - WAN interruption | 17.2.0 |
| 2022-03 | RAN#95 | R5-220747 | 1644 | - | F | Addition of side conditions for NR SL RRM test in Annex B | 17.2.0 |
| 2022-03 | RAN#95 | R5-220748 | 1645 | - | F | Correction to Annex E for NR SL RRM TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220749 | 1646 | - | F | Correction to Annex G for NR SL RRM TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-220798 | 1647 | - | F | Update to 5.5.5.0 FR2 BFD minimum requirements | 17.2.0 |
| 2022-03 | RAN#95 | R5-220801 | 1650 | - | F | Update to 7.5.5.0 FR2 BFD minimum requirements | 17.2.0 |
| 2022-03 | RAN#95 | R5-220804 | 1653 | - | F | Update to Annex E for eMIMO test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220910 | 1657 | - | F | Correction to TRS Configuration of 6.3.2.1.3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220911 | 1658 | - | F | Correction to test procedure of 6.1.1.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220912 | 1659 | - | F | Correction to reference of test frequency in 6.3.1.x NR only test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220918 | 1661 | - | F | Correction to SRS configuration condition for FR1 timing test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220920 | 1662 | - | F | Correction to DRX setting of 8.4.2.9 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220921 | 1663 | - | F | Correction to message exception for handover test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220923 | 1665 | - | F | Correction to BWP switch delay test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220924 | 1666 | - | F | Correction to message exception for 4.7.5.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220927 | 1668 | - | F | Correction to 6.3.2.3.1 NR SA FR1 RRC connection release with redirection | 17.2.0 |
| 2022-03 | RAN#95 | R5-220928 | 1669 | - | F | Correction to NR-EUTRA and EUTRA-NR reselection with high speed | 17.2.0 |
| 2022-03 | RAN#95 | R5-220929 | 1670 | - | F | Correction to message exception for 8.5.1.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220930 | 1671 | - | F | Correction to ssb-ResourceList for 5.3.2.2.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220931 | 1672 | - | F | Correction to SMTC configuration in 6.1.1.7 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220933 | 1674 | - | F | Correction to T HARQ setting for 6.5.3.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220938 | 1678 | - | F | Correction to DRX setting of 6.6.1.7 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220939 | 1679 | - | F | Correction to message exception of 4.6.1.7 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220940 | 1680 | - | F | Correction to test procedure for 8.2.1.2 | 17.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-03 | RAN#95 | R5-220941 | 1681 | - | F | Correction to SIB1 message exceptions of 4.6.1.7 and 4.6.4.5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-220942 | 1682 | - | F | Addition of new test case 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy | 17.2.0 |
| 2022-03 | RAN#95 | R5-220943 | 1683 | - | F | Addition of new test case 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy | 17.2.0 |
| 2022-03 | RAN#95 | R5-220944 | 1684 | - | F | Addition of new test case 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy | 17.2.0 |
| 2022-03 | RAN#95 | R5-220986 | 1688 | - | F | Update of 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220988 | 1690 | - | F | Update of 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220989 | 1691 | - | F | Update of 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220991 | 1693 | - | F | Update of 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-220992 | 1694 | - | F | Update of Annex for EN-DC FR1 L1-SINR measurement test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-220993 | 1695 | - | F | Update of Annex for NR SA FR1 L1-SINR measurement test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221001 | 1696 | - | F | Correction to Annex H.3.6A RRC messages for L1-SINR measurement | 17.2.0 |
| 2022-03 | RAN#95 | R5-221008 | 1698 | - | F | Editorial corrections for EditHelp comments s1 to s3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221009 | 1699 | - | F | Editorial corrections for EditHelp comments s4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221010 | 1700 | - | F | Editorial corrections to revert headers to h6 for s4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221011 | 1701 | - | F | Editorial corrections for EditHelp comments s5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221012 | 1702 | - | F | Editorial corrections to revert headers to h6 for s5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221013 | 1703 | - | F | Editorial corrections for EditHelp comments s6.1 to s6.3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221014 | 1704 | - | F | Editorial corrections for EditHelp comments s6.4 to s6.5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221015 | 1705 | - | F | Editorial corrections for EditHelp comments s7 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221016 | 1706 | - | F | Editorial corrections for EditHelp comments s8 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221017 | 1707 | - | F | Editorial corrections to revert headers to h6 for s8 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221018 | 1708 | - | F | Editorial corrections for EditHelp comments Annexes | 17.2.0 |
| 2022-03 | RAN#95 | R5-221019 | 1709 | - | F | New section for NE-DC RRM test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221020 | 1710 | - | F | Minimum requirements for EN-DC FR1 L1-RSRP test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221021 | 1711 | - | F | Minimum requirements for EN-DC FR2 L1-RSRP test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221024 | 1714 | - | F | Correct message contents reference iRAT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221025 | 1715 | - | F | Add auxiliary band for n39 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221026 | 1716 | - | F | Corrections to 5.7.x.x | 17.2.0 |
| 2022-03 | RAN#95 | R5-221027 | 1717 | - | F | Corrections to 8.4.2.4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221028 | 1718 | - | F | Corrections to 8.2.1.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221029 | 1719 | - | F | Corrections to 8.5.2.2.1 | 17.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-03 | RAN#95 | R5-221031 | 1721 | - | F | Correction reportAmount for B2 report | 17.2.0 |
| 2022-03 | RAN#95 | R5-221033 | 1723 | - | F | Corrections to message contents for 8.4.2.3 and 8.4.2.4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221187 | 1728 | - | F | Correct message content for RLM-SSB Based FR2 5.5.1.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221188 | 1729 | - | F | Correct message content for RLM-SSB Based FR2 5.5.1.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221189 | 1730 | - | F | Correct message content for RLM-SSB Based FR2 5.5.1.3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221190 | 1731 | - | F | Correct message content for RLM-SSB Based FR2 5.5.1.4 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221191 | 1732 | - | F | Correct message content for FR2 interruption | 17.2.0 |
| 2022-03 | RAN#95 | R5-221254 | 1733 | - | F | Update 4.5.7.1 test procedure | 17.2.0 |
| 2022-03 | RAN#95 | R5-221256 | 1734 | - | F | Update number of HARQ processes for FDD | 17.2.0 |
| 2022-03 | RAN#95 | R5-221289 | 1736 | - | F | Correction of RRM re-establishment test case 7.3.2.1.1 including Test Tolerance | 17.2.0 |
| 2022-03 | RAN#95 | R5-221290 | 1737 | - | F | Correction of RRM re-establishment test case 7.3.2.1.2 including Test Tolerance | 17.2.0 |
| 2022-03 | RAN#95 | R5-221291 | 1738 | - | F | Test Tolerance addition in Annex F for RRM FR2 re-establishment test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221297 | 1739 | - | F | Addition of Minimum conformance requirements for DL interruptions at switching between two uplink carriers | 17.2.0 |
| 2022-03 | RAN#95 | R5-221298 | 1740 | - | F | Addition of UL switching test case 6.5.7.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221300 | 1742 | - | F | Cell configuration mapping for UL switching test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221301 | 1743 | - | F | Addition of Idle mode CA/DC measurement test case 6.6.9.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221302 | 1744 | - | F | Addition of Idle Mode measurements of inter-RAT CA candidate cells for early reporting test case 6.6.15.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221370 | 1748 | - | F | Update to PDSCH reference measurement channels for RRM test cases with DRX config | 17.2.0 |
| 2022-03 | RAN#95 | R5-221637 | 1613 | 1 | F | Correction to FR2 NR SA RRM TC 7.6.1.2 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221638 | 1615 | 1 | F | Correction to FR2 NR SA RRM TC 7.6.1.4 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221645 | 1619 | 1 | F | Correction to Mob_enh RRM TC 7.3.1.4 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221646 | 1620 | 1 | F | Correction to Mob_enh RRM TC 7.3.1.5 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221650 | 1685 | 1 | F | Completion 4.5.5.5 including TT analysis results | 17.2.0 |
| 2022-03 | RAN#95 | R5-221651 | 1686 | 1 | F | Completion 4.5.5.6 including TT analysis results | 17.2.0 |
| 2022-03 | RAN#95 | R5-221652 | 1687 | 1 | F | Addition of cell configuration MU and TT for Enhancement on MIMO | 17.2.0 |
| 2022-03 | RAN#95 | R5-221653 | 1689 | 1 | F | Update of 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-221654 | 1692 | 1 | F | Update of 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-221655 | 1656 | 1 | F | Correction to NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221713 | 1591 | 1 | F | Correction to FR1 EN-DC RRM TCs - interruption SCC | 17.2.0 |
| 2022-03 | RAN#95 | R5-221714 | 1746 | 1 | F | Introduce Test case for LTE PSCell addition and release in NE-DC | 17.2.0 |
| 2022-03 | RAN#95 | R5-221715 | 1593 | 1 | F | Correction to FR2 EN-DC RRM TCs - RLM | 17.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-03 | RAN#95 | R5-221716 | 1594 | 1 | F | Correction to FR2 EN-DC RRM TC 5.5.5.1 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221717 | 1595 | 1 | F | Correction to FR2 EN-DC RRM TC 5.5.5.2 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221718 | 1596 | 1 | F | Correction to FR2 EN-DC RRM TC 5.5.5.3 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221719 | 1597 | 1 | F | Correction to FR2 EN-DC RRM TC 5.5.5.4 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221720 | 1598 | 1 | F | Correction to FR2 EN-DC RRM TC 5.5.5.5 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221721 | 1599 | 1 | F | Correction to FR2 EN-DC RRM TC 5.6.1.1 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221722 | 1601 | 1 | F | Correction to FR2 EN-DC RRM TC 5.6.1.3 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221723 | 1712 | 1 | F | New test case 5.7.4.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221724 | 1713 | 1 | F | New test case 5.7.4.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221725 | 1725 | 1 | F | Update to RRM test case with CDRX | 17.2.0 |
| 2022-03 | RAN#95 | R5-221726 | 1720 | 1 | F | Corrections to 6.7.x.x | 17.2.0 |
| 2022-03 | RAN#95 | R5-221727 | 1607 | 1 | F | Correction to FR2 NR SA RRM TC 7.5.5.1 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221728 | 1608 | 1 | F | Correction to FR2 NR SA RRM TC 7.5.5.2 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221729 | 1609 | 1 | F | Correction to FR2 NR SA RRM TC 7.5.5.3 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221730 | 1610 | 1 | F | Correction to FR2 NR SA RRM TC 7.5.5.4 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221731 | 1611 | 1 | F | Correction to FR2 NR SA RRM TC 7.5.5.5 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221732 | 1612 | 1 | F | Correction to FR2 NR SA RRM TC 7.6.1.1 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221733 | 1614 | 1 | F | Correction to FR2 NR SA RRM TC 7.6.1.3 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221734 | 1667 | 1 | F | Correction to message exception for 8.4.2.x with SSB index detection | 17.2.0 |
| 2022-03 | RAN#95 | R5-221735 | 1726 | 1 | F | Test procedure update to L2NR Cell reselection test case | 17.2.0 |
| 2022-03 | RAN#95 | R5-221736 | 1616 | 1 | F | Correction to Annex F for FR2 SSB based BFD TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-221737 | 1617 | 1 | F | Correction to Annex F for FR2 SSB based intra-freq measurement TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-221738 | 1618 | 1 | F | Correction to default configuration in Annex H | 17.2.0 |
| 2022-03 | RAN#95 | R5-221739 | 1722 | 1 | F | Updates to CSI-ReportConfig for FR2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221740 | 1724 | 1 | F | Update report config for iRAT test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221741 | 1745 | 1 | F | Correction of clause 3 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221742 | 1749 | 1 | F | Correction to test frequencies for intra-band contiguous CA | 17.2.0 |
| 2022-03 | RAN#95 | R5-221798 | 1741 | 1 | F | Addition of UL switching test case 6.5.7.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221812 | 1621 | 1 | F | Correction to Mob_enh RRM TC 7.3.3.1 with TT | 17.2.0 |
| 2022-03 | RAN#95 | R5-221813 | 1622 | 1 | F | Correction to Annex F for Mob_enh RRM TCs | 17.2.0 |
| 2022-03 | RAN#95 | R5-221821 | 1629 | 1 | F | Addition of NR SL RRM TC 9.1.2.1 - SLSS Tx NR Cell | 17.2.0 |
| 2022-03 | RAN#95 | R5-221822 | 1630 | 1 | F | Addition of NR SL RRM TC 9.1.2.2 - SLSS Tx SyncRef UE | 17.2.0 |
| 2022-03 | RAN#95 | R5-221823 | 1632 | 1 | F | Addition of NR SL RRM TC 9.1.3.1 - SyncRef reselection GNSS | 17.2.0 |
| 2022-03 | RAN#95 | R5-221824 | 1633 | 1 | F | Addition of NR SL RRM TC 9.1.3.2 - SyncRef reselection Cell | 17.2.0 |
| 2022-03 | RAN#95 | R5-221825 | 1636 | 1 | F | Addition of NR SL RRM TC 9.1.4.2 - Resource pre-emption | 17.2.0 |

| Change history | | | | | | | |
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| 2022-03 | RAN#95 | R5-221826 | 1637 | 1 | F | Addition of NR SL RRM TC 9.1.4.3 - Resource re-evaluation | 17.2.0 |
| 2022-03 | RAN#95 | R5-221827 | 1640 | 1 | F | Addition of NR SL RRM TC 9.1.5.2 - SL-RSSI PC5 only | 17.2.0 |
| 2022-03 | RAN#95 | R5-221828 | 1643 | 1 | F | Addition of RMC for NR SL RRM test in Annex A | 17.2.0 |
| 2022-03 | RAN#95 | R5-221833 | 1648 | 1 | F | Addition of 5.5.5.6 FR2 SCell BFD in non-DRX for NSA | 17.2.0 |
| 2022-03 | RAN#95 | R5-221834 | 1649 | 1 | F | Addition of 5.5.5.7 FR2 SCell BFD in DRX for NSA | 17.2.0 |
| 2022-03 | RAN#95 | R5-221835 | 1651 | 1 | F | Addition of 7.5.5.6 FR2 SCell BFD in non-DRX for SA | 17.2.0 |
| 2022-03 | RAN#95 | R5-221836 | 1652 | 1 | F | Addition of 7.5.5.7 FR2 SCell BFD in DRX for SA | 17.2.0 |
| 2022-03 | RAN#95 | R5-221837 | 1654 | 1 | F | Update to Annex F for eMIMO test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221838 | 1655 | 1 | F | Update to Annex H for eMIMO test cases | 17.2.0 |
| 2022-03 | RAN#95 | R5-221839 | 1697 | 1 | F | Update of RRM Test Cases for UE Enhancements on MIMO | 17.2.0 |
| 2022-03 | RAN#95 | R5-221859 | 1664 | 1 | F | Correction to DRX setting of 4.6.4.5 and 6.6.4.5 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221893 | 1590 | 1 | F | Add test case 7.3.2.2.3 for NR SA FR2 2-step RACH | 17.2.0 |
| 2022-03 | RAN#95 | R5-221923 | 1660 | 1 | F | Correction to test procedure of SFTD measurement accuracy | 17.2.0 |
| 2022-03 | RAN#95 | R5-221924 | 1677 | 1 | F | Correction to BWP configuration for 4.5.6.1.2 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221925 | 1673 | 1 | F | Correction to active BWP ID and TRS configuration in 6.5.6.1.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221926 | 1675 | 1 | F | Correction to CSI-RS offset for 6.5.3.1 | 17.2.0 |
| 2022-03 | RAN#95 | R5-221927 | 1676 | 1 | F | Correction to CSI report offset for 6.5.3.1 | 17.2.0 |
| 2022-06 | RAN#96 | R5-222490 | 1752 | - | F | Correction to test time in 6.1.1.7 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222491 | 1753 | - | F | Editorial correction in 6.1.2.5 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222492 | 1754 | - | F | Correction to physical cell identity in 6.6.3.2 and 6.6.3.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222493 | 1755 | - | F | Correction to test procedure in 8.2.1.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222494 | 1756 | - | F | Correction to test procedure in 8.5.1.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222505 | 1758 | - | F | Correction to test parameters in 5.6.1.x and 5.6.2.x | 17.3.0 |
| 2022-06 | RAN#96 | R5-222507 | 1760 | - | F | Correction to DRX offset setting in 6.6.1.7 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222508 | 1761 | - | F | Correction to DRX offset setting in 6.6.3.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222509 | 1762 | - | F | Correction to DRX offset setting in 8.4.2.x | 17.3.0 |
| 2022-06 | RAN#96 | R5-222517 | 1765 | - | F | Add minimum requirements for 7.7.4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222522 | 1769 | - | F | Remove incorrect references - Chapter 4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222523 | 1770 | - | F | Remove incorrect references - Chapter 5 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222524 | 1771 | - | F | Remove incorrect references - Chapter 6 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222525 | 1772 | - | F | Remove incorrect references - Chapter 7 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222526 | 1773 | - | F | Remove incorrect references - Chapter 8 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222527 | 1774 | - | F | Corrections to 6.6.3.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222528 | 1775 | - | F | Corrections to 8.4.1.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222529 | 1776 | - | F | Modification to the asynchronous / synchronous cells conditions | 17.3.0 |
| 2022-06 | RAN#96 | R5-222531 | 1778 | - | F | Clean-up asynchronous / synchronous cells conditions for IRAT | 17.3.0 |

| Change history | | | | | | | |
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| 2022-06 | RAN#96 | R5-222532 | 1779 | - | F | Editorial correction to H.3.4-5 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222533 | 1780 | - | F | Corrections to 5.6.1.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222534 | 1781 | - | F | Corrections to 5.6.1.4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222535 | 1782 | - | F | Correction to H.3.4-7 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222536 | 1783 | - | F | Editorial correction 4.5.5.x | 17.3.0 |
| 2022-06 | RAN#96 | R5-222633 | 1791 | - | F | Correction to NR SL RRM TCs | 17.3.0 |
| 2022-06 | RAN#96 | R5-222636 | 1792 | - | F | Correction to FR1 EN-DC TC 4.7.5.1 - SFTD | 17.3.0 |
| 2022-06 | RAN#96 | R5-222638 | 1794 | - | F | Correction to FR1 NR SA TCs 6.1.2.2 - low priority reselection | 17.3.0 |
| 2022-06 | RAN#96 | R5-222640 | 1796 | - | F | Correction to inter-RAT TC 8.5.1.1 - SFTD | 17.3.0 |
| 2022-06 | RAN#96 | R5-222882 | 1803 | - | F | Editorial update to minimum requirement in 6.5.7.0 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222887 | 1804 | - | F | Update to minimum requirements for BFR | 17.3.0 |
| 2022-06 | RAN#96 | R5-222890 | 1807 | - | F | Update to FR2 SCell BFD test cases | 17.3.0 |
| 2022-06 | RAN#96 | R5-222962 | 1810 | - | F | Corrections AoA setup references | 17.3.0 |
| 2022-06 | RAN#96 | R5-222964 | 1812 | - | F | Corrections 7.6.3.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222965 | 1813 | - | F | Corrections 7.6.3.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222966 | 1814 | - | F | Corrections 7.6.3.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222967 | 1815 | - | F | Corrections 7.6.3.4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222968 | 1816 | - | F | Update to 4.3.2.2.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222969 | 1817 | - | F | Update to 4.3.2.2.4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222970 | 1818 | - | F | Update to 6.3.2.2.3 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222971 | 1819 | - | F | Update to 6.3.2.2.4 | 17.3.0 |
| 2022-06 | RAN#96 | R5-222998 | 1821 | - | F | Update of 4.6.7 EN-DC FR1 L1-SINR measurement procedure | 17.3.0 |
| 2022-06 | RAN#96 | R5-222999 | 1822 | - | F | Update of 6.6.8 NR SA FR1 L1-SINR measurement procedure | 17.3.0 |
| 2022-06 | RAN#96 | R5-223001 | 1824 | - | F | Addition of 5.6.6.1 EN-DC FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223002 | 1825 | - | F | Addition of 5.6.6.2 EN-DC FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223004 | 1827 | - | F | Addition of 7.6.6.1 NR SA FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223007 | 1830 | - | F | Addition of Annex E and Annex F for FR2 L1-SINR measurement | 17.3.0 |
| 2022-06 | RAN#96 | R5-223214 | 1835 | - | F | Editorial correction to 5G RRM TCs | 17.3.0 |
| 2022-06 | RAN#96 | R5-223246 | 1836 | - | F | Correction to Annexes for RRM SCell activation test cases | 17.3.0 |
| 2022-06 | RAN#96 | R5-223305 | 1837 | - | F | Update to eMIMO test cases 4.5.5.5 and 4.5.5.6 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223605 | 1826 | 1 | F | Addition of 5.6.6.3 EN-DC FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223606 | 1829 | 1 | F | Addition of 7.6.6.3 NR SA FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223607 | 1750 | 1 | F | Correction to EN-DC FR2 RLM tests for PSCell configured with CSI-RS-based RLM-RS in non-DRX including TT | 17.3.0 |

| Change history | | | | | | | |
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| 2022-06 | RAN#96 | R5-223615 | 1763 | 1 | F | Completing 5.7.4.1 including TT analysis | 17.3.0 |
| 2022-06 | RAN#96 | R5-223616 | 1766 | 1 | F | Completing 7.7.4.1 including TT analysis | 17.3.0 |
| 2022-06 | RAN#96 | R5-223707 | 1823 | 1 | F | Addition of minimum requirements for EN-DC FR2 L1-SINR measurement for beam reporting | 17.3.0 |
| 2022-06 | RAN#96 | R5-223710 | 1786 | 1 | F | Introduction of EN-DC FR2 SRS-RSRP measurement in non-DRX test case 5.6.4.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223711 | 1787 | 1 | F | Introduction of EN-DC FR2 SRS-RSRP measurement accuracy test case 5.7.5.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223712 | 1797 | 1 | F | Introduction of NR SA FR2 SRS-RSRP measurement in non-DRX test case 7.6.4.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223713 | 1798 | 1 | F | Introduction of NR SA FR2 SRS-RSRP measurement accuracy test case 7.7.5.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223850 | 1777 | 1 | F | Corrections to 4.7.5.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223851 | 1784 | 1 | F | Corrections to 4.5.5.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223853 | 1808 | 1 | F | Remove condition asynchronous cells | 17.3.0 |
| 2022-06 | RAN#96 | R5-223854 | 1757 | 1 | F | Correction to CSI-RS for tracking in 5.6.1.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223855 | 1764 | 1 | F | Completing 5.7.4.2 including TT analysis | 17.3.0 |
| 2022-06 | RAN#96 | R5-223856 | 1790 | 1 | F | Update to FR2 interruption test case 5.5.2.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223857 | 1793 | 1 | F | Correction to FR2 EN-DC BFD TCs | 17.3.0 |
| 2022-06 | RAN#96 | R5-223858 | 1809 | 1 | F | Corrections to 6.6.3.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223859 | 1751 | 1 | F | Editorial reference correction to NR SA FR2 cell re-selection test requirements | 17.3.0 |
| 2022-06 | RAN#96 | R5-223860 | 1767 | 1 | F | Completing 7.7.4.2 including TT analysis | 17.3.0 |
| 2022-06 | RAN#96 | R5-223861 | 1795 | 1 | F | Correction to FR2 NR SA BFD TCs | 17.3.0 |
| 2022-06 | RAN#96 | R5-223862 | 1831 | 1 | F | Correction of RRM test case 7.7.1.1 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223863 | 1768 | 1 | F | Annex F for L1-RSRP meas accuracy test cases | 17.3.0 |
| 2022-06 | RAN#96 | R5-223864 | 1788 | 1 | F | Alignment of RMC note for DRX test cases | 17.3.0 |
| 2022-06 | RAN#96 | R5-223870 | 1785 | 2 | F | Corrections to 4.5.5.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223874 | 1759 | 1 | F | Correction to Active UL BWP-2 Configuration in 4.5.6.1.1 and 6.5.6.1.2 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223878 | 1832 | 1 | F | Correction of UL switching test case 6.5.7.1 including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223879 | 1833 | 1 | F | Correction of UL switching test case 6.5.7.2 including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223880 | 1805 | 1 | F | Addition of eMIMO test case 6.5.5.5 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223881 | 1806 | 1 | F | Addition of eMIMO test case 6.5.5.6 | 17.3.0 |
| 2022-06 | RAN#96 | R5-223882 | 1828 | 1 | F | Addition of 7.6.6.2 NR SA FR2 L1-SINR measurement including Test Tolerance | 17.3.0 |
| 2022-06 | RAN#96 | R5-223886 | 1789 | 1 | F | Update to FR1 SCell activation and deactivation test cases | 17.3.0 |
| 2022-07 | RAN#96 | R5-223615 | 1763 | 1 | F | addition of missing changes from R5-223615 in Tables 5.7.4.1.5-2, /-3, /-4 | 17.3.1 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-09 | RAN#97 | R5-223926 | 1838 | - | F | Update to 2-step RACH RRM TC 7.3.2.2.4-FR2 non-contention based random access | 17.4.0 |
| 2022-09 | RAN#97 | R5-223965 | 1841 | - | F | Complete 5.7.1.3 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-223966 | 1842 | - | F | Complete 7.7.1.3 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-223977 | 1844 | - | F | Complete TC 4.3.2.2.3 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-223978 | 1845 | - | F | Complete TC 4.3.2.2.4 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-223981 | 1848 | - | F | Annexes for 2-step RACH test cases | 17.4.0 |
| 2022-09 | RAN#97 | R5-224006 | 1851 | - | F | Update of SA FR1 TC 6.3.2.1.1 and 6.3.2.1.2 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224182 | 1854 | - | F | Addition of new test case 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy | 17.4.0 |
| 2022-09 | RAN#97 | R5-224186 | 1858 | - | F | Addition of new test case 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy | 17.4.0 |
| 2022-09 | RAN#97 | R5-224468 | 1866 | - | F | Corrections to 5.6.1.3 and 5.6.1.4 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224469 | 1867 | - | F | Corrections to 5.5.5.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224470 | 1868 | - | F | Corrections to 5.5.5.2 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224471 | 1869 | - | F | Corrections to 5.5.5.3 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224472 | 1870 | - | F | Corrections for BFD LR test cases | 17.4.0 |
| 2022-09 | RAN#97 | R5-224474 | 1872 | - | F | Core spec alignment 6.7.x.1 test cases | 17.4.0 |
| 2022-09 | RAN#97 | R5-224476 | 1874 | - | F | Correction to CSI-RS.3.2 TDD | 17.4.0 |
| 2022-09 | RAN#97 | R5-224501 | 1877 | - | F | Correction to Mob_enh RRM TCs 7.3.1.X - FR2 DAPS HO | 17.4.0 |
| 2022-09 | RAN#97 | R5-224505 | 1878 | - | F | Correction to minimum requirements in 9.1.1.0 - SL Tx timing error | 17.4.0 |
| 2022-09 | RAN#97 | R5-224506 | 1879 | - | F | Correction to NR SL RRM TC 9.1.1.1 - GNSS with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224507 | 1880 | - | F | Correction to NR SL RRM TC 9.1.1.2 - SyncRef UE with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224508 | 1881 | - | F | Correction to NR SL RRM TC 9.1.1.3 - gNB with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224509 | 1882 | - | F | Correction to NR SL RRM TC 9.1.2.1 - S-SSB Tx gNB with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224510 | 1883 | - | F | Correction to NR SL RRM TC 9.1.2.2 - S-SSB Tx SyncRef UE with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224511 | 1884 | - | F | Correction to minimum requirements in 9.1.3.0 - SyncRef reselection | 17.4.0 |
| 2022-09 | RAN#97 | R5-224512 | 1885 | - | F | Correction to NR SL RRM TC 9.1.3.1 - GNSS highest priority with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224514 | 1887 | - | F | Correction to NR SL RRM TC 9.1.4.1 - resource selection with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224515 | 1888 | - | F | Correction to NR SL RRM TC 9.1.4.2 - resource pre-emption with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224517 | 1890 | - | F | Correction to NR SL RRM TC 9.1.5.1 - CBR concurrent with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224518 | 1891 | - | F | Correction to NR SL RRM TC 9.1.5.2 - CBR PC5 only with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224519 | 1892 | - | F | Correction to NR SL RRM TC 9.1.6.1 - WAN interruption with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-224546 | 1903 | - | F | Correction to NR HST RRM TC 6.1.1.7 - intra-freq reselection | 17.4.0 |
| 2022-09 | RAN#97 | R5-224553 | 1910 | - | F | Correction to NR HST RRM TC 8.2.1.2 - intra-RAT reselection | 17.4.0 |

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| 2022-09 | RAN#97 | R5-224635 | 1912 | - | F | Correction to condition DRX.7 in H.3.7 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224637 | 1914 | - | F | Correction to test requirement for SFTD measurement accuracy | 17.4.0 |
| 2022-09 | RAN#97 | R5-224645 | 1915 | - | F | Correction to measurement delay in 4.6.4.5 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224646 | 1916 | - | F | Correction to RMSI CORESET Reference Measurement Channels in A.1.2 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224647 | 1917 | - | F | Correction to SS-SINR condition in 5.7.3.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-224648 | 1918 | - | F | Correction to Starting PRB index for ULBWP.1.3 in A.8.2 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224768 | 1921 | - | F | Addition of minimum requirement for L1-SINR measurement in 5.7.6.0 | 17.4.0 |
| 2022-09 | RAN#97 | R5-224801 | 1926 | - | F | Update to FR2 L1-RSRP measurement test cases 5.6.3.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-224804 | 1928 | - | F | Test Tolerances and test case introduction for FR2 RLM test cases 7.5.1.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-225145 | 1935 | - | F | Correction of the measurement accuracy test cases in Annex F | 17.4.0 |
| 2022-09 | RAN#97 | R5-225146 | 1936 | - | F | Correction of UL switching test case 6.5.7.1 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225147 | 1937 | - | F | Correction of UL switching test case 6.5.7.2 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225148 | 1938 | - | F | Addition of Test Tolerance for UL switching test cases in Annex F of TS 38.533 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225149 | 1939 | - | F | Correction of SA FR2-FR2 SS-RSRP measurement accuracy test case 7.7.1.2 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225152 | 1942 | - | F | Correction of NR SA FR1 SA Idle mode CA/DC measurement for FR1 test case 6.6.9.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225153 | 1943 | - | F | Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225154 | 1944 | - | F | Addition of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case | 17.4.0 |
| 2022-09 | RAN#97 | R5-225213 | 1946 | - | F | Update on number of HARQ processes for FDD RRM test cases | 17.4.0 |
| 2022-09 | RAN#97 | R5-225230 | 1952 | - | F | Update 6.1.1.3 test procedure | 17.4.0 |
| 2022-09 | RAN#97 | R5-225617 | 1839 | 1 | F | Correction to EN-DC FR2 RLM tests for PSCell configured with CSI-RS-based RLM-RS in DRX including TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225622 | 1859 | 1 | F | Addition of new test case 6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy | 17.4.0 |
| 2022-09 | RAN#97 | R5-225623 | 1861 | 1 | F | Completion 7.7.6.2 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225624 | 1862 | 1 | F | Completion 7.7.6.3 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225628 | 1846 | 1 | F | Complete TC 6.3.2.2.3 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225629 | 1847 | 1 | F | Complete TC 6.3.2.2.4 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225630 | 1927 | 1 | F | Test Tolerances for FR2 RLM test cases 5.5.1.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-225631 | 1933 | 1 | F | Correction of ENDC FR2 SSB based L1-RSRP measurement accuracy test case 5.7.4.1 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225632 | 1934 | 1 | F | Correction of ENDC FR2 CSI-RS based L1-RSRP measurement accuracy test case 5.7.4.2 including Test Tolerance | 17.4.0 |

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| 2022-09 | RAN#97 | R5-225633 | 1940 | 1 | F | Correction of SA FR2 SSB based L1-RSRP measurement accuracy test case 7.7.4.1 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225634 | 1941 | 1 | F | Correction of SA FR2 CSI-RS based L1-RSRP measurement accuracy test case 7.7.4.2 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225635 | 1843 | 1 | F | Annex F for 5.7.1.3 and 7.7.1.3 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225690 | 1853 | 1 | F | Completion 4.7.7.1.1 and 6.7.9.1.1 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225691 | 1855 | 1 | F | Addition of new test case 6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy | 17.4.0 |
| 2022-09 | RAN#97 | R5-225692 | 1856 | 1 | F | Completion 4.7.7.2 and 6.7.9.2 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225693 | 1857 | 1 | F | Completion 4.7.7.3.1 and 6.7.9.3.1 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225725 | 1955 | 1 | F | Update to Annex E and F for eMIMO test cases | 17.4.0 |
| 2022-09 | RAN#97 | R5-225748 | 1945 | 1 | F | Addition of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case | 17.4.0 |
| 2022-09 | RAN#97 | R5-225815 | 1863 | 1 | F | Correction on test applicability of HST TCs | 17.4.0 |
| 2022-09 | RAN#97 | R5-225816 | 1864 | 1 | F | Correction message contents 4.6.4.3 and 4.6.4.4 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225817 | 1947 | 1 | F | Clarification on SFTD delay in 4.7.5.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225818 | 1931 | 1 | F | Correction of ENDC FR2 SS-RSRP measurement accuracy test case 5.7.1.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225819 | 1949 | 1 | F | Updates on 5.7.4.1 test procedure and test requirements | 17.4.0 |
| 2022-09 | RAN#97 | R5-225820 | 1951 | 1 | F | Updates on 5.7.4.2 test procedure and test requirements | 17.4.0 |
| 2022-09 | RAN#97 | R5-225821 | 1871 | 1 | F | Correction message contents 6.6.4.3 and 6.6.4.4 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225822 | 1930 | 1 | F | Editorial correction to 5G RRM test case 7.6.1.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-225823 | 1948 | 1 | F | Clarification on SFTD delay in 8.5.1.1 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225824 | 1950 | 1 | F | Corrections to Interruptions at SCell addition/release RRM tests | 17.4.0 |
| 2022-09 | RAN#97 | R5-225846 | 1860 | 1 | F | Completion 7.7.6.1 including TT analysis results | 17.4.0 |
| 2022-09 | RAN#97 | R5-225847 | 1922 | 1 | F | Addition of new test case 5.7.6.1 EN-DC FR2 L1-SINR measurement | 17.4.0 |
| 2022-09 | RAN#97 | R5-225848 | 1923 | 1 | F | Addition of new test case 5.7.6.2 EN-DC FR2 L1-SINR measurement | 17.4.0 |
| 2022-09 | RAN#97 | R5-225849 | 1924 | 1 | F | Addition of new test case 5.7.6.3 EN-DC FR2 L1-SINR measurement | 17.4.0 |
| 2022-09 | RAN#97 | R5-225850 | 1932 | 1 | F | Correction of ENDC FR2-FR2 SS-RSRP measurement accuracy test case 5.7.1.2 including Test Tolerance | 17.4.0 |
| 2022-09 | RAN#97 | R5-225851 | 1886 | 1 | F | Correction to NR SL RRM TC 9.1.3.2 - Cell highest priority with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225852 | 1889 | 1 | F | Correction to NR SL RRM TC 9.1.4.3 - resource re-evaluation with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225853 | 1893 | 1 | F | Correction to Annex F for NR SL RRM TCs | 17.4.0 |
| 2022-09 | RAN#97 | R5-225855 | 1894 | 1 | F | Correction to NR PS RRM TC 7.1.1.3 - intra-freq reselection low mobility with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225856 | 1895 | 1 | F | Correction to NR PS RRM TC 7.1.1.4 - intra-freq reselection not-at-cell-edge with TT | 17.4.0 |

| Change history | | | | | | | |
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| 2022-09 | RAN#97 | R5-225857 | 1896 | 1 | F | Correction to NR PS RRM TC 7.1.1.5 - inter-freq reselection low mobility with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225858 | 1897 | 1 | F | Correction to NR PS RRM TC 7.1.1.6 - inter-freq reselection not-at-cell-edge with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225859 | 1898 | 1 | F | Correction to Annex F for NR PS RRM TCs | 17.4.0 |
| 2022-09 | RAN#97 | R5-225864 | 1908 | 1 | F | Correction to NR SA FR2 RRM TC 7.1.1.1 - intra-freq reselection with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225865 | 1909 | 1 | F | Correction to NR SA FR2 RRM TC 7.1.1.2 - inter-freq reselection with TT | 17.4.0 |
| 2022-09 | RAN#97 | R5-225866 | 1911 | 1 | F | Correction to Annex F for NR RRM TCs | 17.4.0 |
| 2022-09 | RAN#97 | R5-225871 | 1919 | 1 | F | Correction to test parameters in 5.6.3.x | 17.4.0 |
| 2022-09 | RAN#97 | R5-225872 | 1925 | 1 | F | Update of eMIMO test case 6.5.5.5 and 6.5.5.6 | 17.4.0 |
| 2022-09 | RAN#97 | R5-225876 | 1876 | 1 | F | Correction to Mob_enh RRM TCs 6.3.1.X - FR1 DAPS HO | 17.4.0 |
| 2022-09 | RAN#97 | R5-225884 | 1899 | 1 | F | Correction to EN-DC FR1 RRM TC 4.5.2.X - interruption | 17.4.0 |
| 2022-09 | RAN#97 | R5-225885 | 1900 | 1 | F | Correction to EN-DC FR1 RRM TC 4.5.3.X - SCell activation | 17.4.0 |
| 2022-09 | RAN#97 | R5-225886 | 1901 | 1 | F | Correction to EN-DC FR1 RRM TC 4.5.6.1.2 - BWP switching | 17.4.0 |
| 2022-09 | RAN#97 | R5-225887 | 1904 | 1 | F | Correction to NR SA FR1 RRM TC 6.5.2.1 - interruption | 17.4.0 |
| 2022-09 | RAN#97 | R5-225888 | 1905 | 1 | F | Correction to NR SA FR1 RRM TC 6.5.3.X - SCell activation | 17.4.0 |
| 2022-09 | RAN#97 | R5-225889 | 1906 | 1 | F | Correction to NR SA FR1 RRM TC 6.5.6.1.1 - BWP switching | 17.4.0 |
| 2022-12 | RAN#98 | R5-225962 | 1956 | - | F | Adding NR bands n91, n92, n93 and n94 to NR band group for FR1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226113 | 1959 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.3.1.0 - FR1 HO | 17.5.0 |
| 2022-12 | RAN#98 | R5-226114 | 1960 | - | F | Addition of RedCap RRM TC 16.3.1.7 - inter-RAT HO 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226116 | 1962 | - | F | Addition of RedCap RRM TC 16.3.1.9 - inter-RAT blind HO 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226118 | 1964 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.3.2.1.0 - FR1 Reestablish | 17.5.0 |
| 2022-12 | RAN#98 | R5-226119 | 1965 | - | F | Addition of RedCap RRM TC 16.3.2.1.1 - intra reestablish 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226120 | 1966 | - | F | Addition of RedCap RRM TC 16.3.2.1.2 - intra reestablish 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226121 | 1967 | - | F | Addition of RedCap RRM TC 16.3.2.1.3 - inter reestablish 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226122 | 1968 | - | F | Addition of RedCap RRM TC 16.3.2.1.4 - inter reestablish 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226123 | 1969 | - | F | Addition of RedCap RRM TC 16.3.2.1.5 - no timing reestablish 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226124 | 1970 | - | F | Addition of RedCap RRM TC 16.3.2.1.6 - no timing reestablish 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226125 | 1971 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.3.2.2.0 - RACH | 17.5.0 |
| 2022-12 | RAN#98 | R5-226126 | 1972 | - | F | Addition of RedCap RRM TC 16.3.2.2.1 - 4 step CBRA 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226127 | 1973 | - | F | Addition of RedCap RRM TC 16.3.2.2.2 - 4 step CBRA 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226128 | 1974 | - | F | Addition of RedCap RRM TC 16.3.2.2.3 - 4 step CFRA 1 Rx | 17.5.0 |

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| 2022-12 | RAN#98 | R5-226129 | 1975 | - | F | Addition of RedCap RRM TC 16.3.2.2.4 - 4 step CFRA 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226134 | 1980 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.3.2.3.0 - Redirection | 17.5.0 |
| 2022-12 | RAN#98 | R5-226135 | 1981 | - | F | Addition of RedCap RRM TC 16.3.2.3.1 - NR redirection 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226139 | 1985 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.4.1.0 - Tx timing | 17.5.0 |
| 2022-12 | RAN#98 | R5-226142 | 1988 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.5.1.0 - RLM | 17.5.0 |
| 2022-12 | RAN#98 | R5-226143 | 1989 | - | F | Addition of RedCap RRM TC 16.5.1.1 - OOS non-DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226144 | 1990 | - | F | Addition of RedCap RRM TC 16.5.1.2 - OOS non-DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226145 | 1991 | - | F | Addition of RedCap RRM TC 16.5.1.3 - IS non-DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226146 | 1992 | - | F | Addition of RedCap RRM TC 16.5.1.4 - IS non-DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226147 | 1993 | - | F | Addition of RedCap RRM TC 16.5.1.7 - IS DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226148 | 1994 | - | F | Addition of RedCap RRM TC 16.5.1.8 - IS DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226149 | 1995 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.5.2.0 - BFD | 17.5.0 |
| 2022-12 | RAN#98 | R5-226150 | 1996 | - | F | Addition of RedCap RRM TC 16.5.2.1 - SSB BFR 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226152 | 1998 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.6.1.0 - Intra-freq measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-226153 | 1999 | - | F | Addition of RedCap RRM TC 16.6.1.3 - no gap DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226154 | 2000 | - | F | Addition of RedCap RRM TC 16.6.1.4 - no gap DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226155 | 2001 | - | F | Addition of RedCap RRM TC 16.6.1.7 - gap DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226156 | 2002 | - | F | Addition of RedCap RRM TC 16.6.1.8 - gap DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226157 | 2003 | - | F | Addition of RedCap RRM TC 16.6.1.11 - gap non-DRX SSB index 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226158 | 2004 | - | F | Addition of RedCap RRM TC 16.6.1.12 - gap non-DRX SSB index 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226159 | 2005 | - | F | Addition of minimum requirements for RedCap RRM TCs 16.6.4.0 - L1-RSRP | 17.5.0 |
| 2022-12 | RAN#98 | R5-226160 | 2006 | - | F | Addition of RedCap RRM TC 16.6.4.1 - L1-RSRP non-DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226162 | 2008 | - | F | Addition of RedCap RRM TC 16.6.4.3 - L1-RSRP DRX 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-226164 | 2010 | - | F | Addition of minimum requirements for RedCap RRM TCs 17.3.2.1.0 - Reestablish | 17.5.0 |
| 2022-12 | RAN#98 | R5-226165 | 2011 | - | F | Addition of RedCap RRM TC 17.3.2.1.1 - intra reestablish with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226166 | 2012 | - | F | Addition of RedCap RRM TC 17.3.2.1.2 - inter reestablish with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226167 | 2013 | - | F | Addition of RedCap RRM TC 17.3.2.1.3 - no timing reestablish | 17.5.0 |
| 2022-12 | RAN#98 | R5-226168 | 2014 | - | F | Addition of minimum requirements for RedCap RRM TCs 17.5.1.0 - RLM | 17.5.0 |
| 2022-12 | RAN#98 | R5-226169 | 2015 | - | F | Addition of RedCap RRM TC 17.5.1.1 - OOS non-DRX with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226170 | 2016 | - | F | Addition of RedCap RRM TC 17.5.1.2 - IS non-DRX with TT | 17.5.0 |

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| 2022-12 | RAN#98 | R5-226171 | 2017 | - | F | Addition of RedCap RRM TC 17.5.1.4 - IS DRX with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226172 | 2018 | - | F | Addition of minimum requirements for RedCap RRM TCs 17.6.1.0 - Intra-freq measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-226173 | 2019 | - | F | Addition of RedCap RRM TC 17.6.1.1 - no gap non-DRX with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226174 | 2020 | - | F | Addition of minimum requirements for RedCap RRM TCs 18.2.1.0 - L2N HO | 17.5.0 |
| 2022-12 | RAN#98 | R5-226175 | 2021 | - | F | Addition of RedCap RRM TC 18.2.1.1 - L2N HO with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226176 | 2022 | - | F | Addition of minimum requirements for RedCap RRM TCs 18.2.2.0 - L2N redirection | 17.5.0 |
| 2022-12 | RAN#98 | R5-226177 | 2023 | - | F | Addition of RedCap RRM TC 18.2.2.1 - L2N redirection with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-226178 | 2024 | - | F | Correction to Clause 3 for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-226180 | 2026 | - | F | Correction to Annex B for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-226181 | 2027 | - | F | Correction to Annex E for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-226183 | 2029 | - | F | Correction to Annex G for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-226207 | 2030 | - | F | Correction to NR RRM TCs 4.5.2.X and 6.5.2.X - interruption | 17.5.0 |
| 2022-12 | RAN#98 | R5-226208 | 2031 | - | F | Correction to NR RRM TCs 4.5.3.X and 6.5.3.X - SCell activation | 17.5.0 |
| 2022-12 | RAN#98 | R5-226209 | 2032 | - | F | Correction to NR RRM TCs 4.5.6.1.2 and 6.5.6.1.1 - BWP switching | 17.5.0 |
| 2022-12 | RAN#98 | R5-226212 | 2035 | - | F | Correction to cell mapping for RRM TC 6.3.2.3.1 - redirection | 17.5.0 |
| 2022-12 | RAN#98 | R5-226233 | 2039 | - | F | Correction of Inter-RAT TC 8.2.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226374 | 2041 | - | F | Correction to FR2 RRC-based DL active BWP switch | 17.5.0 |
| 2022-12 | RAN#98 | R5-226497 | 2044 | - | F | Corrections to 4.6.4.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226501 | 2048 | - | F | Corrections to 5.6.3.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226502 | 2049 | - | F | Corrections to 6.6.4.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226503 | 2050 | - | F | Corrections to 6.6.4.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226504 | 2051 | - | F | Corrections to 6.6.4.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226505 | 2052 | - | F | Corrections to 6.6.4.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226506 | 2053 | - | F | Corrections to 6.5.5.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226507 | 2054 | - | F | Corrections to 6.5.5.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226508 | 2055 | - | F | Corrections to 6.5.6.2.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226509 | 2056 | - | F | Corrections to 8.4.2.9 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226510 | 2057 | - | F | Corrections to 8.2.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226511 | 2058 | - | F | Corrections to 8.2.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226516 | 2060 | - | F | Update to RRM TC 4A.1.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226647 | 2063 | - | F | Update to test case 6.6.3.1 and 6.6.3.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226649 | 2065 | - | F | Addition of test case 7.4.3.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226650 | 2066 | - | F | Addition of test case 7.5.2.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226652 | 2067 | - | F | Addition of test 7.3.1.1, 7.3.1.2, 7.3.1.3 | 17.5.0 |

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| 2022-12 | RAN#98 | R5-226653 | 2068 | - | F | Update to tests 5.5.2.3 and 5.5.2.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226698 | 2076 | - | F | Update on the delta(Max-Min) rules for 5.7.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226699 | 2077 | - | F | Update on the delta(Max-Min) rules for 5.7.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226775 | 2078 | - | F | Addition of CCA model, RMC into Annex for NR-U | 17.5.0 |
| 2022-12 | RAN#98 | R5-227003 | 2085 | - | F | Update on the delta(Max-Min) rules for 7.7.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227004 | 2086 | - | F | Update on the delta(Max-Min) rules for 7.7.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227005 | 2087 | - | F | Corrections to 7.5.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227006 | 2088 | - | F | Corrections to 7.5.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227007 | 2089 | - | F | Corrections to 7.5.1.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227008 | 2090 | - | F | Corrections to 7.5.1.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227096 | 2094 | - | F | Correction to RadioLinkMonitoringConfig | 17.5.0 |
| 2022-12 | RAN#98 | R5-227097 | 2095 | - | F | Correction to CSI-Report periodicity in procedure of 5.7.4.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227098 | 2096 | - | F | Correction to EUTRA PCell and NR PSCell interruption requirement in 4.5.6.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227100 | 2098 | - | F | Correction to radioBearerConfig in RRCReconfiguration-HO | 17.5.0 |
| 2022-12 | RAN#98 | R5-227182 | 2101 | - | F | Correction of minimum conformance requirements for E-UTRA - NR Early Measurement Reporting test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227188 | 2105 | - | F | Minimum conformance requirements for EN-DC FR1 interruptions at SRS carrier-based switching test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227189 | 2106 | - | F | Addition of EN-DC FR1 interruptions at NR SRS carrier based switching test case 4.5.2.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227190 | 2107 | - | F | Addition of EN-DC FR1 interruptions at NR SRS carrier based switching test case 4.5.2.9 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227191 | 2108 | - | F | Minimum conformance requirements for EN-DC FR2 interruptions at SRS carrier-based switching test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227192 | 2109 | - | F | Addition of EN-DC FR2 interruptions at E-UTRA SRS carrier-based switching test case 5.5.2.7 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227193 | 2110 | - | F | Addition of EN-DC FR2 interruptions at NR SRS carrier-based switching test case 5.5.2.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227194 | 2111 | - | F | Minimum conformance requirements for SA FR1 interruptions at SRS carrier-based switching test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227196 | 2113 | - | F | Minimum conformance requirements for Inter-frequency measurement without measurement gaps | 17.5.0 |
| 2022-12 | RAN#98 | R5-227197 | 2114 | - | F | Addition of SA event triggered reporting with additional mandatory gap pattern test case 6.6.2.9 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227198 | 2115 | - | F | Addition of SA FR1 event triggered reporting without gap when DRX is used test case 6.6.2.10 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227199 | 2116 | - | F | Addition of SA event triggered reporting tests for FR1 without gap when DRX is not used test case 6.6.2.11 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227207 | 2123 | - | F | Correction of minimum conformance requirements for intra-freq measurement cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227211 | 2127 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227212 | 2128 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.3 | 17.5.0 |

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| 2022-12 | RAN#98 | R5-227213 | 2129 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227214 | 2130 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.5 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227215 | 2131 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.6 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227216 | 2132 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.7 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227217 | 2133 | - | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227335 | 2138 | - | F | Correction in 6.1.1.4 test case | 17.5.0 |
| 2022-12 | RAN#98 | R5-227337 | 2139 | - | F | Correction in 6.1.2.4 test case | 17.5.0 |
| 2022-12 | RAN#98 | R5-227340 | 2142 | - | F | Correction on MU definition for BWP switch test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227342 | 2144 | - | F | Updates to L1-RSRP NSA FR1 test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227347 | 2147 | - | F | Updates to L1-RSRP SA FR2 test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227990 | 2135 | 1 | F | Updates to CLI Measurement test case 5.6.4.1, 5.7.5.1, 7.6.4.1 and 7.7.5.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227643 | 1957 | 2 | F | Update of EN-DC FR1 TC 4.5.7.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-226817 | 2079 | - | F | Update of RRM Test Case 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX | 17.5.0 |
| 2022-12 | RAN#98 | R5-227645 | 2093 | 1 | F | Correction to FR2 NSA RLM test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227817 | 2071 | 1 | F | Editorial update to RACH tests | 17.5.0 |
| 2022-12 | RAN#98 | R5-227827 | 2025 | 1 | F | Correction to Annex A for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-227828 | 2126 | 1 | F | Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227829 | 2134 | 1 | F | Addition of NR - E-UTRA cell re-selection test cases for RedCap | 17.5.0 |
| 2022-12 | RAN#98 | R5-227830 | 2112 | 1 | F | Addition of NR FR1 interruptions at SRS carrier-based switching test case 6.5.2.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227831 | 2080 | 1 | F | Modification of description of tables of test requirement for EN-DC FR2 eMIMO measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-227832 | 2082 | 1 | F | Modification of description of tables of test requirement for NR SA FR2 eMIMO measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-227833 | 2059 | 1 | F | Corrections to 6.1.2.5 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227834 | 2141 | 1 | F | Update on priority cell configuration in 8.2.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227835 | 2061 | 1 | F | Update to RRM TC 4A.1.2 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227836 | 2062 | 1 | F | Update to RRM TC 4A.2.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227837 | 2081 | 1 | F | Modification of description of tables of test requirement for EN-DC FR2 L1-RSRP measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-227838 | 2083 | 1 | F | Modification of description of tables of test requirement for NR SA FR2 L1-RSRP measurement | 17.5.0 |
| 2022-12 | RAN#98 | R5-227839 | 2092 | 1 | F | Correction to FR2 NSA BFR test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227844 | 2104 | 1 | F | Addition of CADC enhancement test cases to Annex E and F including Test Tolerance | 17.5.0 |
| 2022-12 | RAN#98 | R5-227845 | 2028 | 1 | F | Correction to Annex F for RedCap RRM TCs | 17.5.0 |
| 2022-12 | RAN#98 | R5-227861 | 2117 | 1 | F | Correction of minimum conformance requirements for intra-freq measurement cases to include HST_enh | 17.5.0 |

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| 2022-12 | RAN#98 | R5-227862 | 2118 | 1 | F | Addition of EN-DC FR1 intra-freq measurement HST_enh test case 4.6.1.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227863 | 2119 | 1 | F | Correction of minimum conformance requirements for inter-freq measurement cases to include HST_enh | 17.5.0 |
| 2022-12 | RAN#98 | R5-227864 | 2120 | 1 | F | Addition of EN-DC FR1 inter-freq measurement HST_enh test case 4.6.2.9 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227865 | 2121 | 1 | F | Correction of minimum conformance requirements for NR SA reselection cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227866 | 2122 | 1 | F | Addition of EN-DC FR1 Cell reselection in HST scenario test case 6.1.1.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227867 | 2124 | 1 | F | Addition of SA FR1 intra-freq measurement HST_enh test case 6.6.1.8 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227868 | 2125 | 1 | F | Addition of SA FR1 intra-freq measurement HST_enh test case 6.6.2.12 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227977 | 2099 | 1 | F | Correction of NR SA FR1 Idle mode CA/DC measurement for FR1 test case 6.6.9.1 including Test Tolerance | 17.5.0 |
| 2022-12 | RAN#98 | R5-227978 | 2100 | 1 | F | Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1 including Test Tolerance | 17.5.0 |
| 2022-12 | RAN#98 | R5-227979 | 2102 | 1 | F | Correction of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case including Test Tolerance | 17.5.0 |
| 2022-12 | RAN#98 | R5-227980 | 2103 | 1 | F | Correction of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case including Test Tolerance | 17.5.0 |
| 2022-12 | RAN#98 | R5-227992 | 2073 | 1 | F | Addition of BFD and Link recovery test cases for NR-U | 17.5.0 |
| 2022-12 | RAN#98 | R5-227993 | 2136 | 1 | F | Addition of EN-DC FR1 RLM test cases under CCA configuration | 17.5.0 |
| 2022-12 | RAN#98 | R5-227994 | 2072 | 1 | F | Update to L1-RSRP measurement accuracy test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-227995 | 2038 | 1 | F | Correction of SA FR1 TC 6.3.2.2.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227996 | 2064 | 1 | F | Addition of test case 7.4.1.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227998 | 2069 | 1 | F | Update to tests 4.5.3.1 and 6.5.3.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-227999 | 2137 | 1 | F | Update on message content for 5.6.1.1 and 5.6.1.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-228000 | 2143 | 1 | F | Corrections to EN-DC FR2 radio link monitoring TCs 5.5.1.1, 5.1.2, 5.5.1.3 and 5.5.1.4 | 17.5.0 |
| 2022-12 | RAN#98 | R5-228001 | 2036 | 1 | F | Correction to Mob_enh RRM TCs 6.3.1.x and 7.3.1.x - DAPS HO | 17.5.0 |
| 2022-12 | RAN#98 | R5-228002 | 2070 | 1 | F | Update to CSI-RS RRM tables | 17.5.0 |
| 2022-12 | RAN#98 | R5-228003 | 1958 | 1 | F | Update of SA FR2 TC 7.5.7.1 | 17.5.0 |
| 2022-12 | RAN#98 | R5-228004 | 2033 | 1 | F | Correction to NR RRM TCs 4.6.4.X and 6.6.4.X - CSI-RS based L1-RSRP | 17.5.0 |
| 2022-12 | RAN#98 | R5-228013 | 1961 | 1 | F | Addition of RedCap RRM TC 16.3.1.8 - inter-RAT HO 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228014 | 1963 | 1 | F | Addition of RedCap RRM TC 16.3.1.10 - inter-RAT blind HO 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228015 | 1976 | 1 | F | Addition of RedCap RRM TC 16.3.2.2.5 - 2 step CBRA 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-228016 | 1977 | 1 | F | Addition of RedCap RRM TC 16.3.2.2.6 - 2 step CBRA 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228017 | 1978 | 1 | F | Addition of RedCap RRM TC 16.3.2.2.7 - 2 step CFRA 1 Rx | 17.5.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-12 | RAN#98 | R5-228018 | 1979 | 1 | F | Addition of RedCap RRM TC 16.3.2.2.8 - 2 step CFRA 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228019 | 1982 | 1 | F | Addition of RedCap RRM TC 16.3.2.3.2 - NR redirection 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228020 | 1983 | 1 | F | Addition of RedCap RRM TC 16.3.2.3.3 - LTE redirection 1 Rx | 17.5.0 |
| 2022-12 | RAN#98 | R5-228021 | 1984 | 1 | F | Addition of RedCap RRM TC 16.3.2.3.4 - LTE redirection 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228022 | 1986 | 1 | F | Addition of RedCap RRM TC 16.4.1.1 - Tx timing 1 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228023 | 1987 | 1 | F | Addition of RedCap RRM TC 16.4.1.2 - Tx timing 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228024 | 1997 | 1 | F | Addition of RedCap RRM TC 16.5.2.2 - SSB BFR 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228025 | 2007 | 1 | F | Addition of RedCap RRM TC 16.6.4.2 - L1-RSRP non-DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228026 | 2009 | 1 | F | Addition of RedCap RRM TC 16.6.4.4 - L1-RSRP DRX 2 Rx with TT | 17.5.0 |
| 2022-12 | RAN#98 | R5-228027 | 2140 | 1 | F | Corrections to SA FR1 SCell activation and deactivation delay TCs 6.5.3.1, 6.5.3.2 and 6.5.3.3 | 17.5.0 |
| 2022-12 | RAN#98 | R5-228028 | 2146 | 1 | F | Updates to L1-RSRP SA FR1 test cases | 17.5.0 |
| 2022-12 | RAN#98 | R5-228029 | 2145 | 1 | F | Updates to L1-RSRP NSA FR2 test cases | 17.5.0 |
| 2023-03 | RAN#99 | R5-230045 | 2148 | - | F | Addition of minimum requirements for FR1 6.6.18.0 - concurrent gaps | 17.6.0 |
| 2023-03 | RAN#99 | R5-230046 | 2149 | - | F | Addition of test case 6.6.18.1 - non-overlapping scenario | 17.6.0 |
| 2023-03 | RAN#99 | R5-230047 | 2150 | - | F | Correction to table E.4-1 for concurrent gap TCs. | 17.6.0 |
| 2023-03 | RAN#99 | R5-230076 | 2151 | - | F | Adding NR bands n100, n101 to NR band group for FR1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230185 | 2154 | - | F | Addition of test case 6.6.18.2 - partial-overlapping scenario | 17.6.0 |
| 2023-03 | RAN#99 | R5-230431 | 2161 | - | F | Update of NR Inter-RAT event triggered reporting tests for FR2 test cases 8.4.2.5 including Test tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-230433 | 2162 | - | F | Update of NR Inter-RAT event triggered reporting tests for FR2 test cases including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-230459 | 2170 | - | F | Addition of RedCap RRM TC 16.3.1.1 - intra known HO 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230465 | 2176 | - | F | Addition of RedCap RRM TC 16.4.3.1 - TA accuracy 1Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230466 | 2177 | - | F | Addition of RedCap RRM TC 16.4.3.2 - TA accuracy 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230467 | 2178 | - | F | Addition of RedCap RRM TC 16.5.1.9 - OOS non-DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230470 | 2181 | - | F | Addition of RedCap RRM TC 16.5.1.12 - IS non-DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230471 | 2182 | - | F | Addition of RedCap RRM TC 16.5.1.13 - OOS DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230474 | 2185 | - | F | Addition of RedCap RRM TC 16.5.1.16 - IS DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230475 | 2186 | - | F | Addition of RedCap RRM TC 16.5.2.5 - BFR non-DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230476 | 2187 | - | F | Addition of RedCap RRM TC 16.5.2.6 - BFR non-DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230477 | 2188 | - | F | Addition of RedCap RRM TC 16.5.2.7 - BFR DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230478 | 2189 | - | F | Addition of RedCap RRM TC 16.5.2.8 - BFR DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230483 | 2194 | - | F | Addition of RedCap RRM TC 16.6.1.5 - intra gap based non-DRX 1Rx | 17.6.0 |

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| 2023-03 | RAN#99 | R5-230484 | 2195 | - | F | Addition of RedCap RRM TC 16.6.1.6 - intra gap based non-DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230487 | 2198 | - | F | Addition of RedCap RRM TC 16.6.4.5 - CSI-RS L1-RSRP 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230488 | 2199 | - | F | Addition of RedCap RRM TC 16.6.4.6 - CSI-RS L1-RSRP 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230489 | 2200 | - | F | Addition of RedCap RRM TC 16.6.4.7 - CSI-RS L1-RSRP DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-230491 | 2202 | - | F | Addition of RedCap RRM TC 17.3.2.2.1 - 4-step CBRA | 17.6.0 |
| 2023-03 | RAN#99 | R5-230492 | 2203 | - | F | Addition of RedCap RRM TC 17.3.2.2.2 - 4-step CFRA | 17.6.0 |
| 2023-03 | RAN#99 | R5-230493 | 2204 | - | F | Addition of RedCap RRM TC 17.3.2.2.3 - 2-step CBRA | 17.6.0 |
| 2023-03 | RAN#99 | R5-230494 | 2205 | - | F | Addition of RedCap RRM TC 17.3.2.2.4 - 2-step CFRA | 17.6.0 |
| 2023-03 | RAN#99 | R5-230495 | 2206 | - | F | Addition of RedCap RRM TC 17.5.1.9 - RLM scheduling restriction | 17.6.0 |
| 2023-03 | RAN#99 | R5-230499 | 2210 | - | F | Addition of RedCap RRM TC 17.6.1.3 - intra gap-based non-DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230500 | 2211 | - | F | Addition of RedCap RRM TC 17.6.1.4 - intra gap-based DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230502 | 2213 | - | F | Addition of RedCap RRM TC 17.6.3.2 - SSB L1-RSRP DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230503 | 2214 | - | F | Addition of RedCap RRM TC 17.6.3.3 - CSI-RS L1-RSRP non-DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230504 | 2215 | - | F | Addition of RedCap RRM TC 17.6.3.4 - CSI-RS L1-RSRP DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230505 | 2216 | - | F | Addition of RedCap RRM TC 18.3.1.1 - FR1 NR meas no-DRX with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230506 | 2217 | - | F | Addition of RedCap RRM TC 18.3.1.2 - FR1 NR meas DRX with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230507 | 2218 | - | F | Addition of RedCap RRM TC 18.3.1.3 - FR1 NR meas no-DRX SBI with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230508 | 2219 | - | F | Addition of RedCap RRM TC 18.3.1.4 - FR1 NR meas DRX SBI with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-230509 | 2220 | - | F | Addition of RedCap RRM TC 18.3.1.5 - FR2 NR meas no-DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230510 | 2221 | - | F | Addition of RedCap RRM TC 18.3.1.6 - FR2 NR meas DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-230511 | 2222 | - | F | Addition of RedCap RRM TC 18.3.1.7 - FR2 NR meas no-DRX SBI | 17.6.0 |
| 2023-03 | RAN#99 | R5-230512 | 2223 | - | F | Addition of RedCap RRM TC 18.3.1.8 - FR2 NR meas DRX SBI | 17.6.0 |
| 2023-03 | RAN#99 | R5-230513 | 2224 | - | F | Correction to Annex A for RedCap RRM TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230514 | 2225 | - | F | Correction to Annex E for RedCap RRM TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230515 | 2226 | - | F | Correction to Annex F for RedCap RRM TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230528 | 2228 | - | F | Correction to Annex A for RRM enhancement TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230529 | 2229 | - | F | Correction to Annex E for RRM enhancement TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230530 | 2230 | - | F | Correction to Annex F for RRM enhancement TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-230532 | 2231 | - | F | Correction to FR1 NR SA RRM TC 6.3.1.3 - inter unknown HO | 17.6.0 |
| 2023-03 | RAN#99 | R5-230725 | 2235 | - | F | Correction to FR2 EN-DC test case 5.3.2.2.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-230774 | 2236 | - | F | Update to RRC based BWP switch in FR2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230777 | 2237 | - | F | Addition of TT for SA FR2 handover test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230780 | 2238 | - | F | Addition of SA FR2-FR2 RRC Connection Release with Redirection test case | 17.6.0 |

| Change history | | | | | | | |
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| 2023-03 | RAN#99 | R5-230782 | 2239 | - | F | Addition of NR-U NSA intra-frequency event-triggered measurement reporting test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230783 | 2240 | - | F | Addition of NR-U SA FR1 RLM and BFR test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230784 | 2241 | - | F | Update to NR-U NSA RLM and BFR test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230867 | 2252 | - | F | Correct Test procedure for RLM-SSB Based FR2 5.5.1.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230929 | 2253 | - | F | Update TC 4A.1.1.1 with TT analysis results | 17.6.0 |
| 2023-03 | RAN#99 | R5-230930 | 2254 | - | F | Update TC 4A.2.1.1 with TT analysis results | 17.6.0 |
| 2023-03 | RAN#99 | R5-230931 | 2255 | - | F | Minimum requirements for TC 4A.2.1.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230932 | 2256 | - | F | Update Annex F for NE-DC test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230938 | 2257 | - | F | Removal of Editor Note for EN-DC FR2 L1-SINR measurement test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230939 | 2258 | - | F | Removal of Editor Note for NR SA FR2 L1-SINR measurement test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-230985 | 2260 | - | F | Clarification on the test procedure of 5.7.1.2 and 7.7.1.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230987 | 2262 | - | F | Correction to message exceptions of 5.7.4.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230988 | 2263 | - | F | Correction to configuration number of 6.3.2.3.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-230989 | 2264 | - | F | Correction to Offset value in CSI-RS RMCs table | 17.6.0 |
| 2023-03 | RAN#99 | R5-230990 | 2265 | - | F | Correction to L1-RSRP report delay requirement | 17.6.0 |
| 2023-03 | RAN#99 | R5-231005 | 2267 | - | F | Correction to 4.5.2.6 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231006 | 2268 | - | F | Correction to 4.5.3.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-231007 | 2269 | - | F | Correction to 4.5.5.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231009 | 2271 | - | F | Correction to 4.5.6.1.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-231010 | 2272 | - | F | Correction to 4.5.7.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231011 | 2273 | - | F | Corrections to 5.6.1.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-231012 | 2274 | - | F | Corrections 5.6.3.3 and 5.6.3.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231013 | 2275 | - | F | Correction to RLM test cases EN-DC FR2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231014 | 2276 | - | F | Correction to RLM test cases NR FR1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231015 | 2277 | - | F | Correction to 6.5.3.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-231016 | 2278 | - | F | Correction to 6.5.6.1.x | 17.6.0 |
| 2023-03 | RAN#99 | R5-231017 | 2279 | - | F | Correction to RLM test cases NR FR2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231018 | 2280 | - | F | Correction in Annex F for 5.6.3.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231019 | 2281 | - | F | Corrections to 16.3.2.3.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231020 | 2282 | - | F | Corrections to 16.6.1.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231025 | 2284 | - | F | Addition of eMG TC 6.6.18.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231026 | 2285 | - | F | Addition of eMG TC 6.6.18.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231111 | 2286 | - | F | Addition of the editors note regarding the principle of testing on mix of E-UTRA and NR FR2 carriers in clause 5 | 17.6.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-03 | RAN#99 | R5-231112 | 2287 | - | F | Addition of the editors note regarding the principle of testing on mix of E-UTRA and NR FR2 carriers in clause 7 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231114 | 2289 | - | F | Editorial corrections of RedCap test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231123 | 2298 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231124 | 2299 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.2 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231125 | 2300 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231126 | 2301 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.4 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231127 | 2302 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.5 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231128 | 2303 | - | F | Addition of NR - E-UTRA cell re-selection test case 16.1.2.6 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231129 | 2304 | - | F | Addition of new NR SA FR1 Event triggered reporting RedCap test case | 17.6.0 |
| 2023-03 | RAN#99 | R5-231130 | 2305 | - | F | Addition of NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx 17.1.1.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231131 | 2306 | - | F | Addition of NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx 17.1.1.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231132 | 2307 | - | F | Addition of NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE 17.1.1.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231133 | 2308 | - | F | Addition of NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE 17.1.1.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231134 | 2309 | - | F | Addition of E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 18.1.1.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231135 | 2310 | - | F | Annex E and F correction for RedCap reselection test cases including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231144 | 2312 | - | F | Correction of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231150 | 2315 | - | F | Correction of EN-DC FR1 HST event triggered reporting test case 4.6.1.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231155 | 2320 | - | F | Correction of cell mapping in Annex E for FR1 HST test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231223 | 2321 | - | F | Correction of NR SA FR1 Idle mode CA/DC measurement for FR1 test case 6.6.9.1 - resubmission | 17.6.0 |
| 2023-03 | RAN#99 | R5-231234 | 2323 | - | F | Corrections in 7.6.2.2 and 7.6.2.4 Test Procedures | 17.6.0 |
| 2023-03 | RAN#99 | R5-231239 | 2324 | - | F | Update Message Contents 4.5.2.5 and 4.5.2.6 test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231240 | 2325 | - | F | Update 5.6.2.4 test applicability | 17.6.0 |
| 2023-03 | RAN#99 | R5-231271 | 2327 | - | F | Update Message Contents 8.4.2.7 and 8.4.2.8 test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231272 | 2328 | - | F | Correction to CSI RS based L1-measurement tests 4.6.4.3, 4.6.4.4,6.6.4.3 and 6.6.4.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231274 | 2330 | - | F | Updated correct Event A4 in test procedure for EN-DC FR1-FR2 event-triggered reporting | 17.6.0 |
| 2023-03 | RAN#99 | R5-231275 | 2331 | - | F | Update of SA FR1 TC 6.1.1.1 and 6.1.2.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231276 | 2332 | - | F | Correction in Measurement uncertainty table Annex F | 17.6.0 |

| Change history | | | | | | | |
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| 2023-03 | RAN#99 | R5-231317 | 2334 | - | F | Update to test case 6.6.3.1 and 6.6.3.2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231706 | 2270 | 1 | F | Correction to 4.5.5.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231707 | 2259 | 1 | F | Correction to firstActiveUplinkBWP-Id in uplinkConfig for non-contention RA TCs | 17.6.0 |
| 2023-03 | RAN#99 | R5-231708 | 2232 | 1 | F | Correction to FR1 NR SA RRM TC 6.7.3.2.1 - SS-SINR | 17.6.0 |
| 2023-03 | RAN#99 | R5-231709 | 2316 | 1 | F | Correction of EN-DC FR1 HST event triggered reporting test case 4.6.2.9 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231710 | 2319 | 1 | F | Correction of SA FR1 HST event triggered reporting test case 6.6.2.12 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231711 | 2243 | 1 | F | Addition of CG-SDT test case | 17.6.0 |
| 2023-03 | RAN#99 | R5-231712 | 2152 | 1 | F | Addition of CG-SDT RRM test case for FR2 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231713 | 2245 | 1 | F | Add new RRC messages and information elements contents for TS38.533 Annex H.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231714 | 2246 | 1 | F | add test case for TS38.533 clause 4.5.5.7 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231715 | 2247 | 1 | F | add test case for TS38.533 clause 4.5.5.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231716 | 2248 | 1 | F | add test case for TS38.533 clause 5.5.5.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231717 | 2249 | 1 | F | add test case for TS38.533 clause 6.5.5.7 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231718 | 2250 | 1 | F | add test case for TS38.533 clause 7.5.5.9 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231719 | 2251 | 1 | F | add test case for TS38.533 clause 7.5.5.10 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231720 | 2169 | 1 | F | Addition of pass fail limits for CBR test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231721 | 2207 | 1 | F | Addition of RedCap RRM TC 17.5.2.3 - CSI-RS BFR non-DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-231722 | 2208 | 1 | F | Addition of RedCap RRM TC 17.5.2.4 - CSI-RS BFR DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-231723 | 2209 | 1 | F | Addition of RedCap RRM TC 17.5.2.5 - BFR scheduling restriction | 17.6.0 |
| 2023-03 | RAN#99 | R5-231724 | 2212 | 1 | F | Addition of RedCap RRM TC 17.6.3.1 - SSB L1-RSRP non-DRX | 17.6.0 |
| 2023-03 | RAN#99 | R5-231725 | 2283 | 1 | F | Corrections to 16.6.1.12 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231726 | 2163 | 1 | F | Addition of test case 4.5.3.5 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231727 | 2164 | 1 | F | Addition of test case 5.5.3.7 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231728 | 2165 | 1 | F | Addition of test case 6.5.3.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231729 | 2166 | 1 | F | Addition of test case 6.5.3.5 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231730 | 2167 | 1 | F | Addition of test case 7.5.3.4 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231731 | 2168 | 1 | F | Addition of test case 7.5.3.5 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231732 | 2290 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231733 | 2292 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.3 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231734 | 2294 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.5 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231735 | 2296 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.7 | 17.6.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-03 | RAN#99 | R5-231736 | 2153 | 1 | F | Adding test case 7.5.11 for UE UL carrier RRC reconfiguration delay | 17.6.0 |
| 2023-03 | RAN#99 | R5-231743 | 2311 | 1 | F | Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231744 | 2313 | 1 | F | Correction of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231746 | 2295 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.6 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231747 | 2297 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.8 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231748 | 2314 | 1 | F | Correction of test tolerance for CADC enhancement test cases in Annex F | 17.6.0 |
| 2023-03 | RAN#99 | R5-231759 | 2183 | 1 | F | Addition of RedCap RRM TC 16.5.1.14 - OOS DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231760 | 2291 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.2 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231761 | 2293 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.4 including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231764 | 2160 | 1 | F | Update of RRM Test Case 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX including Test Tolerance | 17.6.0 |
| 2023-03 | RAN#99 | R5-231767 | 2233 | 1 | F | Introduction of CLI Measurement test case 5.6.4.2, 5.7.5.2, 7.6.4.2, 7.7.5.2, 6.6.6.1 and 6.7.8.1 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231855 | 2155 | 1 | F | Addition of PRS based UE Rx-Tx measurement FR1 SA test case | 17.6.0 |
| 2023-03 | RAN#99 | R5-231856 | 2157 | 1 | F | Addition of PRS based UE Rx-Tx measurement FR2 SA test case | 17.6.0 |
| 2023-03 | RAN#99 | R5-231872 | 2335 | 1 | F | Update to RRM applicability rules and test optimization - 38.533 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231875 | 2261 | 1 | F | Correction to NSA FR2 RLM test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231884 | 2227 | 1 | F | Addition of RRM enh TC 6.5.8.1 - PCell CBW change with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231893 | 2156 | 2 | F | Addition of TRS based UE Rx-Tx measurement SA FR1 test case | 17.6.0 |
| 2023-03 | RAN#99 | R5-231896 | 2242 | 1 | F | Update to HST RRM test cases | 17.6.0 |
| 2023-03 | RAN#99 | R5-231950 | 2317 | 1 | F | Correction of SA FR1 HST reselection test case 6.1.1.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231951 | 2318 | 1 | F | Correction of SA FR1 HST event triggered reporting test case 6.6.1.8 | 17.6.0 |
| 2023-03 | RAN#99 | R5-231954 | 2179 | 1 | F | Addition of RedCap RRM TC 16.5.1.10 - OOS non-DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231955 | 2180 | 1 | F | Addition of RedCap RRM TC 16.5.1.11 - IS non-DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-231956 | 2184 | 1 | F | Addition of RedCap RRM TC 16.5.1.15 - IS DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-231957 | 2190 | 1 | F | Addition of RedCap RRM TC 16.5.4.1 - CBW change 1Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231958 | 2191 | 1 | F | Addition of RedCap RRM TC 16.5.4.2 - CBW change 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231963 | 2201 | 1 | F | Addition of RedCap RRM TC 16.6.4.8 - CSI-RS L1-RSRP DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231976 | 2171 | 1 | F | Addition of RedCap RRM TC 16.3.1.2 - intra known HO 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231977 | 2172 | 1 | F | Addition of RedCap RRM TC 16.3.1.3 - intra unknown HO 1Rx | 17.6.0 |

| Change history | | | | | | | |
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| 2023-03 | RAN#99 | R5-231978 | 2173 | 1 | F | Addition of RedCap RRM TC 16.3.1.4 - intra unknown HO 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231979 | 2174 | 1 | F | Addition of RedCap RRM TC 16.3.1.5 - inter unknown HO 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-231980 | 2175 | 1 | F | Addition of RedCap RRM TC 16.3.1.6 - inter unknown HO 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231981 | 2192 | 2 | F | Addition of RedCap RRM TC 16.6.1.1 - gapless non-DRX 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-231982 | 2193 | 2 | F | Addition of RedCap RRM TC 16.6.1.2 - gapless non-DRX 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | R5-231983 | 2196 | 2 | F | Addition of RedCap RRM TC 16.6.1.9 - intra gapless SBI 1Rx | 17.6.0 |
| 2023-03 | RAN#99 | R5-231984 | 2197 | 2 | F | Addition of RedCap RRM TC 16.6.1.10 - intra gapless SBI 2Rx with TT | 17.6.0 |
| 2023-03 | RAN#99 | - | - | - | - | coversheet correction | 17.6.1 |
| 2023-06 | RAN#100 | R5-232097 | 2340 | - | F | Addition of minimum requirements for 6.6.19.0 - FR1 NCSG | 17.7.0 |
| 2023-06 | RAN#100 | R5-232098 | 2341 | - | F | Addition of NCSG RRM test case 6.6.19.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232099 | 2342 | - | F | Addition of NCSG RRM test case 6.6.19.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232100 | 2343 | - | F | Addition of NCSG RRM test case 6.6.19.3 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232101 | 2344 | - | F | Addition of NCSG RRM test case 6.6.19.4 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232102 | 2345 | - | F | Correction to table E.4-1 and E.4-2 for NCSG TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-232104 | 2346 | - | F | Addition of minimum requirements for 6.6.17.0 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232130 | 2349 | - | F | Addition to CG-SDT RRM test case for FR2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232171 | 2350 | - | F | Core spec alignment for RedCap TCs 16.6.1.8 and 16.6.1.12 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232172 | 2351 | - | F | Correction to Test frequencies reference for RedCap TCs in chapter 16 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232174 | 2353 | - | F | Core spec alignment for SMTC value for TC 6.1.1.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232175 | 2354 | - | F | Correction to Test frequencies reference for active BWP switch TCs: 4.5.6.1.1, 4.5.6.1.2, 4.5.6.2.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232307 | 2369 | - | F | Correction to EN-DC FR2 RLM tests for PSCell configured with CSI-RS-based RLM-RS including TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-232336 | 2370 | - | F | Update concurrent gap test cases 6.6.18.1 and 6.6.18.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232426 | 2371 | - | F | Correction to table E.4-1 for Pre-MG TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-232460 | 2374 | - | F | Correction to RedCap RRM TC 16.5.2.x SSB BFR | 17.7.0 |
| 2023-06 | RAN#100 | R5-232461 | 2375 | - | F | Correction to RedCap RRM TC 16.6.1.x CDSSB intraFreq | 17.7.0 |
| 2023-06 | RAN#100 | R5-232462 | 2376 | - | F | Correction to RedCap RRM TC 16.6.1.x NCDSSB intraFreq | 17.7.0 |
| 2023-06 | RAN#100 | R5-232463 | 2377 | - | F | Correction to RedCap RRM TC 17.5.1.2 SSB InSync noDRX | 17.7.0 |
| 2023-06 | RAN#100 | R5-232467 | 2381 | - | F | Correction to RedCap RRM TC 17.6.1.1 intraFreq noDRX | 17.7.0 |
| 2023-06 | RAN#100 | R5-232469 | 2383 | - | F | Correction to RedCap RRM TC 17.6.1.3 gap intraFreq noDRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-232470 | 2384 | - | F | Correction to RedCap RRM TC 17.6.1.4 gap intraFreq DRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-232472 | 2386 | - | F | Correction to RedCap RRM TC 17.6.3.2 SSB L1RSRP DRX with TT | 17.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-06 | RAN#100 | R5-232473 | 2387 | - | F | Correction to RedCap RRM TC 17.6.3.3 CSIRS L1RSRP noDRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-232474 | 2388 | - | F | Correction to RedCap RRM TC 17.6.3.4 CSIRS L1RSRP DRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-232475 | 2389 | - | F | Correction to RedCap RRM TC 18.2.2.1 L2N Redirection | 17.7.0 |
| 2023-06 | RAN#100 | R5-232480 | 2394 | - | F | Correction to Annex A for RedCap RRM TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-232482 | 2396 | - | F | Correction to Annex F for RedCap RRM TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-232489 | 2397 | - | F | Correction to RRM enh TC 6.5.8.1 CBW change | 17.7.0 |
| 2023-06 | RAN#100 | R5-232491 | 2399 | - | F | Correction to EN DC RRM TC 4.6.2.x FR1 interFreq | 17.7.0 |
| 2023-06 | RAN#100 | R5-232492 | 2400 | - | F | Correction to NR SA RRM TC 6.6.2.x FR1 interFreq | 17.7.0 |
| 2023-06 | RAN#100 | R5-232494 | 2402 | - | F | Correction to Annex H for NR RRM TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-232530 | 2403 | - | F | Update of eMG TC 6.6.18.3 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232531 | 2404 | - | F | Update of eMG TC 6.6.18.4 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232532 | 2405 | - | F | Update of E.4 for MG enhancements | 17.7.0 |
| 2023-06 | RAN#100 | R5-232533 | 2406 | - | F | Update of H.3.1 for MG enhancements | 17.7.0 |
| 2023-06 | RAN#100 | R5-232916 | 2426 | - | F | Correction of EN-DC event reporting with highSpeedMeasCA-SCell-r17 test case 4.6.1.8 including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-232917 | 2427 | - | F | Correction of EN-DC event reporting with highSpeedMeasCA-SCell-r17 test case 4.6.2.9 including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-232918 | 2428 | - | F | Correction of SA FR1 HST reselection test case 6.1.1.8 including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-232920 | 2430 | - | F | Correction of SA event reporting with highSpeedMeasCA-SCell-r17 test case 6.6.2.12 including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-232921 | 2431 | - | F | Correction of Annex F for HST test cases including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-232923 | 2433 | - | F | Correction of RedCap test case 17.1.1.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232924 | 2434 | - | F | Correction of RedCap test case 17.1.1.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232925 | 2435 | - | F | Correction of RedCap test case 17.1.1.3 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232926 | 2436 | - | F | Correction of RedCap test case 17.1.1.4 | 17.7.0 |
| 2023-06 | RAN#100 | R5-232982 | 2439 | - | F | Correction to CSI RS based L1-RSRP measurement test 5.6.3.4 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233011 | 2440 | - | F | Correction to message exception in FR1 BWP Switching test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233012 | 2441 | - | F | Correction to ssb-ToMeasure setting in 5.6.1.1 and 5.6.1.3 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233013 | 2442 | - | F | Correction to CellGroupConfig in 5.5.6.2.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233015 | 2444 | - | F | Correction to entries of FR2 RLM config in Annex H | 17.7.0 |
| 2023-06 | RAN#100 | R5-233019 | 2447 | - | F | Corrections to RRM HST 6.1.1.7 test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233020 | 2448 | - | F | Introduction of 6.5.1.9 power saving enhancement test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233134 | 2449 | - | F | Correction in RRM TC 4.5.2.5 TC Procedure | 17.7.0 |
| 2023-06 | RAN#100 | R5-233136 | 2450 | - | F | Removal of duplicated table in A.1.4.2-3 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233137 | 2451 | - | F | Core spec alignment for TC 5.5.1.7 | 17.7.0 |

| Change history | | | | | | | |
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| 2023-06 | RAN#100 | R5-233140 | 2454 | - | F | PDCCH Config correction for FR2 beam failure detection and link recovery TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233298 | 2461 | - | F | Addition of NR SA FR2 BFD and LR TT for RedCap | 17.7.0 |
| 2023-06 | RAN#100 | R5-233507 | 2367 | 1 | F | Addition of MAC-CE based active TCI state switch test case for HST FR2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233604 | 2359 | 1 | F | Completion of SA FR2 direct SCell activation at handover test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233605 | 2361 | 1 | F | Completion of SA FR2 direct SCell activation test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233606 | 2362 | 1 | F | Completion of ENDC FR2 direct SCell activation test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233607 | 2366 | 1 | F | Addition of UE Rx-Tx time difference measurement for propagation delay compensation using TRS in FR2 test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233608 | 2339 | 1 | F | Addition of Pre-MG RRM test case 6.6.17.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233609 | 2338 | 1 | F | Addition of Pre-MG RRM test case 6.6.17.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233610 | 2352 | 1 | F | Core spec alignment for SMTC value for RedCap TC 16.1.1.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233611 | 2395 | 1 | F | Correction to Annex E for RedCap RRM TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233612 | 2415 | 1 | F | Addition of RedCap RLM OOS test cases 16.5.1.5 and 16.5.1.6 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233613 | 2416 | 1 | F | Addition of RedCap SSB-based BFD and LR in DRX mode test cases 16.5.2.3 and 16.5.2.4 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233614 | 2417 | 1 | F | Addition of RedCap DCI-based DL active BWP switch test cases 16.5.3.1.1 and 16.5.3.1.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233615 | 2418 | 1 | F | Addition of RedCap RRC-based DL active BWP switch test cases 16.5.3.2.1 and 16.5.3.2.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233616 | 2432 | 1 | F | Correction of RedCap NR SA FR1 - E-UTRA Cell reselection test cases in clause 16.1.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233617 | 2437 | 1 | F | Annex E correction for Redcap FR2 reselection cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233618 | 2348 | 1 | F | Adding test case 7.5.3.3 for SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX | 17.7.0 |
| 2023-06 | RAN#100 | R5-233619 | 2419 | 1 | F | Addition of power savings RLM OOS test case 4.5.1.9 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233620 | 2420 | 1 | F | Addition of power savings RLM OOS test case 5.5.1.10 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233621 | 2411 | 1 | F | Addition of NR-U EN-DC SS-RSRP measurement performance test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233622 | 2412 | 1 | F | Update to NR-U frequency bands | 17.7.0 |
| 2023-06 | RAN#100 | R5-233623 | 2413 | 1 | F | Addition of NR-U SA SS-RSRP measurement performance test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233624 | 2355 | 1 | F | Clarification to test procedure for EN-DC active BWP switch TCs: 4.5.6.1.1, 4.5.6.1.2, 4.5.6.2.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233625 | 2423 | 1 | F | Update to SCell activation and deactivation test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233626 | 2455 | 1 | F | T3 correction of SSB_RP for TC 5.5.5.1 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233627 | 2443 | 1 | F | Editorial correction to reference of AoA setup | 17.7.0 |
| 2023-06 | RAN#100 | R5-233628 | 2459 | 1 | F | Update of RRM Test Case 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX | 17.7.0 |
| 2023-06 | RAN#100 | R5-233629 | 2356 | 1 | F | Clarification to test procedure for SA active BWP switch TCs: 6.5.6.1.1, 6.5.6.1.2, 6.5.6.2.1 | 17.7.0 |

| Change history | | | | | | | |
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| 2023-06 | RAN#100 | R5-233630 | 2424 | 1 | F | Correction to test applicability for SA FR2 test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233645 | 2410 | 1 | F | Addition of NR SA FR2 active TCI state switch test cases 7.5.8.1.1 and 7.5.8.2.1 with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233647 | 2385 | 1 | F | Correction to RedCap RRM TC 17.6.3.1 SSB L1RSRP noDRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233648 | 2408 | 1 | F | Update to CLI tests 4.6.5.1 and 6.6.6.1 with TTs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233649 | 2409 | 1 | F | Update to CLI tests 4.7.6.1 and 6.7.8.1 with TTs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233650 | 2422 | 1 | F | Annex E and F updates for CLI-based test cases including TTs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233654 | 2378 | 1 | F | Correction to RedCap RRM TC 17.5.2.3 CSIRS BFR noDRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233655 | 2379 | 1 | F | Correction to RedCap RRM TC 17.5.2.4 CSIRS BFR DRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233656 | 2380 | 1 | F | Correction to RedCap RRM TC 17.5.2.5 BFR restriction with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233657 | 2382 | 1 | F | Addition of RedCap RRM TC 17.6.1.2 intraFreq DRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233658 | 2429 | 1 | F | Correction of SA event reporting with highSpeedMeasCA-SCell-r17 test case 6.6.1.8 including Test Tolerance | 17.7.0 |
| 2023-06 | RAN#100 | R5-233660 | 2363 | 1 | F | Update to PRS based UE Rx-Tx measurement FR1 SA test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233661 | 2364 | 1 | F | Update to PRS based UE Rx-Tx measurement FR2 SA test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233662 | 2365 | 1 | F | Update to TRS based UE Rx-Tx measurement FR1 SA test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233663 | 2347 | 1 | F | UE UL carrier RRC reconfiguration delay test tolerances for FR2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233665 | 2368 | 1 | F | Correction to FR2 BFD and LR including TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233666 | 2460 | 1 | F | Correction to FR2 BFD and LR | 17.7.0 |
| 2023-06 | RAN#100 | R5-233667 | 2421 | 1 | F | TT update for test cases 6.6.3.1 and 6.6.3.2 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233729 | 2452 | 1 | F | Core spec alignment for antenna configuration for 4.5.3 TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233730 | 2453 | 1 | F | Core spec alignment for antenna configuration for 6.5.3 TCs | 17.7.0 |
| 2023-06 | RAN#100 | R5-233739 | 2456 | 1 | F | Update to FR1 CG-SDT test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233740 | 2414 | 1 | F | Update to RRM idle mode HST test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233741 | 2457 | 1 | F | Correction for multi-TRP test case 7.5.5.9 | 17.7.0 |
| 2023-06 | RAN#100 | R5-233742 | 2458 | 1 | F | Update to L2N latency test cases | 17.7.0 |
| 2023-06 | RAN#100 | R5-233747 | 2357 | 1 | F | Completion of EN-DC FR1 direct SCell activation test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233748 | 2358 | 1 | F | Completion of SA FR1 direct SCell activation test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233749 | 2360 | 1 | F | Completion SA FR1 direct SCell activation at handover test case | 17.7.0 |
| 2023-06 | RAN#100 | R5-233752 | 2390 | 1 | F | Correction to RedCap RRM TC 18.3.1.5 interRAT noDRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233753 | 2391 | 1 | F | Correction to RedCap RRM TC 18.3.1.6 interRAT DRX with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233754 | 2392 | 1 | F | Correction to RedCap RRM TC 18.3.1.7 interRAT noDRX SBI with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233755 | 2393 | 1 | F | Correction to RedCap RRM TC 18.3.1.8 interRAT DRX SBI with TT | 17.7.0 |
| 2023-06 | RAN#100 | R5-233771 | 2373 | 1 | F | Correction to RedCap RRM TC 16.3.1.x NCDSSB HO | 17.7.0 |
| 2023-06 | RAN#100 | R5-233773 | 2398 | 1 | F | Correction to Annex A for RRM enh TCs | 17.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-06 | RAN#100 | R5-233775 | 2401 | 2 | F | Correction to NR SA RRM TC 8.4.2.x FR2 interRAT | 17.7.0 |
| 2023-09 | RAN#101 | R5-233889 | 2467 | - | F | Update CORESET RMC in Annex for Redcap TC 16.5.3.2.1 and 16.5.3.2.2 with core spec alignment | 17.8.0 |
| 2023-09 | RAN#101 | R5-233891 | 2468 | - | F | Correction of 6.6.19.1 NCSG test case with Test Tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-233892 | 2469 | - | F | Correction of 6.6.19.2 NCSG test case with Test Tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-233894 | 2471 | - | F | Correction of 6.6.19.4 NCSG test case with Test Tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-233967 | 2472 | - | F | Adding TTs into 7.5.3.3 - SCell Activation and deactivation for SCell in FR2 inter-band in non-DRX | 17.8.0 |
| 2023-09 | RAN#101 | R5-233999 | 2476 | - | F | Correction of Redcap test case 16.6.1.3, 16.6.1.4, 16.6.1.7 and 16.6.1.8 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234000 | 2477 | - | F | Correction of Redcap test case 16.1.2.1, 16.1.2.2, 16.1.2.3 and 16.1.2.4 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234086 | 2481 | - | F | Correction of test step number and reference for RRM Test Case | 17.8.0 |
| 2023-09 | RAN#101 | R5-234331 | 2482 | - | F | Correction in minimum conformance requirements for intra-frequency cell re-selection to handle HST FR2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234332 | 2483 | - | F | Addition of intra-frequency cell re-selection NR FR2 test case for UE power class 6 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234337 | 2486 | - | F | Completion of propagation delay compensation FR1 SA test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234338 | 2487 | - | F | Completion of propagation delay compensation FR2 SA test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234356 | 2497 | - | F | Addition of 16.6.7.1 test case: NR SA FR1 intra-frequency CGI identification of NR neighbour cell in FR1 for 1 Rx UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-234357 | 2498 | - | F | Addition of 16.6.7.2 test case: NR SA FR1 intra-frequency CGI identification of NR neighbour cell in FR1 for 2 Rx UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-234367 | 2507 | - | F | Cell configuration mapping for the MRDC and CPAC test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-234385 | 2508 | - | F | Correction to FR2 RLM tests for PSCell configured with SSB-based RLM-RS including TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234386 | 2509 | - | F | Correction to TC 17.5.1.2 RedCap NR SA FR2 RLM including TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234388 | 2510 | - | F | Correction to 5.5.1.6 EN-DC FR2 RLM test for PSCell configured with CSI-RS-based RLM-RS including TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234397 | 2514 | - | F | Correction to RedCap RRM TC 16.3.1.1_intra freq HO known 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234398 | 2515 | - | F | Correction to RedCap RRM TC 16.3.1.3_intra freq HO unknown 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234399 | 2516 | - | F | Correction to RedCap RRM TC 16.3.1.4_intra freq HO unknown 2Rx | 17.8.0 |
| 2023-09 | RAN#101 | R5-234400 | 2517 | - | F | Correction to RedCap RRM TC 16.3.1.5_inter freq HO unknown 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234401 | 2518 | - | F | Correction to RedCap RRM TC 16.5.1.1_SSB OOS no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234402 | 2519 | - | F | Correction to RedCap RRM TC 16.5.1.3_SSB IS no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234404 | 2521 | - | F | Correction to RedCap RRM TC 16.5.1.7_SSB IS DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234405 | 2522 | - | F | Correction to RedCap RRM TC 16.5.1.9_CSIRS OOS no DRX 1Rx with TT | 17.8.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-09 | RAN#101 | R5-234406 | 2523 | - | F | Correction to RedCap RRM TC 16.5.1.11_CSIRS IS no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234407 | 2524 | - | F | Correction to RedCap RRM TC 16.5.1.13_CSIRS OOS DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234408 | 2525 | - | F | Correction to RedCap RRM TC 16.5.1.15_CSIRS IS DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234409 | 2526 | - | F | Correction to RedCap RRM TC 16.6.1.1_no gap no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234410 | 2527 | - | F | Correction to RedCap RRM TC 16.6.1.3_no gap DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234411 | 2528 | - | F | Correction to RedCap RRM TC 16.6.1.5_gap no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234412 | 2529 | - | F | Correction to RedCap RRM TC 16.6.1.7_gap DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234413 | 2530 | - | F | Correction to RedCap RRM TC 16.6.1.9_no gap no DRX SBI 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234414 | 2531 | - | F | Correction to RedCap RRM TC 16.6.1.11_no gap DRX SBI 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234415 | 2532 | - | F | Correction to RedCap RRM TC 16.6.4.1_SSB L1 RSRP no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234416 | 2533 | - | F | Correction to RedCap RRM TC 16.6.4.3_SSB L1 RSRP DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234417 | 2534 | - | F | Correction to RedCap RRM TC 16.6.4.5_CSIRS L1 RSRP no DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234418 | 2535 | - | F | Correction to RedCap RRM TC 16.6.4.7_CSIRS L1 RSRP DRX 1Rx with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234428 | 2537 | - | F | Addition of RRM enh TC 4.5.6.3.1 - EN DC dual DCI BWP switch | 17.8.0 |
| 2023-09 | RAN#101 | R5-234429 | 2538 | - | F | Addition of RRM enh TC 4.5.6.5.1 - EN DC dual RRC BWP switch | 17.8.0 |
| 2023-09 | RAN#101 | R5-234430 | 2539 | - | F | Addition of RRM enh TC 6.5.6.3.1 - NR SA dual DCI BWP switch | 17.8.0 |
| 2023-09 | RAN#101 | R5-234431 | 2540 | - | F | Addition of RRM enh TC 6.5.6.5.1 - NR SA dual RRC BWP switch | 17.8.0 |
| 2023-09 | RAN#101 | R5-234432 | 2541 | - | F | Correction to Annex E for RRM enh TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-234436 | 2544 | - | F | Correction to NR SA RRM TC 6.7.1.2.1_RSRP absolute accuracy | 17.8.0 |
| 2023-09 | RAN#101 | R5-234437 | 2545 | - | F | Correction to FR2 NR inter-RAT measurement TCs 8.4.2.X | 17.8.0 |
| 2023-09 | RAN#101 | R5-234440 | 2547 | - | F | Correction to power saving RRM TCs 6.1.1.x_relaxed measurements | 17.8.0 |
| 2023-09 | RAN#101 | R5-234646 | 2548 | - | F | Addition of NTN intra-frequency measurement test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234647 | 2549 | - | F | Addition of NTN general sections | 17.8.0 |
| 2023-09 | RAN#101 | R5-234650 | 2550 | - | F | Update for test case 4.5.1.9 including TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234652 | 2551 | - | F | Update for test case 5.5.1.10 including TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-234653 | 2552 | - | F | Addition of NR-U general sections | 17.8.0 |
| 2023-09 | RAN#101 | R5-234654 | 2553 | - | F | Addition of NR-U interruption test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-234655 | 2554 | - | F | Addition of NR-U SCell activation and deactivation test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234656 | 2555 | - | F | Addition of NR-U SS-RSRQ measurement accuracy test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234657 | 2556 | - | F | Addition of NR-U SS-SINR measurement accuracy test cases | 17.8.0 |

| Change history | | | | | | | |
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| 2023-09 | RAN#101 | R5-234658 | 2557 | - | F | Update to NR-U test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234659 | 2558 | - | F | Update to NR-U annexes E and H | 17.8.0 |
| 2023-09 | RAN#101 | R5-234662 | 2559 | - | F | Annex E and F updates for Redcap RLM, BFR and BWP switch test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234664 | 2560 | - | F | Update to Redcap RLM, BFR and BWP switch tests including TTs | 17.8.0 |
| 2023-09 | RAN#101 | R5-234671 | 2561 | - | F | Update to TT analysis for L2N RedCap latency test cases 18.3.1.x | 17.8.0 |
| 2023-09 | RAN#101 | R5-234677 | 2564 | - | F | Addition of TT analysis for TCI state switch test cases 7.5.8.1.1 and 7.5.8.2.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234681 | 2566 | - | F | Update to TT analysis for L2N latency test cases 8.4.2.x | 17.8.0 |
| 2023-09 | RAN#101 | R5-234682 | 2567 | - | F | Addition of CSI-RS based RLM SA FR2 Test Cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234776 | 2571 | - | F | Test tolerances and measurement uncertainty for DL interruptions testcases 6.5.7A.2 and 6.5.7B.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234807 | 2572 | - | F | Addition of minimum requirements for Fast SCell Activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234808 | 2573 | - | F | Addition of minimum requirements for Conditional PSCell addition | 17.8.0 |
| 2023-09 | RAN#101 | R5-234810 | 2575 | - | F | Addition of new test case 7.5.3.14 for Fast SCell Activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234811 | 2576 | - | F | Addition of new test case 7.5.12.1 for Conditional PSCell addition | 17.8.0 |
| 2023-09 | RAN#101 | R5-234812 | 2577 | - | F | Addition of new test case 7.5.15.1 for SCG activation and deactivation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234813 | 2578 | - | F | Addition of CSI-RS configuration for Fast SCell activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234855 | 2580 | - | F | Addition of 5.5.11.1 new test case for unified joint TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234856 | 2581 | - | F | Addition of 5.5.11.2 new test case for unified UL TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234857 | 2582 | - | F | Addition of 5.5.11.3 new test case for unified DL TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234858 | 2583 | - | F | Addition of 7.5.13.1 new test case for unified joint TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234859 | 2584 | - | F | Addition of 7.5.13.2 new test case for unified UL TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234860 | 2585 | - | F | Addition of 7.5.13.3 new test case for unified DL TCI activation | 17.8.0 |
| 2023-09 | RAN#101 | R5-234919 | 2591 | - | F | Correction to Cell 2 PCI for next iteration in 16.1.1.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-234921 | 2593 | - | F | Correction to test requirements in RedCap Cell reselection test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234924 | 2596 | - | F | Correction to RedCap Event triggered measurement test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-234977 | 2608 | - | F | Addition of cell configuration mapping for interruptions at SRS carrier based switching test cases to Annex E | 17.8.0 |
| 2023-09 | RAN#101 | R5-234992 | 2623 | - | F | Addition of NR Event triggered reporting test case 16.6.2.9 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-234995 | 2626 | - | F | Addition of NR Event triggered reporting test case 16.6.2.12 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-234997 | 2628 | - | F | Addition of cell configuration mapping for event triggered measurement RedCap test cases to Annex E | 17.8.0 |
| 2023-09 | RAN#101 | R5-235107 | 2646 | - | F | TC 4.6.1.2 alignment with SA FR1 test case on DRX configuration | 17.8.0 |
| 2023-09 | RAN#101 | R5-235108 | 2647 | - | F | Correction in 5.5.1.5 and 5.5.1.6 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235110 | 2648 | - | F | Correction in 5.5.1.7 and 5.5.1.8 | 17.8.0 |

| Change history | | | | | | | |
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| 2023-09 | RAN#101 | R5-235117 | 2652 | - | F | Correction in 8.4.2.8 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235166 | 2654 | - | F | Addition of clause 5.5.9.0 minimum conformance requirements for uplink spatial relation switch delay | 17.8.0 |
| 2023-09 | RAN#101 | R5-235167 | 2655 | - | F | Addition of EN-DC PSCell FR2 uplink spatial relation switch for a known spatial relation test case 5.5.9.1.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235168 | 2656 | - | F | Addition of EN-DC PSCell FR2 uplink spatial relation switch associated with a known DL-RS test case 5.5.9.2.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235170 | 2658 | - | F | Addition of NR PCell FR2 uplink spatial relation switch with known DL-RS test case 7.5.9.1.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235171 | 2659 | - | F | Addition of NR PCell FR2 uplink spatial relation switch with known DL-RS test case 7.5.9.2.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235172 | 2660 | - | F | Addition of test cases 5.5.9.1.1 and 5.5.9.2.1 to Table E.3-1, and test cases 7.5.9.1.1 and 7.5.9.2.1 to Table E.5-1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235463 | 2602 | 1 | F | Correction of interruptions at NR SRS carrier based switching test case 4.5.2.8 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235464 | 2603 | 1 | F | Correction of interruptions at E-UTRA SRS carrier based switching test case 4.5.2.9 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235465 | 2568 | 2 | F | Update to gap-based measurement reporting tests | 17.8.0 |
| 2023-09 | RAN#101 | R5-235466 | 2600 | 1 | F | Correction to BWP Switch Delay test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-235695 | 2466 | 1 | F | Correction of RedCap test case 16.6.1.7 and 16.6.1.11 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235696 | 2562 | 1 | F | Update to stationary measurement idle mode RedCap tests | 17.8.0 |
| 2023-09 | RAN#101 | R5-235697 | 2627 | 1 | F | Correction of the conditions for 1Rx RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235698 | 2631 | 1 | F | Removal of redundant Note 4 in 16.6.4.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235699 | 2633 | 1 | F | Alignment of Annex E14 to Test procedure for RedCap Redirection TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235700 | 2638 | 1 | F | Corrections to RedCap RA TCs 16.3.2.2.2 and 16.3.2.2.4 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235701 | 2639 | 1 | F | Typos corrections for RedCap TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235702 | 2645 | 1 | F | Core Spec alignment for RedCap RLM Tcs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235703 | 2499 | 1 | F | Addition of NR SA FR2 SSB based Inter-cell L1-RSRP measurement in non-DRX test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235704 | 2579 | 1 | F | Addition of minimum requirement for unified TCI state switch delay | 17.8.0 |
| 2023-09 | RAN#101 | R5-235705 | 2586 | 1 | F | Update to Annex for feMIMO | 17.8.0 |
| 2023-09 | RAN#101 | R5-235706 | 2495 | 1 | F | Addition of DL interruptions at switching between two uplink bands with two transmit antenna connectors for 6.5.7C.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235707 | 2484 | 1 | F | Corrections in MAC-CE based active TCI state switch test case for HST FR2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235708 | 2485 | 1 | F | Handle of PC6 devices via HighSpeedMeasFlagFR2-r17 signalling for 7.4.1.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235709 | 2478 | 1 | F | Addition of new test case 4.5.2.10 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | 17.8.0 |
| 2023-09 | RAN#101 | R5-235710 | 2479 | 1 | F | Addition of new test case 4.5.10.1 EN-DC FR1 PSCell activation and deactivation delay | 17.8.0 |
| 2023-09 | RAN#101 | R5-235711 | 2480 | 1 | F | Addition of new test case 5.5.12.1 EN-DC FR2 PSCell activation and deactivation delay | 17.8.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-09 | RAN#101 | R5-235712 | 2574 | 1 | F | Addition of new test case 5.5.13.1 for Conditional PSCell addition | 17.8.0 |
| 2023-09 | RAN#101 | R5-235713 | 2542 | 1 | F | Editorial correction to NR RRM TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235714 | 2569 | 1 | F | Update to Random Access applicability | 17.8.0 |
| 2023-09 | RAN#101 | R5-235715 | 2635 | 1 | F | Typo correction for 4.5.2.6 Test purpose | 17.8.0 |
| 2023-09 | RAN#101 | R5-235716 | 2643 | 1 | F | Editorial changes to correct formatting | 17.8.0 |
| 2023-09 | RAN#101 | R5-235717 | 2651 | 1 | F | Correction to firstActiveDownlinkBWP-Id for non-contention based RA TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235718 | 2632 | 1 | F | Removal of inexistent Config IDs 6.6.4.x | 17.8.0 |
| 2023-09 | RAN#101 | R5-235719 | 2642 | 1 | F | Core Spec alignment for Table 6.6.3.3.5-1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235720 | 2492 | 1 | F | Correction in DCCA test case titles | 17.8.0 |
| 2023-09 | RAN#101 | R5-235721 | 2634 | 1 | F | Alignment of Annex E Cell configuration mapping to Test procedure for TC 6.3.2.3.1 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235722 | 2563 | 1 | F | Update to RRM tests with testability issues | 17.8.0 |
| 2023-09 | RAN#101 | R5-235723 | 2661 | 1 | F | Addition of test cases 5.5.9.1.1 and 5.5.9.2.1 to Table F.1.3.2-3 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235724 | 2536 | 1 | F | Correction to Annex F for RedCap RRM TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235725 | 2609 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.3 including test tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235727 | 2611 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.7 including test tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235728 | 2612 | 1 | F | Correction of NR SA FR1 - E-UTRA Cell reselection RedCap test case 16.1.2.1 including test tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235729 | 2613 | 1 | F | Correction of NR SA FR1- E-UTRA Cell reselection RedCap test case 16.1.2.3 including test tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235733 | 2649 | 1 | F | Introduction of 5.5.5.9 power saving enhancement test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235734 | 2650 | 1 | F | Update on 6.5.1.9 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235735 | 2662 | 1 | F | Addition of test cases 7.5.9.1.1 and 7.5.9.2.1 to Table F.1.3.2-4 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235738 | 2463 | 1 | F | Correction to 6.6.17.2 for editor's note, confirm TT=0, RRC msg content | 17.8.0 |
| 2023-09 | RAN#101 | R5-235739 | 2465 | 1 | F | Update Annex F for gap enhancement test cases 6.6.18.1 and 6.6.18.2 including TTs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235741 | 2543 | 1 | F | Correction to FR1 L1 RSRP relative accuracy TCs with TT | 17.8.0 |
| 2023-09 | RAN#101 | R5-235742 | 2546 | 1 | F | Correction to Annex F for FR1 L1 RSRP relative accuracy TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235744 | 2462 | 1 | F | Correction to 6.6.17.1 for editor's note, confirm TT=0, update Annex F for pre-MG TCs | 17.8.0 |
| 2023-09 | RAN#101 | R5-235745 | 2464 | 1 | F | Update concurrent gap test cases 6.6.18.1 and 6.6.18.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235840 | 2657 | 1 | F | Addition of clause 7.5.9.0 minimum conformance requirements for uplink spatial relation switch delay | 17.8.0 |
| 2023-09 | RAN#101 | R5-235881 | 2475 | 1 | F | Core spec alignment for Redcap test case 16.5.1.5, 16.5.1.6, 16.5.2.3, 16.5.3.2.1 and 16.5.3.2.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235882 | 2592 | 1 | F | Removal of square brackets from test parameters of RedCap test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-235883 | 2597 | 1 | F | Correction to CORESET RMC settings in 16.6.1.8 | 17.8.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-09 | RAN#101 | R5-235884 | 2614 | 1 | F | Correction of NR SA FR1- E-UTRA Cell reselection RedCap test case 16.1.2.5 including test tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235885 | 2615 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.1 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235886 | 2616 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.2 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235887 | 2617 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.3 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235888 | 2618 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.4 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235889 | 2621 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.7 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235890 | 2622 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.8 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235891 | 2624 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.10 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235892 | 2625 | 1 | F | Addition of NR Event triggered reporting test case 16.6.2.11 for RedCap UE | 17.8.0 |
| 2023-09 | RAN#101 | R5-235894 | 2653 | 1 | F | Update in Redcap Radio Link Monitoring In-sync Test in DRX mode for 2 Rx | 17.8.0 |
| 2023-09 | RAN#101 | R5-235895 | 2473 | 1 | F | Modification to CG-SDT RRM test case for FR2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235896 | 2587 | 1 | F | TT update for test cases 4.5.5.7& 4.5.5.8 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235897 | 2588 | 1 | F | TT update for test cases 5.5.5.8 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235898 | 2589 | 1 | F | TT update for test cases 6.5.5.7 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235899 | 2590 | 1 | F | TT update for test cases 7.5.5.9& 7.5.5.10 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235900 | 2604 | 1 | F | Correction of interruptions at E-UTRA SRS carrier based switching test case 5.5.2.7 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235901 | 2605 | 1 | F | Correction of interruptions at NR SRS carrier based switching test case 5.5.2.5 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235902 | 2606 | 1 | F | Correction of interruptions at NR SRS carrier based switching test case 6.5.2.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235903 | 2607 | 1 | F | Addition of SRS configuration for carrier based switching test cases to Annex A | 17.8.0 |
| 2023-09 | RAN#101 | R5-235904 | 2493 | 1 | F | Addition of NR SA FR1 DL interruptions at switching between two uplink carriers for 6.5.7A.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235905 | 2494 | 1 | F | Addition of NR SA FR1 DL interruptions at switching between two uplink bands for 6.5.7B.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235906 | 2496 | 1 | F | Addition of DL interruptions at switching between two uplink bands with two transmit antenna connectors for 6.5.7C.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235907 | 2470 | 1 | F | Correction of 6.6.19.3 NCSG test case with Test Tolerance | 17.8.0 |
| 2023-09 | RAN#101 | R5-235908 | 2500 | 1 | F | Addition of EN-DC FR1 test case for the addition and release delay of PSCell | 17.8.0 |
| 2023-09 | RAN#101 | R5-235909 | 2501 | 1 | F | Addition of EN-DC FR1 fast SCell activation test case for 160 ms SCell measurement cycle | 17.8.0 |
| 2023-09 | RAN#101 | R5-235910 | 2502 | 1 | F | Addition of EN-DC FR1 fast SCell activation test case for 640 ms SCell measurement cycle | 17.8.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-09 | RAN#101 | R5-235911 | 2503 | 1 | F | Addition of EN-DC FR2 fast SCell in intra-band activation test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235912 | 2504 | 1 | F | Addition of NR SA FR1 fast SCell activation test case for 160 ms SCell measurement cycle | 17.8.0 |
| 2023-09 | RAN#101 | R5-235913 | 2505 | 1 | F | Addition of NR SA FR1 fast SCell activation test case for 640 ms SCell measurement cycle | 17.8.0 |
| 2023-09 | RAN#101 | R5-235914 | 2506 | 1 | F | Addition of NR SA FR2 fast SCell in intra-band activation test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235916 | 2488 | 1 | F | TT analysis of NR SA FR1 direct SCell activation at handover test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235917 | 2489 | 1 | F | TT analysis of NR SA FR2 direct SCell activation test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235918 | 2490 | 1 | F | TT analysis of NR SA FR2 direct SCell activation at handover test case | 17.8.0 |
| 2023-09 | RAN#101 | R5-235919 | 2491 | 1 | F | Measurement uncertainty and test tolerance updation of direct SCell activation test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-235946 | 2601 | 1 | F | Correction to csi-SSB-ResourceToAddModList for SSB-based CSI-Reporting test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-235948 | 2565 | 1 | F | Update to FR2 RLM test cases | 17.8.0 |
| 2023-09 | RAN#101 | R5-235963 | 2630 | 1 | F | Correction of Redcap test case 16.4.1.1, 16.4.1.2, 16.4.3.1, 16.4.3.2, 16.5.3.1.1 and 16.5.3.1.2 | 17.8.0 |
| 2023-09 | RAN#101 | R5-235964 | 2629 | 2 | F | Test tolerance correction in Annex F for 1Rx RedCap test cases | 17.8.0 |
| 2023-09 | RAN#101 | - | - | - | - | Administrative release upgrade to match the release of 3GPP TS 38.522 which was upgraded at RAN#101 to Rel-18 due to Rel-18 relevant CR(s) | 18.0.0 |
| 2023-12 | RAN#102 | R5-236160 | 2665 | - | F | Update of MG enhancements TC 6.6.17.x | 18.1.0 |
| 2023-12 | RAN#102 | R5-236163 | 2668 | - | F | Update of measGapId-r17 for MG enhancements TC | 18.1.0 |
| 2023-12 | RAN#102 | R5-236196 | 2669 | - | F | Editorial correction for 6.7.3.2.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236198 | 2670 | - | F | Addition of SMTC.7 and SMTC.8 into reference SMTC configuration in Annex | 18.1.0 |
| 2023-12 | RAN#102 | R5-236199 | 2671 | - | F | Addition of minimum requirements for FR2 7.6.15.0 - concurrent gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-236200 | 2672 | - | F | Addition of new test case 7.6.15.2 for overlapping concurrent gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-236201 | 2673 | - | F | Addition of new test case 7.6.15.3 for concurrent gaps with PRS measurement | 18.1.0 |
| 2023-12 | RAN#102 | R5-236202 | 2674 | - | F | Update cell mapping table for FR2 concurrent gaps new test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236209 | 2676 | - | F | Addition of NR SA FR2 SSB-based L1-RSRP measurement test case for PC6 devices | 18.1.0 |
| 2023-12 | RAN#102 | R5-236212 | 2677 | - | F | Addition of NR-U redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-236213 | 2678 | - | F | Addition of NR-U redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-236216 | 2679 | - | F | Completion of NR SA FR1 DL interruptions test case 6.5.7C.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236217 | 2680 | - | F | Completion of NR SA FR1 DL interruptions test case 6.5.7C.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236227 | 2684 | - | F | Completion of EN-DC FR1 fast SCell activation test case for 160 ms SCell measurement cycle | 18.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-236228 | 2685 | - | F | Completion of EN-DC FR1 fast SCell activation test case for 640 ms SCell measurement cycle | 18.1.0 |
| 2023-12 | RAN#102 | R5-236230 | 2687 | - | F | Completion of EN-DC FR2 fast SCell in intra-band activation test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-236231 | 2688 | - | F | Completion of NR SA FR1 fast SCell activation test case for 160 ms SCell measurement cycle | 18.1.0 |
| 2023-12 | RAN#102 | R5-236232 | 2689 | - | F | Completion of NR SA FR1 fast SCell activation test case for 640 ms SCell measurement cycle | 18.1.0 |
| 2023-12 | RAN#102 | R5-236233 | 2690 | - | F | Completion of NR SA FR2 fast SCell in intra-band activation test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-236362 | 2694 | - | F | Correction of TRP specific BFR test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236383 | 2695 | - | F | Addition of new test case 7.6.16.3 for NCSG | 18.1.0 |
| 2023-12 | RAN#102 | R5-236384 | 2696 | - | F | Addition of new test case 7.6.16.2 for NCSG | 18.1.0 |
| 2023-12 | RAN#102 | R5-236385 | 2697 | - | F | Addition of minimum requirements for 7.6.16.0 - FR2 NCSG | 18.1.0 |
| 2023-12 | RAN#102 | R5-236386 | 2698 | - | F | Update cell mapping table for FR2 NCSG new test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236454 | 2703 | - | F | Update cell mapping table for FR2 Pre-MG new test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-236455 | 2704 | - | F | Addition of minimum requirements for 7.6.14.0 - FR2 Pre-MG | 18.1.0 |
| 2023-12 | RAN#102 | R5-236682 | 2709 | - | F | Addition of RedCap RRM TC 16.6.5.3 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236704 | 2731 | - | F | Addition of RedCap RRM TC 16.7.6.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236705 | 2732 | - | F | Addition of RedCap RRM TC 16.7.6.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236709 | 2736 | - | F | Addition of RedCap RRM TC 17.3.2.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236711 | 2738 | - | F | Addition of RedCap RRM TC 17.4.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236712 | 2739 | - | F | Addition of RedCap RRM TC 17.5.1.5 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236713 | 2740 | - | F | Addition of RedCap RRM TC 17.5.1.6 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236715 | 2742 | - | F | Addition of RedCap RRM TC 17.5.1.8 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236721 | 2748 | - | F | Correction to RedCap RRM TC 16.3.2.1.1 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236722 | 2749 | - | F | Correction to RedCap RRM TC 16.3.2.1.3 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236724 | 2751 | - | F | Correction to RedCap RRM TC 16.3.2.2.1 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236725 | 2752 | - | F | Correction to RedCap RRM TC 16.3.2.2.3 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236726 | 2753 | - | F | Correction to RedCap RRM TC 16.3.2.2.5 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236727 | 2754 | - | F | Correction to RedCap RRM TC 16.3.2.2.7 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236728 | 2755 | - | F | Correction to RedCap RRM TC 16.3.2.3.1 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236730 | 2757 | - | F | Correction to RedCap RRM TC 16.5.2.1 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236731 | 2758 | - | F | Correction to RedCap RRM TC 16.5.2.5 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236732 | 2759 | - | F | Correction to RedCap RRM TC 16.5.2.7 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-236734 | 2761 | - | F | Correction to RedCap RRM TC 16.6.1.x | 18.1.0 |
| 2023-12 | RAN#102 | R5-236736 | 2763 | - | F | Corrections to BWP RMCs and configurations for RedCap RRM TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-236737 | 2764 | - | F | Corrections to Annex E for RedCap RRM TCs | 18.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-236748 | 2766 | - | F | Correction to RRM enhancement TC 6.5.8.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236749 | 2767 | - | F | Correction to FR1 EN-DC TC 4.6.4.3 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236750 | 2768 | - | F | Correction to FR1 NR SA TC 6.6.4.3 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236751 | 2769 | - | F | Correction to CORESET RMC | 18.1.0 |
| 2023-12 | RAN#102 | R5-236819 | 2773 | - | F | Addition of new test case 7.6.15.1 for SA event triggered reporting tests with concurrent gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-236821 | 2775 | - | F | Addition of CCR settings for FR1 Link recovery procedures | 18.1.0 |
| 2023-12 | RAN#102 | R5-236822 | 2776 | - | F | Correction to SNR on RLM-RS in 6.5.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236825 | 2777 | - | F | Addition of SSB index assigned as BFD-RS to CSI-RS-based RLM for 2Rx | 18.1.0 |
| 2023-12 | RAN#102 | R5-236916 | 2786 | - | F | Correction to message contents for 4.5.2.3 and 4.5.2.4 | 18.1.0 |
| 2023-12 | RAN#102 | R5-236992 | 2787 | - | F | Correction of FR2 EN-DC Inter-freq accuracy measurement test case 5.7.1.2 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-236993 | 2788 | - | F | Correction of FR2 SA Inter-freq accuracy measurement test case 7.7.1.2 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-236994 | 2789 | - | F | TT analysis correction for FR2 Inter-freq accuracy measurement test cases in Annex F | 18.1.0 |
| 2023-12 | RAN#102 | R5-236997 | 2792 | - | F | Correction of NR SA FR2 Cell reselection RedCap test case 17.1.1.1 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-236998 | 2793 | - | F | Correction of NR SA FR2 Cell reselection RedCap test case 17.1.1.2 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-236999 | 2794 | - | F | Correction of NR SA FR2 Cell reselection RedCap test case 17.1.1.3 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237000 | 2795 | - | F | Correction of NR SA FR2 Cell reselection RedCap test case 17.1.1.4 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237015 | 2809 | - | F | Correction of SA event triggered reporting with additional mandatory gap pattern test case 6.6.2.9 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237018 | 2812 | - | F | Addition of cell configuration mapping for rel-16 RRM test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237020 | 2814 | - | F | Correction of Inter-RAT FR1 Cell reselection RedCap test case 16.1.2.6 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237095 | 2816 | - | F | Correction to Cell Configuration Maping for TC 6.3.3.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237096 | 2817 | - | F | Missing DRX.X1 configuration addition to Annex A.5 and formatting adaption | 18.1.0 |
| 2023-12 | RAN#102 | R5-237097 | 2818 | - | F | Core Spec alignment for RRM TC 6.5.1.9 Enh Power Saving | 18.1.0 |
| 2023-12 | RAN#102 | R5-237098 | 2819 | - | F | Core spec alignment for TC 5.5.1.1 and 5.5.1.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237101 | 2822 | - | F | Addition of minimum conformance requirement for FR1 RedCap 16.7.1.x test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237103 | 2824 | - | F | Corrections for references of RedCap 2-step RA TC 16.3.2.2.6 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237104 | 2825 | - | F | Message content exception addition for RedCap 2-step RA TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237183 | 2846 | - | F | Addition of clause 4.5.9.0 minimum conformance requirements for UE specific CBW change | 18.1.0 |
| 2023-12 | RAN#102 | R5-237184 | 2847 | - | F | Addition of UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN-DC test case 4.5.9.1 | 18.1.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-237185 | 2848 | - | F | Addition of clause 4.6.6.0 minimum conformance requirements for measurements with autonomous gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-237187 | 2850 | - | F | Addition of clause 5.5.6.3.0 minimum conformance requirements for simultaneous DCI-based and timer-based active BWP switch on multiple CCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237189 | 2852 | - | F | Addition of clause 5.5.6.4.0 minimum conformance requirements for SCell dormancy switch | 18.1.0 |
| 2023-12 | RAN#102 | R5-237191 | 2854 | - | F | Addition of clause 5.5.10.0 minimum conformance requirements for UE specific CBW change on FR2 NR Pscell | 18.1.0 |
| 2023-12 | RAN#102 | R5-237192 | 2855 | - | F | Addition of UE specific CBW change on FR2 NR PSCell test case 5.5.10.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237193 | 2856 | - | F | Addition of clause 5.6.5.0 minimum conformance requirements for measurements with autonomous gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-237195 | 2858 | - | F | Addition of clause 6.6.7.0 minimum conformance requirements for NR measurements with autonomous gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-237198 | 2861 | - | F | Addition of clause 7.5.2.0.2 minimum conformance requirements for UE specific CBW change | 18.1.0 |
| 2023-12 | RAN#102 | R5-237200 | 2863 | - | F | Addition of clause 7.5.6.3.0 minimum conformance requirements for simultaneous DCI-based and timer-based active BWP switch on multiple CCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237202 | 2865 | - | F | Addition of clause 7.5.10.0 minimum conformance requirements for UE specific CBW change | 18.1.0 |
| 2023-12 | RAN#102 | R5-237203 | 2866 | - | F | Addition of NR FR2 UE specific CBW change of PCell with non-DRX in SA test case 7.5.10.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237205 | 2868 | - | F | Addition of clause 7.6.5.0 minimum conformance requirements for NR measurements with autonomous gaps | 18.1.0 |
| 2023-12 | RAN#102 | R5-237218 | 2870 | - | F | Update on relative angular offset in 2AoA testing for PC1 devices | 18.1.0 |
| 2023-12 | RAN#102 | R5-237220 | 2872 | - | F | Update on 16.4.1.1 test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-237222 | 2874 | - | F | Update on DRX configuration in message content | 18.1.0 |
| 2023-12 | RAN#102 | R5-237470 | 2827 | 1 | F | Corrections to UE position provision for NR-NTN | 18.1.0 |
| 2023-12 | RAN#102 | R5-237688 | 2830 | 1 | F | Addition of NTN inter-frequency measurement test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237689 | 2831 | 1 | F | Addition of NTN parallel measurement gap-based inter-frequency test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237702 | 2779 | 1 | F | Correction for 38.533 Annex | 18.1.0 |
| 2023-12 | RAN#102 | R5-237703 | 2772 | 1 | F | Addition of new test case 7.6.14.1 for SA event triggered reporting tests with Pre-MG | 18.1.0 |
| 2023-12 | RAN#102 | R5-237704 | 2774 | 1 | F | Addition of new test case 7.6.16.1 for SA event triggered reporting tests with NCSG | 18.1.0 |
| 2023-12 | RAN#102 | R5-237705 | 2707 | 1 | F | Addition of RedCap RRM TC 16.2.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237706 | 2708 | 1 | F | Addition of RedCap RRM TC 16.2.1.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237707 | 2711 | 1 | F | Addition of RedCap RRM TC 16.7.2.3_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237708 | 2712 | 1 | F | Addition of RedCap RRM TC 16.7.2.3_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237709 | 2771 | 1 | F | Addition of powerControlOffsetSS in 16.5.2.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237710 | 2821 | 1 | F | Typo correction for SNR values at T3 - T5 for TC 16.5.2.4 | 18.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-237711 | 2823 | 1 | F | Addition of FR1 RedCap SS-RSRP intra-frequency measurement accuracy test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237712 | 2810 | 1 | F | Correction of SA event triggered reporting tests for FR1 without gap when DRX is used 6.6.2.10 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237713 | 2811 | 1 | F | Correction of SA event triggered reporting tests for FR1 without gap when DRX is not used 6.6.2.11 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237714 | 2813 | 1 | F | Correction of Annex H to cover additional mandatory gap pattern with MGL 3ms | 18.1.0 |
| 2023-12 | RAN#102 | R5-237715 | 2849 | 1 | F | Addition of EN-DC intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC test case 4.6.6.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237716 | 2851 | 1 | F | Addition of E-UTRAN - NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC test case 5.5.6.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237717 | 2853 | 1 | F | Addition of E-UTRAN - NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time test case 5.5.6.4.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237718 | 2857 | 1 | F | Addition of EN-DC inter-frequency CGI identification of NR neighbour cell in FR2 test case 5.6.5.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237719 | 2820 | 1 | F | Addition of SA FR1 NR-U SS-RSRQ measurement accuracy test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237720 | 2699 | 1 | F | Correct of RRM Test Case | 18.1.0 |
| 2023-12 | RAN#102 | R5-237737 | 2836 | 1 | F | Addition of NR-U inter-frequency RSSI and Channel Occupancy tests | 18.1.0 |
| 2023-12 | RAN#102 | R5-237738 | 2837 | 1 | F | Addition of NR-U EN-DC unlicensed event triggered inter-frequency test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237739 | 2838 | 1 | F | Addition of NR-U EN-DC inter-frequency licensed cell reporting test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237740 | 2839 | 1 | F | Addition of NR-U EN-DC DCI-based and RRC-based Active BWP Switch test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237741 | 2840 | 1 | F | Addition of NR-U EN-DC PSCell addition and release delay test case | 18.1.0 |
| 2023-12 | RAN#102 | R5-237742 | 2713 | 1 | F | Addition of RedCap RRM TC 16.7.2.4_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237743 | 2714 | 1 | F | Addition of RedCap RRM TC 16.7.2.4_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237744 | 2715 | 1 | F | Addition of RedCap RRM TC 16.7.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237745 | 2716 | 1 | F | Addition of RedCap RRM TC 16.7.3.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237746 | 2717 | 1 | F | Addition of RedCap RRM TC 16.7.3.3_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237747 | 2718 | 1 | F | Addition of RedCap RRM TC 16.7.3.3_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237748 | 2719 | 1 | F | Addition of RedCap RRM TC 16.7.3.4_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237749 | 2720 | 1 | F | Addition of RedCap RRM TC 16.7.3.4_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237750 | 2729 | 1 | F | Addition of RedCap RRM TC 16.7.5.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237751 | 2730 | 1 | F | Addition of RedCap RRM TC 16.7.5.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237752 | 2733 | 1 | F | Addition of RedCap RRM TC 17.2.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237753 | 2734 | 1 | F | Addition of RedCap RRM TC 17.3.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237754 | 2735 | 1 | F | Addition of RedCap RRM TC 17.3.1.2 | 18.1.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-237755 | 2737 | 1 | F | Addition of RedCap RRM TC 17.4.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237756 | 2741 | 1 | F | Addition of RedCap RRM TC 17.5.1.7 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237757 | 2743 | 1 | F | Addition of RedCap RRM TC 17.5.4.1.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237758 | 2744 | 1 | F | Addition of RedCap RRM TC 17.5.4.2.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237759 | 2745 | 1 | F | Addition of RedCap RRM TC 17.6.4.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237760 | 2859 | 1 | F | Addition of SA intra-frequency CGI identification of NR neighbor cell in FR1 test case 6.6.7.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237761 | 2860 | 1 | F | Addition of identification of a new CGI of inter-RAT E-UTRA cell using autonomous gaps in NR SA test case 6.6.7.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237762 | 2862 | 1 | F | Addition of SA interruptions at NR SRS carrier-based switching test case 7.5.2.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237763 | 2864 | 1 | F | Addition of Active BWP switch on multiple SCells with non-DRX in SA test case 7.5.6.3.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237764 | 2867 | 1 | F | Addition of SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2) (rel16 additional mandatory gap pattern 17) test case 7.6.2.9 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237765 | 2869 | 1 | F | Addition of SA inter-frequency CGI reporting in autonomous gaps test (PCell in FR2) test case 7.6.5.1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237766 | 2835 | 1 | F | Applicability update for r17 HST inter-frequency tests | 18.1.0 |
| 2023-12 | RAN#102 | R5-237767 | 2843 | 1 | F | Applicability update to FR2 inter-frequency tests | 18.1.0 |
| 2023-12 | RAN#102 | R5-237768 | 2841 | 1 | F | Editorial changes to 38.533 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237769 | 2844 | 1 | F | Applicability update for r16 supported gap pattern | 18.1.0 |
| 2023-12 | RAN#102 | R5-237770 | 2845 | 1 | F | Update to RRM test 6.3.1.4 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237785 | 2681 | 1 | F | Completion of NR SA FR1 intra-frequency CGI identification of NR neighbour cell for 1 Rx UE | 18.1.0 |
| 2023-12 | RAN#102 | R5-237786 | 2747 | 1 | F | Correction to RedCap RRM TC 16.3.1.9 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237787 | 2750 | 1 | F | Correction to RedCap RRM TC 16.3.2.1.5 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237788 | 2756 | 1 | F | Correction to RedCap RRM TC 16.3.2.3.3 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237789 | 2790 | 1 | F | Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.1 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237790 | 2791 | 1 | F | Annex F correction for RedCap test cases including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237793 | 2683 | 1 | F | Completion of 7.6.3.6 test case with message content section and test tolerance values. | 18.1.0 |
| 2023-12 | RAN#102 | R5-237803 | 2686 | 1 | F | Completion of EN-DC FR1 test case for the conditional addition delay of PSCell | 18.1.0 |
| 2023-12 | RAN#102 | R5-237804 | 2691 | 1 | F | Measurement uncertainty and test tolerance updation of fast SCell activation and CPAC test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237805 | 2700 | 1 | F | Update of RRM Test Case 4.5.2.10 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | 18.1.0 |
| 2023-12 | RAN#102 | R5-237806 | 2701 | 1 | F | Update of RRM Test Case 4.5.10.1 EN-DC FR1 PSCell activation and deactivation delay | 18.1.0 |
| 2023-12 | RAN#102 | R5-237807 | 2702 | 1 | F | Update of RRM Test Case 5.5.12.1 EN-DC FR2 PSCell activation and deactivation delay | 18.1.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-237808 | 2781 | 1 | F | Update of 5.5.13.1 Conditional PSCell Addition including test tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237809 | 2782 | 1 | F | Update of 7.5.12.1 Conditional PSCell Addition including test tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237810 | 2785 | 1 | F | Update of Annex F for MR-DC enhancement test cases including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237811 | 2842 | 1 | F | Update to SA FR2 CSI-RS based RLM test cases including TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237827 | 2664 | 1 | F | Modification to CG-SDT RRM test case for FR2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237830 | 2808 | 1 | F | Editorial correction of test cases 7.1.1.x | 18.1.0 |
| 2023-12 | RAN#102 | R5-237833 | 2832 | 1 | F | Addition of NTN intra-frequency gap-based measurement test cases | 18.1.0 |
| 2023-12 | RAN#102 | R5-237865 | 2828 | 1 | F | Satllite access configuration update | 18.1.0 |
| 2023-12 | RAN#102 | R5-237866 | 2829 | 1 | F | Updates to High level test procedure for SAN RRM tests | 18.1.0 |
| 2023-12 | RAN#102 | R5-237886 | 2796 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with DRX and without SSB time index for 1Rx test case 16.6.2.1 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237887 | 2797 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with DRX and without SSB time index for 2Rx test case 16.6.2.2 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237888 | 2798 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without DRX and without SSB time index for 1Rx test case 16.6.2.3 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237889 | 2799 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without DRX and without SSB time index for 2Rx test case 16.6.2.4 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237890 | 2800 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without DRX and with SSB time index for 1Rx test case 16.6.2.5 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237891 | 2801 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without DRX and with SSB time index for 2Rx UE test case 16.6.2.6 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237892 | 2802 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with DRX and SSB time index for 1Rx UE test case 16.6.2.7 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237893 | 2803 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with DRX and SSB time index for 2Rx UE test case 16.6.2.8 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237894 | 2804 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with additional mandatory gap pattern for 1Rx test case 16.6.2.9 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237895 | 2805 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting with additional mandatory gap pattern for 2Rx UEtest case 16.6.2.10 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237896 | 2806 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without measurement gap for 1Rx UE test case 16.6.2.11 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237897 | 2815 | 1 | F | SMTC configuration for RedCap | 18.1.0 |
| 2023-12 | RAN#102 | R5-237914 | 2682 | 1 | F | Completion of NR SA FR1 intra-frequency CGI identification of NR neighbour cell for 2 Rx UE | 18.1.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-12 | RAN#102 | R5-237915 | 2710 | 1 | F | Addition of RedCap RRM TC 16.6.5.4 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237916 | 2721 | 1 | F | Addition of RedCap RRM TC 16.7.4.1_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237917 | 2722 | 1 | F | Addition of RedCap RRM TC 16.7.4.1_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237918 | 2723 | 1 | F | Addition of RedCap RRM TC 16.7.4.2_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237919 | 2724 | 1 | F | Addition of RedCap RRM TC 16.7.4.2_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237920 | 2725 | 1 | F | Addition of RedCap RRM TC 16.7.4.3_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237921 | 2726 | 1 | F | Addition of RedCap RRM TC 16.7.4.3_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237922 | 2727 | 1 | F | Addition of RedCap RRM TC 16.7.4.4_1 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237923 | 2728 | 1 | F | Addition of RedCap RRM TC 16.7.4.4_2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237924 | 2746 | 1 | F | Correction to RedCap RRM TC 16.3.1.7 with TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237925 | 2762 | 1 | F | Correction to RedCap RRM TC 16.6.7.1 and 16.6.7.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237926 | 2765 | 1 | F | Corrections to Annex F for RedCap RRM TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237927 | 2826 | 1 | F | Corrections for RedCap RA TCs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237938 | 2705 | 1 | F | Addition of new test case 7.6.14.2 for FR2 Pre-MG | 18.1.0 |
| 2023-12 | RAN#102 | R5-237942 | 2807 | 1 | F | Correction of NR SA FR1-FR1 Event triggered reporting without measurement gap for 2Rx UE test case 16.6.2.12 including Test Tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237950 | 2778 | 1 | F | Correction to message exception in 16.5.3.1.2 and 16.5.3.2.2 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237951 | 2693 | 1 | F | Updating unified TCI switch test cases to add MU and TT | 18.1.0 |
| 2023-12 | RAN#102 | R5-237953 | 2783 | 1 | F | Update of 7.5.14 PSCell activation including test tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237954 | 2780 | 1 | F | Update of 7.5.3.14 Fast SCell activation including test tolerance | 18.1.0 |
| 2023-12 | RAN#102 | R5-237959 | 2675 | 1 | F | Addition of new NR SA FR2 event triggered reporting test case for PC6 devices | 18.1.0 |
| 2023-12 | RAN#102 | R5-237960 | 2833 | 1 | F | Update to FR1 CG-SDT test case including TTs | 18.1.0 |
| 2023-12 | RAN#102 | R5-237962 | 2834 | 1 | F | Update to RRM tests 16.3.1.7 and 16.3.1.8 | 18.1.0 |
| 2023-12 | RAN#102 | R5-237966 | 2871 | 1 | F | Update on 6.5.1.9 RLM for relaxed measurement criteria | 18.1.0 |
| 2024-03 | RAN#103 | R5-240026 | 2875 | - | F | Editorial corrections for 6.7.3.1 and 6.7.3.2.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240369 | 2884 | - | F | Addition of NR SA FR1 DL interruptions at switching between two uplink carriers for 6.5.7A.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240372 | 2887 | - | F | Test tolerances and measurement uncertainty for DL interruptions test cases 6.5.7A.1, 6.5.7B.1 and 6.5.7C.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240381 | 2888 | - | F | Update of test procedure in 4.5.10.1 PSCell activation for EN-DC | 18.2.0 |
| 2024-03 | RAN#103 | R5-240382 | 2889 | - | F | Correction to 4.5.11.1 EN-DC FR1 Conditional PSCell Addition | 18.2.0 |
| 2024-03 | RAN#103 | R5-240383 | 2890 | - | F | Update of measurement configuration for 5.5.13.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240384 | 2891 | - | F | Update of measurement configuration for 7.5.12.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240385 | 2892 | - | F | Update of message contents for 4.5.3.7 and 6.5.3.11 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240449 | 2893 | - | F | Resubmission of Annex B Corrections to BWP RMCs and configurations for RedCap RRM TCs | 18.2.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#103 | R5-240518 | 2894 | - | F | Update to NR-U redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA test case | 18.2.0 |
| 2024-03 | RAN#103 | R5-240519 | 2895 | - | F | Update to NR-U redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA test case | 18.2.0 |
| 2024-03 | RAN#103 | R5-240681 | 2901 | - | F | Addition of RedCap RRM test case 17.5.3.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240682 | 2902 | - | F | Addition of RedCap RRM test case 17.5.3.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240683 | 2903 | - | F | Addition of RedCap RRM test case 17.5.5.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240684 | 2904 | - | F | Addition of RedCap RRM test case 17.5.5.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240685 | 2905 | - | F | Addition of RedCap RRM test case 17.5.6.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240686 | 2906 | - | F | Addition of RedCap RRM test case 17.7.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240687 | 2907 | - | F | Addition of RedCap RRM test case 17.7.1.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240688 | 2908 | - | F | Addition of RedCap RRM test case 17.7.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240689 | 2909 | - | F | Addition of RedCap RRM test case 17.7.2.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240690 | 2910 | - | F | Addition of RedCap RRM test case 17.7.3.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240691 | 2911 | - | F | Addition of RedCap RRM test case 17.7.3.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240692 | 2912 | - | F | Addition of RedCap RRM test case 17.7.4.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240695 | 2915 | - | F | Correction to RedCap RRM test case 16.5.2.3 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240696 | 2916 | - | F | Correction to RedCap RRM test case 16.5.4.1 and 16.5.4.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240697 | 2917 | - | F | Correction to RedCap RRM test case 17.4.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240698 | 2918 | - | F | Correction to RedCap RRM test case 17.6.4.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240699 | 2919 | - | F | Correction to SSB time offset in NCD-SSB test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-240700 | 2920 | - | F | Correction to RRM enh test case 6.5.8.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240707 | 2927 | - | F | Correction to RedCap RRM test cases 16.3.2.2.X with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240709 | 2929 | - | F | Correction to RedCap RRM test case 16.6.5.4 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240710 | 2930 | - | F | Correction to RedCap RRM test case 16.7.2.3.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240714 | 2934 | - | F | Correction to RedCap RRM test case 16.7.3.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240715 | 2935 | - | F | Correction to RedCap RRM test case 16.7.3.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240716 | 2936 | - | F | Correction to RedCap RRM test case 16.7.3.3.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240717 | 2937 | - | F | Correction to RedCap RRM test case 16.7.3.3.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240718 | 2938 | - | F | Correction to RedCap RRM test case 16.7.3.4.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240720 | 2940 | - | F | Correction to RedCap RRM test case 16.7.4.1.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240721 | 2941 | - | F | Correction to RedCap RRM test case 16.7.4.1.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240722 | 2942 | - | F | Correction to RedCap RRM test case 16.7.4.2.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240723 | 2943 | - | F | Correction to RedCap RRM test case 16.7.4.2.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240724 | 2944 | - | F | Correction to RedCap RRM test case 16.7.4.3.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240725 | 2945 | - | F | Correction to RedCap RRM test case 16.7.4.3.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240726 | 2946 | - | F | Correction to RedCap RRM test case 16.7.4.4.1 with TT | 18.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#103 | R5-240727 | 2947 | - | F | Correction to RedCap RRM test case 16.7.4.4.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240728 | 2948 | - | F | Correction to RedCap RRM test case 16.7.5.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240729 | 2949 | - | F | Correction to RedCap RRM test case 16.7.5.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240730 | 2950 | - | F | Correction to RedCap RRM test case 16.7.6.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240731 | 2951 | - | F | Correction to RedCap RRM test case 16.7.6.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240758 | 2955 | - | F | Correction to FR1 4-step RACH test cases with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240759 | 2956 | - | F | Correction to FR1 2-step RACH test cases with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240760 | 2957 | - | F | Correction to FR1 inter-frequency SS SINR relative accuracy test cases with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240761 | 2958 | - | F | Correction to FR1 L1 RSRP absolute accuracy test cases with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240762 | 2959 | - | F | Correction to FR1 LTE RSRP accuracy test case 6.7.5.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-240790 | 2961 | - | F | Addition of Test Tolerance into Annex F for RedCap test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-240793 | 2962 | - | F | Correction of Test tolerance for FR2 Inter frequency test case | 18.2.0 |
| 2024-03 | RAN#103 | R5-240798 | 2967 | - | F | Addition of NR SA FR2-FR2 Event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2) test case 17.6.2.1 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-240799 | 2968 | - | F | Addition of NR SA FR2-FR2 Event triggered reporting tests For FR2 without SSB time index detection when DRX is used (PCell in FR2) test case 17.6.2.2 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-240800 | 2969 | - | F | Addition of NR SA FR2-FR2 Event triggered reporting tests For FR2 with SSB time index detection when DRX is not used (PCell in FR2) test case 17.6.2.3 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-240801 | 2970 | - | F | Addition of NR SA FR2-FR2 Event triggered reporting tests For FR2 with SSB time index detection when DRX is used (PCell in FR2) test case 17.6.2.4 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-240802 | 2971 | - | F | Addition of cell configuration mapping for event triggered measurement test cases for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-240803 | 2972 | - | F | Addition of NR_U test case 11.5.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240804 | 2973 | - | F | Addition of NR_U test case 11.5.1.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240805 | 2974 | - | F | Addition of NR_U test case 11.5.1.3 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240806 | 2975 | - | F | Addition of NR_U test case 11.5.1.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240807 | 2976 | - | F | Addition of NR_U test case 11.5.1.9 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240809 | 2978 | - | F | Addition of NR_U test case 11.5.2.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240811 | 2979 | - | F | Addition of NR_U test case 11.5.2.5 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240812 | 2980 | - | F | Addition of NR_U test case 11.5.2.6 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240813 | 2981 | - | F | Addition of NR_U test case 11.5.2.7 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240814 | 2982 | - | F | Addition of NR_U test case 11.5.2.8 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240815 | 2983 | - | F | Addition of NR_U test case 11.5.2.9 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240816 | 2984 | - | F | Addition of NR_U test case 11.5.2.10 | 18.2.0 |
| 2024-03 | RAN#103 | R5-240920 | 2987 | - | F | Cell Mapping correction for TC 6.5.6.1.1 in Annex E | 18.2.0 |
| 2024-03 | RAN#103 | R5-240921 | 2988 | - | F | Cell Mapping correction for TC 6.6.1.8 in Annex E | 18.2.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#103 | R5-241114 | 2990 | - | F | Correction to OCNG references in 16.1.1 and 16.1.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241115 | 2991 | - | F | Correction to title of RedCap test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241116 | 2992 | - | F | Correction to PRACH config in 16.5.2.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241120 | 2996 | - | F | Correction to QuantityConfigu-DEFAULT in H.3.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241160 | 3005 | - | F | Correction to EN-DC FR1 Beam Failure TCs 4.5.5.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241162 | 3006 | - | F | Correction to EN-DC FR2 Beam Failure TCs 5.5.5.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241198 | 3008 | - | F | Addition of new test case 4.7.8.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell | 18.2.0 |
| 2024-03 | RAN#103 | R5-241200 | 3009 | - | F | Correct of EN-DC FR1 addition and release delay of known PSCell for test case 4.5.7.1 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241211 | 3012 | - | F | Annex E.14 correction for new RedCap test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241213 | 3014 | - | F | Correction of NR SA FR1 SS-RSRP absolute measurement accuracy for RedCap 1 Rx UE test case 16.7.1.1.1 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241214 | 3015 | - | F | Correction of NR SA FR1 SS-RSRP relative measurement accuracy for 1 Rx UE test case 16.7.1.1.2 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241215 | 3016 | - | F | Correction of NR SA FR1 SS-RSRP absolute measurement accuracy for RedCap 2 Rx UE test case 16.7.1.2.1 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241216 | 3017 | - | F | Correction of NR SA FR1 SS-RSRP relative measurement accuracy for 2 Rx UE test case 16.7.1.2.2 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241217 | 3018 | - | F | Addition of NR SA FR1 SS-RSRQ measurement accuracy for 1 Rx UE test case 16.7.2.1 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241218 | 3019 | - | F | Addition of NR SA FR1 SS-RSRQ measurement accuracy for 2 Rx UE test case 16.7.2.2 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-241219 | 3020 | - | F | Addition of RRM RedCap test cases 16.7.1.3.1, 16.7.1.3.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241220 | 3021 | - | F | Addition of RRM RedCap test cases 16.7.1.4.1, 16.7.1.4.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241227 | 3022 | - | F | Editorial Correction to RedCap PRACH TC 16.3.2.2.8 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241228 | 3023 | - | F | Editorial corrections for RedCap test cases 18.3.1.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241233 | 3026 | - | F | Editorial correction in Table 5.6.1.3.5-2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241235 | 3028 | - | F | Correction to BFD-LR test case 5.5.5.5 message content | 18.2.0 |
| 2024-03 | RAN#103 | R5-241238 | 3031 | - | F | Editor correction to Test Procedure 5.5.1.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241241 | 3032 | - | F | Addition of SA FR1 NR-U intra-frequency SS-SINR measurement accuracy test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241242 | 3033 | - | F | Addition of SA FR1 NR-U inter-frequency SS-SINR measurement accuracy test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241243 | 3034 | - | F | Addition of SA FR1 NR-U intra-frequency RSSI measurement accuracy test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241264 | 3035 | - | F | Core Spec alignment for RedCap test cases 18.3.1.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241265 | 3036 | - | F | General update to NTN tests | 18.2.0 |
| 2024-03 | RAN#103 | R5-241266 | 3037 | - | F | Addition of NTN timing accuracy test 14.3.1.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241267 | 3038 | - | F | Addition of NTN time-based CHO tests 14.2.1.x | 18.2.0 |

| Change history | | | | | | | |
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| 2024-03 | RAN#103 | R5-241268 | 3039 | - | F | Addition of NTN intra-frequency cell reselection tests 14.1.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241269 | 3040 | - | F | Addition of NTN SS-SINR measurement accuracy tests 14.6.3.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241272 | 3042 | - | F | Addition of NR-U SA BWP switch tests including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241273 | 3043 | - | F | Addition of UL active BWP switch test 10.3.5.1 including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241274 | 3044 | - | F | Update of NR-U Annex E and F including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241275 | 3045 | - | F | Update to NR-U general sections | 18.2.0 |
| 2024-03 | RAN#103 | R5-241276 | 3046 | - | F | Addition of NR-U UE Timing Tests 10.2.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241277 | 3047 | - | F | Addition of NR-U L1-RSRP accuracy test 10.5.4.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241278 | 3048 | - | F | Addition of NR-U RSSI measurement accuracy tests 10.5.5.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241279 | 3049 | - | F | Addition of NR-U Channel occupancy measurement accuracy tests 10.5.6.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241280 | 3050 | - | F | Addition of NR-U L1-RSRP tests 10.4.3.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241281 | 3051 | - | F | Addition of NR-U IRAT tests 10.4.4.x | 18.2.0 |
| 2024-03 | RAN#103 | R5-241282 | 3052 | - | F | Update to NSA NR-U tests including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241283 | 3053 | - | F | Update to SA NR-U tests including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241284 | 3054 | - | F | Update to OCNG noise power in UL CCA model | 18.2.0 |
| 2024-03 | RAN#103 | R5-241285 | 3055 | - | F | Core alignment for NR-U common sections | 18.2.0 |
| 2024-03 | RAN#103 | R5-241295 | 3056 | - | F | Cleanup on FR1 CG-SDT test 6.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241296 | 3057 | - | F | Addition of RedCap SA FR2 SSB RLM OOS in DRX test case 17.5.1.3 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241297 | 3058 | - | F | Addition of RedCap SA FR2 SSB BFR test cases 17.5.2.1 and 17.5.2.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241298 | 3059 | - | F | Update to RRM test 16.3.1.8 including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241299 | 3060 | - | F | Correction to stationary relaxed measurement criterion tests | 18.2.0 |
| 2024-03 | RAN#103 | R5-241300 | 3061 | - | F | Update to Re-establishment test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241301 | 3062 | - | F | Applicability update for several RedCap tests | 18.2.0 |
| 62024-03 | RAN#103 | R5-241304 | 3063 | - | F | Update to RRM test 6.3.1.4 including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241311 | 3064 | - | F | Addition of Clause 4.7.9.0 minimum conformance requirements for CSI-RSRQ | 18.2.0 |
| 2024-03 | RAN#103 | R5-241312 | 3065 | - | F | Addition of EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 4.7.9.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241313 | 3066 | - | F | Addition of EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 4.7.9.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241314 | 3067 | - | F | Addition of Clause 4.7.10.0 minimum conformance requirements for CSI-SINR | 18.2.0 |
| 2024-03 | RAN#103 | R5-241315 | 3068 | - | F | Addition of EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 4.7.10.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241316 | 3069 | - | F | Addition of EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell l test case 4.7.10.2 | 18.2.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#103 | R5-241317 | 3070 | - | F | Addition of Clause 5.7.8.0 minimum conformance requirements for CSI-RSRQ | 18.2.0 |
| 2024-03 | RAN#103 | R5-241318 | 3071 | - | F | Addition of EN-DC intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell test case 5.7.8.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241319 | 3072 | - | F | Addition of EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell test case 5.7.8.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241320 | 3073 | - | F | Addition of Clause 5.7.9.0 minimum conformance requirements for CSI-SINR | 18.2.0 |
| 2024-03 | RAN#103 | R5-241321 | 3074 | - | F | Addition of EN-DC intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell test case 5.7.9.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241322 | 3075 | - | F | Addition of EN-DC inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell test case 5.7.9.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241323 | 3076 | - | F | Addition of Clause 6.7.11.0 minimum conformance requirements for CSI-RSRQ | 18.2.0 |
| 2024-03 | RAN#103 | R5-241324 | 3077 | - | F | Addition of SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 6.7.11.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241325 | 3078 | - | F | Addition of SA inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 6.7.11.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241326 | 3079 | - | F | Addition of Clause 6.7.12.0 minimum conformance requirements for CSI-SINR | 18.2.0 |
| 2024-03 | RAN#103 | R5-241327 | 3080 | - | F | Addition of SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 6.7.12.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241328 | 3081 | - | F | Addition of SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell test case 6.7.12.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241329 | 3082 | - | F | Addition of Clause 7.7.8.0 minimum conformance requirements for CSI-RSRQ | 18.2.0 |
| 2024-03 | RAN#103 | R5-241330 | 3083 | - | F | Addition of SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell test case 7.7.8.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241331 | 3084 | - | F | Addition of SA inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell test case 7.7.8.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241332 | 3085 | - | F | Addition of Clause 7.7.9.0 minimum conformance requirements for CSI-SINR | 18.2.0 |
| 2024-03 | RAN#103 | R5-241333 | 3086 | - | F | Addition of SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell test case 7.7.9.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241335 | 3088 | - | F | Addition of test cases 4.5.9.1, 5.5.6.3.1, and 5.5.6.4.1 to Annex E | 18.2.0 |
| 2024-03 | RAN#103 | R5-241447 | 3091 | - | F | Correction to Annex F for R15 RRM test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241670 | 2925 | 1 | F | Correction to RedCap RRM test case 16.2.1.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241671 | 2926 | 1 | F | Correction to RedCap RRM test case 16.2.1.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241672 | 2952 | 2 | F | Correction to Annex F for RedCap RRM test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241673 | 2953 | 1 | F | Correction to SDT RRM test case 6.2.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241677 | 2898 | 1 | F | Correction to FR2 SA event triggered reporting tests with Pre-MG including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241678 | 2899 | 1 | F | Correction to FR2 SA event triggered reporting tests with concurrent gaps including TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241679 | 2900 | 1 | F | Correction to FR2 SA event triggered reporting tests with NCSG including TT | 18.2.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#103 | R5-241826 | 2985 | 1 | F | Removal of Editor Note affecting to TC 5.5.5.9 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241827 | 2977 | 1 | F | Addition of NR_U test case 11.5.2.3 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241828 | 3041 | 1 | F | Core alignment for NSA NR-U tests | 18.2.0 |
| 2024-03 | RAN#103 | R5-241829 | 2921 | 1 | F | Correction to RRM enh test case 6.6.2.9 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241830 | 3007 | 1 | F | Addition of new test case 4.7.8.1 EN-DC FR1 interruptions due to RRM and RLM/BFD measurements on deactivated NR PSCell | 18.2.0 |
| 2024-03 | RAN#103 | R5-241831 | 3087 | 1 | F | Addition of SA inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell test case 7.7.9.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241832 | 2886 | 1 | F | Cell configuration mapping for DL interruptions test cases 6.5.7A.1 and 6.5.7B.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241833 | 2989 | 1 | F | Correct Table 4.3.2.2.1.4.1-2 & Table 4.3.2.2.2.4.1-2 & Table 4.3.2.2.3.4.1-2 & Table 4.3.2.2.4.4.1-2 of test frequency | 18.2.0 |
| 2024-03 | RAN#103 | R5-241834 | 2995 | 1 | F | Correction to test applicability of 4.6.1.7 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241835 | 3025 | 1 | F | Correction for test case 5.5.6.2.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241836 | 3027 | 1 | F | Corrections to BFD-LR test case 5.5.5.5 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241837 | 3024 | 1 | F | Corrections to test procedure for 2-step RACH TC 6.3.2.2.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241838 | 2881 | 1 | F | Correction to Table H.3.1-8A | 18.2.0 |
| 2024-03 | RAN#103 | R5-241839 | 2882 | 1 | F | Correction to Table H.3.1-12 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241840 | 2883 | 1 | F | Correction to Table H.3.1-12A | 18.2.0 |
| 2024-03 | RAN#103 | R5-241862 | 2897 | 1 | F | Introducing the Re-Positioning Concept for FR2 RRM TCs | 18.2.0 |
| 2024-03 | RAN#103 | R5-241886 | 2928 | 1 | F | Correction to RedCap RRM test case 16.6.5.3 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241893 | 3089 | 1 | F | Addition of test cases 4.5.9.1, 5.5.6.3.1, and 5.5.6.4.1 to Annex F | 18.2.0 |
| 2024-03 | RAN#103 | R5-241896 | 2885 | 1 | F | Addition of NR SA FR1 DL interruptions at switching between two uplink bands for 6.5.7B.1 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241901 | 3010 | 1 | F | Correct of Test Tolerance into Annex F for EN-DC FR1 addition and release delay of known PSCell | 18.2.0 |
| 2024-03 | RAN#103 | R5-241963 | 2939 | 1 | F | Correction to RedCap RRM test case 16.7.3.4.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-241964 | 2998 | 1 | F | Correction to test configuration in 16.4.1.2 and 16.5.2.2 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241965 | 2999 | 1 | F | Correction to PDCCH level in CSI-RS based RLM test cases for RedCap | 18.2.0 |
| 2024-03 | RAN#103 | R5-241967 | 2997 | 1 | F | Correction to PDCCH level in 6.5.1.9 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241994 | 2923 | 1 | F | Correction to EN-DC and NR SA SCell activation test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241995 | 2924 | 1 | F | Correction to PCI updating formulas in RRM test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241996 | 3029 | 1 | F | Removal of Editors note for RRM FR2 RLM in-sync test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241997 | 3030 | 1 | F | Revision of Editors note for RRM FR2 RLM test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-241998 | 3003 | 1 | F | Correction to TRS Configuration in 6.3.2.1.3 | 18.2.0 |
| 2024-03 | RAN#103 | R5-241999 | 3004 | 1 | F | Correction to PDCCH level in 6.5.1.8 | 18.2.0 |
| 2024-03 | RAN#103 | R5-242021 | 3002 | 1 | F | Correction to test parameters in 5.6.1.3 and 5.6.1.4 | 18.2.0 |
| 2024-03 | RAN#103 | R5-242033 | 2963 | 1 | F | Addition of NR - E-UTRA event-triggered reporting in non-DRX in FR1 for 1 Rx UE test case 16.6.3.1 including Test Tolerance | 18.2.0 |

| Change history | | | | | | | |
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| 2024-03 | RAN#103 | R5-242034 | 2964 | 1 | F | Addition of NR - E-UTRA event-triggered reporting in non-DRX in FR1 for 2 Rx UE test case 16.6.3.2 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-242035 | 2965 | 1 | F | Addition of NR - E-UTRA event-triggered reporting in DRX in FR1 for 1 Rx UE test case 16.6.3.3 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-242036 | 2966 | 1 | F | Addition of NR - E-UTRA event-triggered reporting in non-DRX in FR1 for 2Rx UE test case 16.6.3.4 including Test Tolerance | 18.2.0 |
| 2024-03 | RAN#103 | R5-242037 | 2879 | 1 | F | Correction of Redcap inter-RAT E-UTRAN CGI test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-242039 | 2913 | 1 | F | Correction to NCD-SSB and SMTC RMCs | 18.2.0 |
| 2024-03 | RAN#103 | R5-242040 | 2914 | 1 | F | Correction to RedCap inter-frequency measurement test cases | 18.2.0 |
| 2024-03 | RAN#103 | R5-242041 | 2931 | 1 | F | Correction to RedCap RRM test case 16.7.2.3.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-242042 | 2932 | 1 | F | Correction to RedCap RRM test case 16.7.2.4.1 with TT | 18.2.0 |
| 2024-03 | RAN#103 | R5-242043 | 2933 | 1 | F | Correction to RedCap RRM test case 16.7.2.4.2 with TT | 18.2.0 |
| 2024-03 | RAN#103 | - | - | - | - | addition of small missing changes of R5-241965, R5-242040, R5-240718, R5-241963 | 18.2.1 |
| 2024-06 | RAN#104 | R5-242371 | 3094 | - | F | Introduction of band n106 to NR band group for FR1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242579 | 3096 | - | F | Correction to TC titles for event triggered reporting with measurement gap | 18.3.0 |
| 2024-06 | RAN#104 | R5-242609 | 3100 | - | F | Editorial correction to 7.6.3.6 test case | 18.3.0 |
| 2024-06 | RAN#104 | R5-242611 | 3101 | - | F | Incorrect clause number for test case 7.6.13.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242612 | 3102 | - | F | Addition of cell configuration mapping for HST FR2 test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242636 | 3107 | - | F | Correction of NR SA event triggered reporting tests with additional mandatory gap pattern test case 6.6.2.9 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-242637 | 3108 | - | F | Correction of NR SA event triggered reporting tests for FR1 without gap when DRX is used test case 6.6.2.10 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-242638 | 3109 | - | F | Correction of NR SA event triggered reporting tests for FR1 without gap when DRX is not used test case 6.6.2.11 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-242641 | 3112 | - | F | Test Tolerance correction in Annex F for RRM enhancement test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242643 | 3114 | - | F | Correction of NR_U SA Inter_RAT measurements test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242646 | 3116 | - | F | Cell configuration correction in Annex E for SA FR2 RRM enhancement test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242647 | 3117 | - | F | Minimum conformance requirements for FR2 SA event triggered reporting without gap | 18.3.0 |
| 2024-06 | RAN#104 | R5-242727 | 3126 | - | F | Correct Table 4.5.2.1.4.1-2 & Table 4.5.2.2.4.1-2 & Table 4.5.2.3.4.1-2 & Table 4.5.2.4.4.1-2 & Table 4.5.2.5.4.1-2 of test frequency | 18.3.0 |
| 2024-06 | RAN#104 | R5-242867 | 3129 | - | F | Addition of MCE RRM test case 6.5.7D.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242868 | 3130 | - | F | Addition of MCE RRM test case 6.5.7D.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242869 | 3131 | - | F | Addition of MCE RRM test case 6.5.7D.3 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242870 | 3132 | - | F | Correction to Annex E for MCE RRM test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242872 | 3133 | - | F | Correction to R15 L1-RSRP absolute accuracy RRM test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242875 | 3136 | - | F | Correction to R15 SCell activation test cases | 18.3.0 |

| Change history | | | | | | | |
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| 2024-06 | RAN#104 | R5-242876 | 3137 | - | F | Correction to R16 relaxed measurement RRM test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242878 | 3138 | - | F | Correction to RedCap RRM test case 16.1.1.5 and 16.1.1.7 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242883 | 3143 | - | F | Correction to RedCap RRM test case 17.3.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242884 | 3144 | - | F | Correction to RedCap RRM test case 17.3.1.2 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242885 | 3145 | - | F | Correction to RedCap RRM test case 17.3.2.3.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242887 | 3147 | - | F | Correction to RedCap RRM test case 17.4.3.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242892 | 3152 | - | F | Correction to RedCap RRM test case 17.5.4.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242893 | 3153 | - | F | Correction to RedCap RRM test case 17.5.4.2.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242895 | 3155 | - | F | Correction to RedCap RRM test case 17.5.5.2.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-242904 | 3164 | - | F | Correction to Annex E for RedCap RRM test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242979 | 3167 | - | F | Editorial correction of references to TS 38.101-1 in section 7 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242980 | 3168 | - | F | Editorial correction of references to TS 38.101-1 in section 6.7 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242981 | 3169 | - | F | Editorial correction of references to TS 38.101-1 in section 6.6 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242982 | 3170 | - | F | Editorial correction of references to TS 38.101-1 in section 5 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242983 | 3171 | - | F | Editorial correction of references to TS 38.101-1 in section 4 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242986 | 3173 | - | F | Editorial correction to title of R17 RedCap test case 16.6.4.7 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242987 | 3174 | - | F | Test procedure correction for R17 RedCap NCD-SSB test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242988 | 3175 | - | F | Addition of SA FR1 NR-U RSSI minimum conformance requirements | 18.3.0 |
| 2024-06 | RAN#104 | R5-242989 | 3176 | - | F | Addition of SA FR1 NR-U RSSI measurement accuracy test case 11.6.5.3 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242990 | 3177 | - | F | Addition of SA FR1 NR-U SSB based L1-RSRP measurement test case 11.6.4.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242991 | 3178 | - | F | Addition of SA FR1 NR-U channel occupancy inter-frequency test case 11.6.6.3 | 18.3.0 |
| 2024-06 | RAN#104 | R5-242992 | 3179 | - | F | Correction to frequencies table for RRM FR2 SA test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242993 | 3180 | - | F | Corrections to message contents for SA FR2 event triggered intra-frequency test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-242994 | 3181 | - | F | Corrections to message contents for SA FR2 timing test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243019 | 3183 | - | F | Correction to K1 in 4.6.4.3 and 6.6.4.3 for FDD and TDD SCS 30 kHz | 18.3.0 |
| 2024-06 | RAN#104 | R5-243020 | 3184 | - | F | Correction to DCI trigger in 6.6.4.3 for FDD and TDD SCS 15 kHz | 18.3.0 |
| 2024-06 | RAN#104 | R5-243025 | 3186 | - | F | Correction to SMTC settings in 16.6.2.9 and 16.6.2.10 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243095 | 3187 | - | F | Removal of Editors note for applicability of RedCap SS-RSRP test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243097 | 3189 | - | F | Addition of SA FR1 NR-U channel occupancy intra-frequency test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243235 | 3192 | - | F | Addition of Clause 4.5.6.4.0 minimum conformance requirements for simultaneous RRC-based active BWP switch on multiple CCs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243236 | 3193 | - | F | Addition of Clause 4.6.8.0 minimum conformance requirements for CSI-RS based intra-frequency measurement | 18.3.0 |

| Change history | | | | | | | |
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| 2024-06 | RAN#104 | R5-243237 | 3194 | - | F | Addition of Clause 4.6.9.0 minimum conformance requirements for CSI-RS based inter-frequency measurement | 18.3.0 |
| 2024-06 | RAN#104 | R5-243238 | 3195 | - | F | Addition of Clause 5.5.3.0 minimum conformance requirements for SCell activation and deactivation delay | 18.3.0 |
| 2024-06 | RAN#104 | R5-243239 | 3196 | - | F | Addition of Clause 5.5.6.5.0 minimum conformance requirements for simultaneous RRC-based active BWP switch on multiple CC | 18.3.0 |
| 2024-06 | RAN#104 | R5-243329 | 3213 | - | F | Addition of EN-DC FR1 NR-U Random Access and Handover test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243341 | 3216 | - | F | Corrections to NR FR1 RedCap E-UTRA cell re-selection TCs 16.1.2.1, 16.1.2.3 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243342 | 3217 | - | F | Editorial correction in Redcap 16.6.2.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243343 | 3218 | - | F | Correction to FR1 RedCap E-UTRA - NR inter - RAT Handover TC 18.2.1.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243344 | 3219 | - | F | Editorial correction in Annex E for FR1 RedCap TCs 16.6.2.3, 16.6.2.4 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243359 | 3220 | - | F | Addition of NTN Timing Advance test 14.3.2.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243360 | 3221 | - | F | Addition of NTN distance-based CHO tests 14.2.1.5 and 14.2.1.6 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243361 | 3222 | - | F | Addition of NTN inter-frequency Measurement Initiation Cell Reselection tests 14.1.7 and 14.1.8 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243362 | 3223 | - | F | Addition of NTN L1-RSRP Measurement Accuracy tests 14.6.4.1 and 14.6.4.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243363 | 3224 | - | F | Update to NTN general sections | 18.3.0 |
| 2024-06 | RAN#104 | R5-243364 | 3225 | - | F | Update to NR-U Cases 10.4.1.1 and 10.4.1.4 including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243365 | 3226 | - | F | Update to NR-U Timing Accuracy Test 10.2.1.1 including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243366 | 3227 | - | F | Update to NR-U Timing Advance Test 10.2.2.1 including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243367 | 3228 | - | F | Update to NR-U L1-RSRP measurement reporting tests 10.4.3.x including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243368 | 3229 | - | F | Update to SCell activation and deactivation tests 10.3.3.x including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243369 | 3230 | - | F | Addition of NR-U EN-DC PSCell addition and release delay test case including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243370 | 3231 | - | F | Addition of NR-U SA FR1 UE transmit timing and timing advance test cases including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243371 | 3232 | - | F | Addition of NR-U SA FR1 SCell activation and deactivation test cases including TTs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243373 | 3234 | - | F | Removal of interruption during SCell operation NR-U tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243377 | 3238 | - | F | Addition of testing methodology for Shared Spectrum | 18.3.0 |
| 2024-06 | RAN#104 | R5-243378 | 3239 | - | F | Clean up of pending items in section 10 NR-U tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243379 | 3240 | - | F | Update to Annex H for NR-U | 18.3.0 |
| 2024-06 | RAN#104 | R5-243380 | 3241 | - | F | Clean up of pending items in section 11 NR-U tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243381 | 3242 | - | F | Editorial update to Annex D for NR-U | 18.3.0 |
| 2024-06 | RAN#104 | R5-243382 | 3243 | - | F | Update to OCNG modelling for NR-U | 18.3.0 |
| 2024-06 | RAN#104 | R5-243384 | 3245 | - | F | Correction to stationary relaxed measurement criterion tests | 18.3.0 |

| Change history | | | | | | | |
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| 2024-06 | RAN#104 | R5-243388 | 3249 | - | F | Editorial correction to section 18 title | 18.3.0 |
| 2024-06 | RAN#104 | R5-243391 | 3252 | - | F | Correction to gap-based measurement tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243393 | 3254 | - | F | Correction to Handover tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243703 | 3190 | 1 | F | Update to Unified TCI state test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243704 | 3191 | 1 | F | Correcting propagation AWGN in test cases without Noc | 18.3.0 |
| 2024-06 | RAN#104 | R5-243705 | 3119 | 1 | F | Adding TRP specific Minimum conformance requirements | 18.3.0 |
| 2024-06 | RAN#104 | R5-243706 | 3105 | 1 | F | Correction of FR2 interruptions at SRS carrier based switching test case 5.5.2.7 and 5.5.2.8 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243707 | 3121 | 1 | F | Addition of new test case 5.6.7.1 EN-DC event triggered reporting test without gap under non-DRX | 18.3.0 |
| 2024-06 | RAN#104 | R5-243708 | 3122 | 1 | F | Addition of new test case 5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used | 18.3.0 |
| 2024-06 | RAN#104 | R5-243709 | 3123 | 1 | F | Addition of new test case 5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.3.0 |
| 2024-06 | RAN#104 | R5-243710 | 3124 | 1 | F | Addition of new test case 5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.3.0 |
| 2024-06 | RAN#104 | R5-243711 | 3250 | 1 | F | Update to gap-based measurement reporting tests for HST | 18.3.0 |
| 2024-06 | RAN#104 | R5-243712 | 3214 | 1 | F | Correction to RRM RedCap TC 16.5.1.7 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243713 | 3172 | 1 | F | Corrections to R17 RedCap 18.3.1.x test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243735 | 3236 | 1 | F | Update to SA measurement accuracy NR-U tests including TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243744 | 3097 | 1 | F | Correction to 7.6.15.3 FR2 SA event triggered reporting tests with concurrent gaps including TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243748 | 3115 | 1 | F | Correction of NR_U SA L1-RSRP measurements test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243749 | 3099 | 1 | F | Completion of NR-U redirection from NR FR1 carrier without CCA to NR FR1 carrier under CCA test case including test tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243751 | 3098 | 1 | F | Completion of NR-U redirection from NR FR1 carrier under CCA to NR FR1 carrier under CCA test case including test tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243754 | 3103 | 1 | F | Correction of interruptions at NR SRS carrier based switching test case 4.5.2.8 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243755 | 3104 | 1 | F | Correction of interruptions at E-UTRA SRS carrier based switching test case 4.5.2.9 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243756 | 3106 | 1 | F | Correction of SA FR1 interruptions at NR SRS carrier based switching test case 6.5.2.2 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243757 | 3110 | 1 | F | Addition of FR2 SA event triggered reporting test without gap under non-DRX test case 7.6.2.10 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243758 | 3111 | 1 | F | Addition of FR2 SA event triggered reporting test without gap under DRX test case 7.6.2.11 including Test Tolerance | 18.3.0 |
| 2024-06 | RAN#104 | R5-243774 | 3146 | 1 | F | Correction to RedCap RRM test case 17.4.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243775 | 3154 | 1 | F | Correction to RedCap RRM test case 17.5.5.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243776 | 3156 | 1 | F | Correction to RedCap RRM test case 17.7.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243777 | 3157 | 1 | F | Correction to RedCap RRM test case 17.7.1.2 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243778 | 3158 | 1 | F | Correction to RedCap RRM test case 17.7.2.1 with TT | 18.3.0 |

| Change history | | | | | | | |
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| 2024-06 | RAN#104 | R5-243779 | 3159 | 1 | F | Correction to RedCap RRM test case 17.7.2.2 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243780 | 3160 | 1 | F | Correction to RedCap RRM test case 17.7.3.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243781 | 3161 | 1 | F | Correction to RedCap RRM test case 17.7.3.2 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243782 | 3162 | 1 | F | Correction to RedCap RRM test case 17.7.4.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243783 | 3163 | 1 | F | Addition of RedCap RRM test case 17.7.4.2 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243815 | 3197 | 1 | F | Addition of message contents to test case 4.7.9.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243842 | 3198 | 1 | F | Addition of message contents to test case 4.7.9.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243843 | 3199 | 1 | F | Addition of message contents to test case 4.7.10.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243844 | 3200 | 1 | F | Addition of message contents to test case 4.7.10.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243845 | 3201 | 1 | F | Addition of message contents to test case 5.7.8.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243846 | 3202 | 1 | F | Addition of message contents to test case 5.7.8.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243847 | 3203 | 1 | F | Addition of message contents to test case 5.7.9.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243848 | 3204 | 1 | F | Addition of message contents to test case 5.7.9.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243849 | 3205 | 1 | F | Addition of message contents to test case 6.7.11.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243850 | 3206 | 1 | F | Addition of message contents to test case 6.7.11.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243851 | 3207 | 1 | F | Addition of message contents to test case 6.7.12.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243852 | 3208 | 1 | F | Addition of message contents to test case 6.7.12.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243853 | 3209 | 1 | F | Addition of message contents to test case 7.7.8.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243854 | 3210 | 1 | F | Addition of message contents to test case 7.7.8.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243855 | 3211 | 1 | F | Addition of message contents to test case 7.7.9.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243856 | 3212 | 1 | F | Addition of message contents to test case 7.7.9.2 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243880 | 3118 | 1 | F | Addition test case for Inter-cell SSB based L1-RSRP Reporting | 18.3.0 |
| 2024-06 | RAN#104 | R5-243892 | 3237 | 1 | F | Update to NSA event-triggered measurement NR-U tests including TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-243901 | 3251 | 1 | F | Update to Rel.17 HST CA measurement reporting tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243902 | 3253 | 1 | F | Correction to SUL test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243903 | 3247 | 1 | F | Correction to re-establishment test cases for RedCap | 18.3.0 |
| 2024-06 | RAN#104 | R5-243904 | 3244 | 1 | F | Correction to gap-based measurement tests for RedCap | 18.3.0 |
| 2024-06 | RAN#104 | R5-243909 | 3215 | 1 | F | Correction to FR1 NSA Event Trigger TC 4.6.1.8 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243916 | 3134 | 1 | F | Correction to R15 RACH RRM test cases and RMCs | 18.3.0 |
| 2024-06 | RAN#104 | R5-243917 | 3135 | 1 | F | Correction to R15 reestablishment RRM test case 6.3.2.1.1 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243918 | 3139 | 1 | F | Correction to RedCap RRM test case 16.1.2.5 and 16.1.2.6 | 18.3.0 |
| 2024-06 | RAN#104 | R5-243919 | 3255 | 1 | F | Correction to RedCap inter-RAT measurement test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-243994 | 3233 | 2 | F | Update to Annex E and F for NR-U RRM tests | 18.3.0 |
| 2024-06 | RAN#104 | R5-243995 | 3235 | 2 | F | Update to NSA measurement accuracy NR-U tests including TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-244001 | 3127 | 1 | F | Correction to SDT RRM test case 6.2.1 with TT | 18.3.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-06 | RAN#104 | R5-244002 | 3125 | 1 | F | Addition of MU and test tolerance in Annex F for Rel-16 RRM test case EN-DC CSI-RSRP measurement accuracy with FR1 serving cell and FR1 target cell | 18.3.0 |
| 2024-06 | RAN#104 | R5-244003 | 3166 | 2 | F | Update of Rel-16 RRM test case EN-DC CSI-RSRP measurement accuracy with FR1 serving cell and FR1 target cell | 18.3.0 |
| 2024-06 | RAN#104 | R5-244005 | 3092 | 1 | F | Addition of TT for MG enhancements TC 6.6.18.3 | 18.3.0 |
| 2024-06 | RAN#104 | R5-244006 | 3093 | 2 | F | Addition of TT for MG enhancements TC 6.6.18.4 | 18.3.0 |
| 2024-06 | RAN#104 | R5-244012 | 3165 | 2 | F | Correction to Annex F for RedCap RRM test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-244013 | 3095 | 2 | F | Update test requirement for Redcap inter-frequency test cases | 18.3.0 |
| 2024-06 | RAN#104 | R5-244014 | 3140 | 1 | F | Correction to RedCap RRM test case 16.2.1.1 with TT | 18.3.0 |
| 2024-06 | RAN#104 | R5-244015 | 3141 | 1 | F | Correction to RedCap RRM test case 16.2.1.2 with TT | 18.3.0 |
| 2024-09 | RAN#105 | R5-244110 | 3259 | - | F | Correction to RedCap RRM - 16.6.1.1 test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244151 | 3264 | - | F | Addition of minimum requirements for FR1 LTM intra L1-RSRP measurement | 18.4.0 |
| 2024-09 | RAN#105 | R5-244153 | 3266 | - | F | Addition of minimum requirements for FR1 LTM inter L1-RSRP measurement with GAP | 18.4.0 |
| 2024-09 | RAN#105 | R5-244155 | 3268 | - | F | Addition of minimum requirements for FR1 LTM inter L1-RSRP measurement without GAP | 18.4.0 |
| 2024-09 | RAN#105 | R5-244157 | 3270 | - | F | Addition of minimum requirements for FR1 LTM inter L1-RSRP measurement accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-244160 | 3273 | - | F | Addition of new band groups for FR1 LTM L1-RSRP measurement accuracy test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244161 | 3274 | - | F | Editorial correction of RRC IE used in ReportConfigNR-DEFAULT for LTM L1-RSRP measurement test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244285 | 3275 | - | F | Addition of minimum requirements for 6.3.4.0 - FR1 LTM PCell switch | 18.4.0 |
| 2024-09 | RAN#105 | R5-244286 | 3276 | - | F | Addition of new test case 6.3.4.1 for FR1 LTM intra-f Rach-based PCell switch | 18.4.0 |
| 2024-09 | RAN#105 | R5-244287 | 3277 | - | F | Addition of new test case 6.3.4.2 for FR1 LTM inter-f Rach-based PCell switch | 18.4.0 |
| 2024-09 | RAN#105 | R5-244288 | 3278 | - | F | Correction to table E.4-1 for LTM FR1 TCs | 18.4.0 |
| 2024-09 | RAN#105 | R5-244292 | 3281 | - | F | Addition of LTM Candidate TCI State Configurations to align with core specs | 18.4.0 |
| 2024-09 | RAN#105 | R5-244293 | 3282 | - | F | Editorial correction of Redcap inter-RAT CGI test case 16.6.5.4 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244318 | 3287 | - | F | Correction of Redcap RRM-16.7.4.0.3 and 16.7.4.0.4 CSI-RS L1-RSRP accuracy requirements | 18.4.0 |
| 2024-09 | RAN#105 | R5-244334 | 3288 | - | F | Editorial correction of 1Rx RedCap RRM - L1-RSRP measurement for beam reporting | 18.4.0 |
| 2024-09 | RAN#105 | R5-244349 | 3289 | - | F | Correction on test requirements in Redcap RLM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244350 | 3290 | - | F | Addition of new sub-clause 6.3.2.4.0 for LTM | 18.4.0 |
| 2024-09 | RAN#105 | R5-244351 | 3291 | - | F | Addition of new test case 6.3.2.4.1 for LTM | 18.4.0 |
| 2024-09 | RAN#105 | R5-244352 | 3292 | - | F | Addition of new test case 6.3.2.4.2 for LTM | 18.4.0 |
| 2024-09 | RAN#105 | R5-244353 | 3293 | - | F | Addition of new test case 6.3.2.4.3 for LTM | 18.4.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-244361 | 3294 | - | F | Editorial correction to clause 4.5.3.0 and TC 4.5.2.3 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244390 | 3295 | - | F | Introduction of bands n31 and n72 to NR band group for FR1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244549 | 3296 | - | F | Addition of Rel-18 inter-frequency cell reselection HST FR2 test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244550 | 3297 | - | F | Addition of Rel-18 HST FR2 active TCI state switch delay test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244556 | 3299 | - | F | Addition of FR1 intra-frequency handover for less than 5MHz test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244557 | 3300 | - | F | Addition of RLM OOS in DRX mode for UE operating on a cell with less than 5MHz bandwidth test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244558 | 3301 | - | F | Addition of RLM OOS in non-DRX mode for UE operating on a cell with less than 5MHz bandwidth test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244559 | 3302 | - | F | Addition of less than 5 MHz RMC and CORESET RMSI scheduling | 18.4.0 |
| 2024-09 | RAN#105 | R5-244562 | 3303 | - | F | Addition of SA FR2 UE Transmit Timing with 2 TAGs for multi-DCI multi-TRP operation test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-244565 | 3306 | - | F | Addition of Test Case: TRS based SCell Activation of SSB-less SCell in FR1 inter-band CA in non-DRX | 18.4.0 |
| 2024-09 | RAN#105 | R5-244605 | 3310 | - | F | Correction to MCE RRM test case 6.5.7D.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244606 | 3311 | - | F | Correction to MCE RRM test case 6.5.7D.2 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244607 | 3312 | - | F | Correction to MCE RRM test case 6.5.7D.3 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244610 | 3315 | - | F | Correction to Annex H for Tx switch RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244613 | 3317 | - | F | Correction to EN-DC BFR test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244614 | 3318 | - | F | Correction to NR SA BFR test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244615 | 3319 | - | F | Correction to NR SA CSI-RS based L1-RSRP test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244617 | 3321 | - | F | Correction to NR SA RRM test case 7.3.2.1.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244619 | 3322 | - | F | Correction to R16 Tx switch RRM test case 4.5.8.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244620 | 3323 | - | F | Correction to R16 Tx switch RRM test case 6.5.7.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244621 | 3324 | - | F | Correction to R16 Tx switch RRM test case 6.5.7.2 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244622 | 3325 | - | F | Correction to Annex F for R16 Tx switch RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244624 | 3326 | - | F | Correction to R17 Tx switch RRM test case 6.5.7A.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244625 | 3327 | - | F | Correction to R17 Tx switch RRM test case 6.5.7A.2 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244626 | 3328 | - | F | Correction to R17 Tx switch RRM test case 6.5.7B.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244627 | 3329 | - | F | Correction to R17 Tx switch RRM test case 6.5.7B.2 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244628 | 3330 | - | F | Correction to R17 Tx switch RRM test case 6.5.7C.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244629 | 3331 | - | F | Correction to R17 Tx switch RRM test case 6.5.7C.2 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244630 | 3332 | - | F | Correction to Annex F for R17 Tx switch RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244632 | 3333 | - | F | Correction to RedCap RRM test case 16.1.1.7 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244633 | 3334 | - | F | Correction to RedCap BFR test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244634 | 3335 | - | F | Correction to RedCap RRM test case 17.5.1.3 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244635 | 3336 | - | F | Correction to RedCap RRM test case 17.5.1.5 with TT | 18.4.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-244636 | 3337 | - | F | Correction to RedCap RRM test case 17.5.1.6 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244637 | 3338 | - | F | Correction to RedCap RRM test case 17.5.1.7 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244638 | 3339 | - | F | Correction to RedCap RRM test case 17.5.1.8 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244639 | 3340 | - | F | Correction to RedCap RRM test case 17.5.3.1.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244640 | 3341 | - | F | Correction to RedCap RRM test case 17.5.3.2.1 with TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-244759 | 3343 | - | F | Cell Configuration Mapping for RRM Enhancements Test Cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244769 | 3351 | - | F | Correction of Interruptions at NR SRS Carrier Based Switching Test Case 4.5.2.8 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244770 | 3352 | - | F | Correction of Interruptions at E-UTRA SRS Carrier Based Switching Test Case 4.5.2.9 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244771 | 3353 | - | F | Correction of SA FR1 Interruptions at NR SRS Carrier Based Switching Test Case 6.5.2.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244778 | 3357 | - | F | Addition of MU and test tolerance in Annex F for Rel-16 RRM EN-DC event triggered reporting test for NR FR2 cell when DRX is used | 18.4.0 |
| 2024-09 | RAN#105 | R5-244781 | 3359 | - | F | Addition of MU and test tolerance in Annex F for Rel-16 RRM EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.4.0 |
| 2024-09 | RAN#105 | R5-244784 | 3361 | - | F | Addition of MU and test tolerance in Annex F for Rel-16 RRM EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.4.0 |
| 2024-09 | RAN#105 | R5-244810 | 3362 | - | F | Update of FR2 Random Access test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-244832 | 3364 | - | F | Correction to message exception in 16.5.3.1.1 and 16.5.3.2.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244835 | 3367 | - | F | Addition of clarification notes in 16.7.2.1 and 16.7.2.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244836 | 3368 | - | F | Correction to test requirement in 16.7.4.1.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-244840 | 3372 | - | F | Editorial correction to 6.7.1.2.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245036 | 3374 | - | F | Typo correction to A3 offset in TC 7.6.1.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245040 | 3378 | - | F | Corrections to msg content of BFD-LR test cases 4.5.5.1,4.5.5.2,5.5.5.1,5.5.5.2,6.5.5.1 and 6.5.5.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245042 | 3380 | - | F | Update to NR-U UE random access tests with PSCell under DL CCA including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245044 | 3382 | - | F | Update to NR-U UE FR1 SA Intra-frequency measurement accuracy on SCC TC 11.6.1.2 including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245074 | 3384 | - | F | Editorial correction of 3GPP style issue | 18.4.0 |
| 2024-09 | RAN#105 | R5-245123 | 3386 | - | F | Addition of RRC message content for Further NR mobility enhancements | 18.4.0 |
| 2024-09 | RAN#105 | R5-245131 | 3388 | - | F | Correction for new reference SSB configuration | 18.4.0 |
| 2024-09 | RAN#105 | R5-245132 | 3389 | - | F | Correction of test configurations and test cases for FeMIMO | 18.4.0 |
| 2024-09 | RAN#105 | R5-245242 | 3395 | - | F | Corrections to NRU measurement accuracy test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245243 | 3396 | - | F | Addition of new test cases for SS-RSRP measurement accuracy for Satellite Access | 18.4.0 |
| 2024-09 | RAN#105 | R5-245244 | 3397 | - | F | Addition of new test cases for SS-RSRQ measurement accuracy for Satellite Access | 18.4.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-245245 | 3398 | - | F | Editorial corrections to Table 14.0.2-1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245248 | 3401 | - | F | Editorial corrections to Initial Conditions for RRM FR2 SA test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245252 | 3404 | - | F | Correction of MU values for RRM FR2 PC1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245267 | 3405 | - | F | Correction of SS-RSRP RedCap test case 16.7.1.4.2 including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245268 | 3406 | - | F | Correction of SS-RSRP RedCap test case 16.7.1.4.1 including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245269 | 3407 | - | F | Correction of SS-RSRP RedCap test case 16.7.1.3.2 including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245272 | 3410 | - | F | Correction of FR2 Event Triggered test cases including TT for PC1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245273 | 3411 | - | F | Correction of FR2 Timing Advance test cases including TT for PC1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245274 | 3412 | - | F | Correction of FR2 Uplink Timing test cases including TT for PC1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245278 | 3416 | - | F | Annex E.14 correction for new RedCap test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245279 | 3417 | - | F | Annex F correction for RRM FR2 PC1 test cases including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245281 | 3418 | - | F | Correction to Editors Notes in Annex B | 18.4.0 |
| 2024-09 | RAN#105 | R5-245316 | 3419 | - | F | Update in 16.7.1.1.1 to align Noc level to TT analysis | 18.4.0 |
| 2024-09 | RAN#105 | R5-245318 | 3420 | - | F | Update in 16.7.2.2 to align Noc level | 18.4.0 |
| 2024-09 | RAN#105 | R5-245319 | 3421 | - | F | Annex F correction for RedCap test cases including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245333 | 3422 | - | F | Update on 4.6.2.9 DRX configuration | 18.4.0 |
| 2024-09 | RAN#105 | R5-245337 | 3423 | - | F | Update on pdcch-DMRS-SCID for NSA FR1 BFR test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245338 | 3424 | - | F | Update on pdcch-DMRS-SCID for NSA FR2 BFR test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245346 | 3427 | - | F | Addition of Annex E for NR-NTN test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245347 | 3428 | - | F | Correction to RRM test 6.6.2.9 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245349 | 3430 | - | F | Update to SDT test 6.2.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245351 | 3432 | - | F | Core alignment for section 11 tests | 18.4.0 |
| 2024-09 | RAN#105 | R5-245352 | 3433 | - | F | Addition of chapter 13 tests on a secondary carrier with CCA | 18.4.0 |
| 2024-09 | RAN#105 | R5-245353 | 3434 | - | F | Update to Annex E and F for NR-U tests | 18.4.0 |
| 2024-09 | RAN#105 | R5-245354 | 3435 | - | F | Addition of NR-U SA FR1 cell reselection test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245355 | 3436 | - | F | Addition of NR-U SA FR1 Handover test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245356 | 3437 | - | F | Addition of NR-U SA FR1 RRC re-establishment test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245357 | 3438 | - | F | Addition of chapter 12 inter-RAT tests on target carrier with CCA | 18.4.0 |
| 2024-09 | RAN#105 | R5-245358 | 3439 | - | F | Update to PSCell HO test 10.1.2 including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-245359 | 3440 | - | F | Addition of NR-U SA FR1 Inter-RAT cell reselection test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245360 | 3441 | - | F | Editorial corrections to Annex D.7 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245361 | 3442 | - | F | Core alignment for gap-based FR2 inter-RAT measurement tests | 18.4.0 |
| 2024-09 | RAN#105 | R5-245362 | 3443 | - | F | Update to SUL tests including TT | 18.4.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-245365 | 3446 | - | F | Update to RedCap SA FR2 SSB BFR test cases 17.5.2.1 and 17.5.2.2 including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-245368 | 3449 | - | F | Update to RedCap 2Rx event-triggered test cases 16.6.3.2 and 16.6.3.4 including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-245369 | 3450 | - | F | Update to Annex F for RedCap event-triggered test cases 16.6.3.x | 18.4.0 |
| 2024-09 | RAN#105 | R5-245370 | 3451 | - | F | Correction to RedCap BFR 1Rx test cases 16.5.2.1 and 16.5.2.3 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245727 | 3470 | 1 | F | Update of test titles for RedCap UE | 18.4.0 |
| 2024-09 | RAN#105 | R5-245731 | 3308 | 2 | F | Correction to CSI-RS L3 measurement RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245732 | 3457 | 2 | F | Update to Clause 5.7.8.1 ENDC and Clause 7.7.8.1 SA intra-frequency CSI-RSRQ measurement accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245733 | 3458 | 2 | F | Update to Clause 5.7.8.2 ENDC and Clause 7.7.8.2 SA inter-frequency CSI-RSRQ measurement accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245734 | 3459 | 2 | F | Update to Clause 5.7.9.1 ENDC and Clause 7.7.9.1 SA intra-frequency CSI-SINR measurement accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245735 | 3460 | 2 | F | Update to Clause 5.7.9.2 ENDC and Clause 7.7.9.2 SA inter-frequency CSI-SINR measurement accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245742 | 3262 | 1 | F | Correction to FR2 RRM - 5.5.5.5 test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-245743 | 3263 | 1 | F | Correction to FR2 RRM - 7.5.5.5 test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-245859 | 3425 | 1 | F | Addition of NR-NTN RLM test cases 14.4.1.x | 18.4.0 |
| 2024-09 | RAN#105 | R5-245860 | 3426 | 1 | F | Addition of NR-NTN Re-establishment test cases 14.2.2.1.x | 18.4.0 |
| 2024-09 | RAN#105 | R5-245880 | 3307 | 1 | F | Addition of Test Case: NR SA FR1 SSB-less SCell Activation SSB-less inter-band CA based on A-TRS in non-DRX | 18.4.0 |
| 2024-09 | RAN#105 | R5-245881 | 3309 | 1 | F | Correction to Annex D for 8Rx capable UEs | 18.4.0 |
| 2024-09 | RAN#105 | R5-245882 | 3298 | 1 | F | Addition of Test Case: Cell reselection to FR1 intra-frequency NR for UE operating on a cell with less than 5MHz BW | 18.4.0 |
| 2024-09 | RAN#105 | R5-245883 | 3313 | 1 | F | Correction to Annex A for MCE RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245884 | 3305 | 1 | F | Annexure A changes for adding SA FR2 UL TCI state switch test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-245885 | 3304 | 1 | F | Addition of NR SA FR2 PCell uplink TCI state switch for two known TCI states test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-245886 | 3265 | 1 | F | Addition of new test case 6.6.26.1 for FR1 LTM intra L1-RSRP measurement | 18.4.0 |
| 2024-09 | RAN#105 | R5-245887 | 3267 | 1 | F | Addition of new test case 6.6.27.1 for FR1 LTM inter L1-RSRP measurement with gap | 18.4.0 |
| 2024-09 | RAN#105 | R5-245888 | 3269 | 1 | F | Addition of new test case 6.6.28.1 for FR1 LTM inter L1-RSRP measurement without gap | 18.4.0 |
| 2024-09 | RAN#105 | R5-245889 | 3271 | 1 | F | Addition of new test case 6.7.17.1.1 for FR1 LTM inter L1-RSRP absolute accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245890 | 3272 | 1 | F | Addition of new test case 6.7.17.1.2 for FR1 LTM inter L1-RSRP relative accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245891 | 3279 | 1 | F | Addition of new test case 6.3.4.3 for FR1 LTM intra-f Rach-less PCell switch | 18.4.0 |
| 2024-09 | RAN#105 | R5-245892 | 3280 | 1 | F | Update of FR1 and FR2 PRACH configurations to align with core specs | 18.4.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-245893 | 3452 | 1 | F | Add CSI-RS.RRM profiles to 38.533 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245894 | 3345 | 1 | F | Introduction of new test case 6.7.10.1.1 CSI-RSRP Intra-frequency Absolute Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245895 | 3346 | 1 | F | Introduction of new test case 6.7.10.1.2 CSI-RSRP Intra-frequency Relative Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245896 | 3347 | 1 | F | Introduction of new test case 6.7.10.2.1 CSI-RSRP Inter-frequency Absolute Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245897 | 3348 | 1 | F | Introduction of new test case 6.7.10.2.2 CSI-RSRP Inter-frequency Relative Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245898 | 3349 | 1 | F | Introduction of new test case 7.7.7.1.1 CSI-RSRP Intra-frequency Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245899 | 3350 | 1 | F | Introduction of new test case 7.7.7.2.1 NR SA FR1-FR1 CSI-RSRP Measurement Accuracy | 18.4.0 |
| 2024-09 | RAN#105 | R5-245900 | 3344 | 1 | F | Introduction of new test case 5.5.7.1 Addition and Release Delay of NR PSCell | 18.4.0 |
| 2024-09 | RAN#105 | R5-245901 | 3373 | 1 | F | Addition of NR-U UE random access test with PCell under DL CCA | 18.4.0 |
| 2024-09 | RAN#105 | R5-245902 | 3316 | 1 | F | Correction to EN-DC RRM test case 4.5.7.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245903 | 3444 | 1 | F | Core alignment for r17 HST tests with DRX | 18.4.0 |
| 2024-09 | RAN#105 | R5-245906 | 3402 | 1 | F | Test parameters alignment FR2 Event-Triggered SA 7.6.1.1 to NSA 5.6.1.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245908 | 3366 | 1 | F | Correction to title of 16.7.1.x | 18.4.0 |
| 2024-09 | RAN#105 | R5-245909 | 3369 | 1 | F | Correction to test requirements in FR1 L1-RSRP absolute measurement for RedCap | 18.4.0 |
| 2024-09 | RAN#105 | R5-245910 | 3370 | 1 | F | Correction to test requirement in 16.3.1.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245911 | 3371 | 1 | F | Correction to test parameters in 16.3.2.3.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245912 | 3385 | 1 | F | Update to test case titles to match work plan | 18.4.0 |
| 2024-09 | RAN#105 | R5-245930 | 3356 | 1 | F | Update of Rel-16 RRM test case EN-DC event triggered reporting test when DRX is used | 18.4.0 |
| 2024-09 | RAN#105 | R5-245931 | 3358 | 1 | F | Update of Rel-16 RRM test case EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.4.0 |
| 2024-09 | RAN#105 | R5-245932 | 3360 | 1 | F | Update of Rel-16 RRM test case EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell | 18.4.0 |
| 2024-09 | RAN#105 | R5-245945 | 3314 | 1 | F | Correction to Annex F for MCE RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245952 | 3413 | 1 | F | Correction of Relative Measurement Accuracy test cases including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-245953 | 3414 | 1 | F | Correction of Absolute Measurement Accuracy test cases including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-245954 | 3409 | 1 | F | Correction of FR2 Intra-frequency measurement accuracy test cases including TT for PC1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245955 | 3391 | 1 | F | Update the position of core requirements for test case 7.5.14 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245956 | 3342 | 1 | F | Correction to Annex F for RedCap RRM test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-245957 | 3283 | 1 | F | Correction to Redcap RRM TC 16.6.4.5 and 16.6.4.7_CSI-RS L1 RSRP 1Rx with TT | 18.4.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-09 | RAN#105 | R5-245958 | 3284 | 1 | F | Correction of Redcap CSI-RS based BFD and LR 16.5.2.5 and 16.5.2.7 test case with Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245959 | 3285 | 1 | F | Correction of 16.7.4.3.1 Redcap CSI-RS based L1-RSRP accuracy for 1RX test case with Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245960 | 3286 | 1 | F | Correction of 16.7.4.3.2 Redcap CSI-RS based L1-RSRP accuracy for 1RX test case with Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245961 | 3377 | 1 | F | Correction to cell2 SS-RSRP for test 1 in TC 16.7.3.1 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245962 | 3383 | 1 | F | Update to NR2L FR1 measurement accuracy TC 16.7.5.2 | 18.4.0 |
| 2024-09 | RAN#105 | R5-245963 | 3408 | 1 | F | Correction of SS-RSRP RedCap test case 16.7.1.3.1 including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-245995 | 3363 | 1 | F | Correction to CellGroupConfig for Non-Contention Based Random Access | 18.4.0 |
| 2024-09 | RAN#105 | R5-246015 | 3320 | 1 | F | Correction to EN-DC and NR SA CFRA test cases and RMCs | 18.4.0 |
| 2024-09 | RAN#105 | R5-246016 | 3260 | 1 | F | Correction to RedCap RRM - 16.5.4.1 and 16.5.4.2 test cases | 18.4.0 |
| 2024-09 | RAN#105 | R5-246017 | 3261 | 1 | F | Correction to RedCap RRM - 16.6.3.x test case | 18.4.0 |
| 2024-09 | RAN#105 | R5-246020 | 3379 | 1 | F | Update to NR-U ENDC FR1 Channel occupancy measurement on PSCell under DL CCA including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-246021 | 3381 | 1 | F | Update to NR-U ENDC FR1 RSSI measurement accuracy on PSCell under DL CCA including Test Tolerance | 18.4.0 |
| 2024-09 | RAN#105 | R5-246022 | 3431 | 1 | F | Core alignment for section 10 tests | 18.4.0 |
| 2024-09 | RAN#105 | R5-246029 | 3390 | 1 | F | Correction to 6.6.4.6 NR SA FR1 Inter-cell SSB based L1-RSRP measurements on PCell in DRX | 18.4.0 |
| 2024-09 | RAN#105 | R5-246045 | 3445 | 1 | F | Update to r17 HST reselection test 6.1.1.8 | 18.4.0 |
| 2024-09 | RAN#105 | R5-246046 | 3375 | 1 | F | Correction to Antenna config in TC 16.6.2.9 | 18.4.0 |
| 2024-09 | RAN#105 | R5-246053 | 3448 | 1 | F | Update to RedCap 1Rx event-triggered test cases 16.6.3.1 and 16.6.3.3 including TT | 18.4.0 |
| 2024-09 | RAN#105 | R5-246064 | 3376 | 1 | F | Corrections to BFD-LR test cases 4.5.5.1,4.5.5.2,5.5.5.1,5.5.5.2,6.5.5.1 and 6.5.5.2 | 18.4.0 |
| 2024-12 | RAN#106 | R5-246172 | 3472 | - | F | Update TT value to LTM intra TC 6.3.2.4.1 and TC 6.3.2.4.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246182 | 3474 | - | F | Update LTM TC 6.6.26.1 including TTs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246183 | 3475 | - | F | Update LTM TC 6.6.27.1 including TTs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246184 | 3476 | - | F | Update LTM TC 6.6.28.1 including TTs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246185 | 3477 | - | F | Update LTM TC 6.7.17.1.1 including TTs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246186 | 3478 | - | F | Update Annex F for LTM L1-RSRP test cases including TTs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246187 | 3479 | - | F | Update message contents and test applicability for LTM TC 6.6.26.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246188 | 3480 | - | F | Update message contents and test applicability for LTM TC 6.6.27.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246189 | 3481 | - | F | Update message contents and test applicability for LTM TC 6.6.28.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246190 | 3482 | - | F | Update message contents and test applicability for LTM TC 6.7.17.1.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246192 | 3483 | - | F | Update TT to Annex F for LTM PDCCH order TCs | 18.5.0 |

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| 2024-12 | RAN#106 | R5-246196 | 3484 | - | F | Update LTM TC 6.3.4.3 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246197 | 3485 | - | F | Update LTM TC 6.3.4.1 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246198 | 3486 | - | F | Update LTM TC 6.3.4.2 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246201 | 3487 | - | F | Correction to LTM test case 6.3.4.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246202 | 3488 | - | F | Update message contents for LTM TC 6.3.4.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246203 | 3489 | - | F | Core alignment for LTM RACHless TC 6.3.4.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246207 | 3491 | - | F | Update message contents for LTM TC 6.3.4.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246208 | 3492 | - | F | Update message contents for LTM TC 6.3.4.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246209 | 3493 | - | F | Correction to RedCap RRM - SS-SINR accuracy requirement for 1RX | 18.5.0 |
| 2024-12 | RAN#106 | R5-246311 | 3494 | - | F | Removal of LTM L1-RSRP relative accuracy TC 6.7.17.1.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246320 | 3496 | - | F | Update test requirement for Redcap inter-frequency test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246352 | 3497 | - | F | Correction to TC 6.6.18.3 and 6.6.18.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246393 | 3498 | - | F | Core spec alignment for LTM cell switch TC 6.3.4.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246433 | 3500 | - | F | Update RRC message content for Further NR mobility enhancements | 18.5.0 |
| 2024-12 | RAN#106 | R5-246492 | 3503 | - | F | Core spec alignment update to LTM PDCCH order TCs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246493 | 3504 | - | F | Update test applicability to clause 6.3.2.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246494 | 3505 | - | F | Update message content to clause 6.3.2.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246495 | 3506 | - | F | Correction to Inter-RAT NR cell re-selection for RedCap including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246719 | 3508 | - | F | Correction to FR1 NR SA re-establishment RRM test case 6.3.2.1.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246720 | 3509 | - | F | Correction to FR2 NR SA re-establishment RRM test case 7.3.2.1.3 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246722 | 3511 | - | F | Correction to Annex F for FR2 RRM test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246727 | 3513 | - | F | Correction to FR1 NR SA 2-step RACH RRM test cases 6.3.2.2.3 & 6.3.2.2.4 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246732 | 3515 | - | F | Correction to RedCap inter-RAT reselection test cases 16.1.2.1 & 16.1.2.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246734 | 3517 | - | F | Correction to RedCap inter-frequency measurement test cases 16.6.2.5 & 16.6.2.6 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246735 | 3518 | - | F | Correction to FR1 RedCap inter-RAT measurement RRM test cases 16.6.3.X | 18.5.0 |
| 2024-12 | RAN#106 | R5-246737 | 3520 | - | F | Correction to FR2 RedCap re-establishment RRM test cases 17.3.2.1.3 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246738 | 3521 | - | F | Correction to FR2 RedCap RLM scheduling restriction test case 17.5.1.9 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246809 | 3522 | - | F | Test Tolerance , Statistical analysis update and core spec alignment to NR-U FR1 E-UTRAN-NR inter-RAT measurements under CCA | 18.5.0 |
| 2024-12 | RAN#106 | R5-246822 | 3529 | - | F | Update to propagation conditions for NR-NTN RLM test cases 14.4.1.x | 18.5.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-12 | RAN#106 | R5-246823 | 3530 | - | F | Addition of Annex F for NR-NTN test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246824 | 3531 | - | F | Update to NR-NTN event-triggered reporting test cases 14.5.1.x including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246825 | 3532 | - | F | Addition of NR-NTN cell reselection test cases 14.1.1 and 14.1.5 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246826 | 3533 | - | F | Addition of NR-NTN cell reselection enhanced requirement test case 14.1.6 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246827 | 3534 | - | F | Addition of NR-NTN idle mode relaxed measurement test cases 14.1.9 and 14.1.10 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246828 | 3535 | - | F | Update to EN-DC 2-step RACH NR-U tests | 18.5.0 |
| 2024-12 | RAN#106 | R5-246829 | 3536 | - | F | Addition of NR-U L1-RSRP tests 13.3.3.1 and 13.3.3.2 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246830 | 3537 | - | F | Addition of NR-U inter-RAT cell reselection test 12.1.1.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246831 | 3538 | - | F | Addition of NR-U inter-RAT handover test 12.2.1.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246833 | 3540 | - | F | Update to NR-U inter-RAT tests 12.4.2.1, 12.4.2.2, 12.4.2.3 and 12.4.2.4 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246834 | 3541 | - | F | Update to NR-U SS-RSRP test 13.4.1.1 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246836 | 3543 | - | F | Update to NR-U SS-SINR test 13.4.3.1 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246837 | 3544 | - | F | Update to NR-U L1-RSRP test 13.4.4.1 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246838 | 3545 | - | F | Update to NR-U RSSI tests 13.4.5.1 and 13.4.5.2 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246839 | 3546 | - | F | Update to NR-U channel occupancy tests 13.4.6.1 and 13.4.6.2 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246840 | 3547 | - | F | Addition of NR-U SCell activation and deactivation tests 13.2.2.1, 13.2.2.2 and 13.2.2.3 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246841 | 3548 | - | F | Addition of NR-U inter-frequency tests 13.3.2.3, 13.3.2.4, 13.3.2.5 and 13.3.2.6 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246842 | 3549 | - | F | Addition of NR-U intra-frequency measurement tests 13.3.1.x including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246843 | 3550 | - | F | Update to Annex F for NR-U test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246844 | 3551 | - | F | Update to 4-step RACH NR-U test cases including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246845 | 3552 | - | F | Update to 2-step RACH NR-U test cases including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246846 | 3553 | - | F | Update to Annex E for NR-U test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246848 | 3555 | - | F | Update to r17 HST reselection test 6.1.1.8 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246849 | 3556 | - | F | Clarification on FR2 RLM test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246881 | 3557 | - | F | Addition of minimum conformance requirements for MUSIM gap configured | 18.5.0 |
| 2024-12 | RAN#106 | R5-246882 | 3558 | - | F | Addition of NR SA FR1 event triggered reporting with MUSIM gap configured test case 6.6.1.9 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246883 | 3559 | - | F | Addition of NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority test case 6.6.2.13 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246884 | 3560 | - | F | Correction to Cell configuration mapping for MUSIM gap test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246925 | 3561 | - | F | Addition of minimum requirements for NR FR1 NES-based CHO test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-246929 | 3565 | - | F | Correction to test applicability for 6.6.1.2 | 18.5.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-12 | RAN#106 | R5-246954 | 3566 | - | F | Addition of spatial relation configuration to 38.533 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246955 | 3567 | - | F | Addition of TC4.5.3.4 SCell Activation and deactivation of multiple unknown SCells in FR1 with single activation deactivation command | 18.5.0 |
| 2024-12 | RAN#106 | R5-246956 | 3568 | - | F | Addition of TC4.5.6.4.1 E-UTRAN - NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs | 18.5.0 |
| 2024-12 | RAN#106 | R5-246957 | 3569 | - | F | Addition of TC5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246958 | 3570 | - | F | Addition of TC5.5.6.5.1 E-UTRAN - NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC | 18.5.0 |
| 2024-12 | RAN#106 | R5-246959 | 3571 | - | F | Addition of TC7.5.6.5.1 Active BWP switch on multiple SCells with non-DRX in SA | 18.5.0 |
| 2024-12 | RAN#106 | R5-246963 | 3574 | - | F | Correct a typo in the title of Annex A.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-246976 | 3575 | - | F | Completion of Test Case: Cell reselection to FR1 intra-frequency NR for UE operating on a cell with less than 5MHz BW including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246978 | 3577 | - | F | Addition of test tolerance for cell reselection and handover test cases when cell is operating in less than 5 MHz | 18.5.0 |
| 2024-12 | RAN#106 | R5-246983 | 3578 | - | F | Completion of SA FR2 UE Transmit Timing with 2 TAGs for multi-DCI multi-TRP operation test case including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-246985 | 3580 | - | F | Annex A changes for adding SA FR2 UL TCI state switch test case | 18.5.0 |
| 2024-12 | RAN#106 | R5-246986 | 3581 | - | F | Addition of test tolerance for test cases of NR SA FR2 MAC-CE based active uplink TCI state switch and UE Transmit Timing for multi-TRP operation | 18.5.0 |
| 2024-12 | RAN#106 | R5-246990 | 3583 | - | F | Update to TRS based SCell Activation of SSB-less SCell in inter-band CA in non-DRX test case | 18.5.0 |
| 2024-12 | RAN#106 | R5-247046 | 3586 | - | F | Addition of RRC message content for Further measurement gap enhancements | 18.5.0 |
| 2024-12 | RAN#106 | R5-247127 | 3587 | - | F | Correction in Message contents for FR2-FR2 event-triggered reporting in DRX test cases. | 18.5.0 |
| 2024-12 | RAN#106 | R5-247128 | 3588 | - | F | Correction A3-Offset for TC 7.6.1.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247186 | 3589 | - | F | Correction to message contents for FR1 SA absolute measurement accuracy | 18.5.0 |
| 2024-12 | RAN#106 | R5-247187 | 3590 | - | F | Correction to message contents for BFD-LR 1Rx RedCap test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247189 | 3592 | - | F | Update of test requirements for RedCap test cases in Annex F | 18.5.0 |
| 2024-12 | RAN#106 | R5-247194 | 3593 | - | F | Correction to TDD configuration in RedCap handover test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247195 | 3594 | - | F | Correction to CORESET Reference Channel in 16.3.2.3.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247197 | 3596 | - | F | Correction to general test parameters of active BWP switch delay for RedCap | 18.5.0 |
| 2024-12 | RAN#106 | R5-247198 | 3597 | - | F | Correction to Active BWP Dedicated CORESET RMC in 16.6.1.7 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247264 | 3598 | - | F | Introduction of band n254 to NR band group for FR1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247284 | 3599 | - | F | Addition of new test cases for SSB based L1-RSRP measurement for Satellite Access | 18.5.0 |
| 2024-12 | RAN#106 | R5-247292 | 3603 | - | F | Editorial corrections to Annex F.1.1.2 | 18.5.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-12 | RAN#106 | R5-247293 | 3604 | - | F | Correction of Table H.3.1-10 BeamFailureRecoveryConfig | 18.5.0 |
| 2024-12 | RAN#106 | R5-247295 | 3606 | - | F | Core spec alignment for SMTC FR2 patterns | 18.5.0 |
| 2024-12 | RAN#106 | R5-247298 | 3609 | - | F | Editors note removal for RedCap test case 16.6.5.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247299 | 3610 | - | F | Alignment of FR1 RedCap L1-RSRP absolute measurement test cases to TT analysis | 18.5.0 |
| 2024-12 | RAN#106 | R5-247437 | 3619 | - | F | Correction to EN-DC FR2 event triggered reporting TCs 5.6.1.2, 5.6.1.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247440 | 3622 | - | F | Correction to E-UTRA event-triggered reporting of a NR FR2 neighbour cell TC 8.4.2.5 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247442 | 3623 | - | F | Correction to NR FR1 RedCap Cell reselection TC 16.1.1.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247472 | 3643 | - | F | Introduction of NR SA FR2-FR1 inter-frequency NES triggering conditional handover test case 7.3.3.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247473 | 3644 | - | F | Correction of Annex E for NES HO test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247474 | 3645 | - | F | Correction of Annex E for NR mobility enhancements test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247475 | 3646 | - | F | Introduction of RACH-based intra-frequency LTM PSCell switch from FR1 to FR1 test case 6.3.5.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247476 | 3647 | - | F | Introduction of RACH-based Intra-frequency LTM PSCell switch from FR2 to FR2 test case 7.3.5.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247488 | 3651 | - | F | Introduction of Intra-frequency SSB based L1-RSRP measurement in FR2 7.6.22.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247509 | 3652 | - | F | Update to Annex B for NR-U test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247685 | 3507 | 2 | F | Correction to FR2 EN-DC RLM measurement restriction test case 5.5.1.9 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247686 | 3510 | 2 | F | Correction to FR2 NR SA RLM measurement restriction test case 7.5.1.9 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247687 | 3595 | 1 | F | Addition of CORESET RMC for RLM 1Rx RedCap test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247807 | 3584 | 1 | F | Update to NR SA FR1 SSB-less SCell Activation SSB-less inter-band CA based on A-TRS in non-DRX test case | 18.5.0 |
| 2024-12 | RAN#106 | R5-247808 | 3642 | 1 | F | Introduction of NR SA FR2 intra-frequency NES triggering conditional handover test case 7.3.3.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247809 | 3490 | 1 | F | Addition of new test case 6.3.4.4 for FR1 LTM intra-f Rach-less PCell switch without L1-RSRP measurement | 18.5.0 |
| 2024-12 | RAN#106 | R5-247810 | 3499 | 1 | F | Core spec alignment for LTM cell switch TC 6.3.4.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247811 | 3539 | 1 | F | General maintenance for NR-U chapter 10 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247813 | 3620 | 1 | F | Correction to EN-DC FR2 Inter-frequency measurements TCs 5.6.2.2 and 5.6.2.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247814 | 3607 | 1 | F | Corrections to spec implementation, including editorial corrections | 18.5.0 |
| 2024-12 | RAN#106 | R5-247815 | 3608 | 1 | F | Correction for RRM FR2 SS-RSRP measurement accuracy test cases for PC1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247836 | 3562 | 1 | F | Addition of new test case 6.3.3.6 NR FR1 intra-frequency NES-based CHO->>ok! | 18.5.0 |
| 2024-12 | RAN#106 | R5-247863 | 3527 | 1 | F | Test Tolerance update to NR-U FR1 handover tests under CCA | 18.5.0 |
| 2024-12 | RAN#106 | R5-247864 | 3528 | 1 | F | Test Tolerance update to NR-U FR1 RRC Re-establishment with CCA tests and addition of TC 11.2.2.1.3 | 18.5.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-12 | RAN#106 | R5-247865 | 3601 | 1 | F | Corrections to NRU SS-SINR measurement accuracy test cases including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247866 | 3625 | 1 | F | Correction of SA FR1 event-triggered reporting on PCC without gaps under non-DRX test case 11.5.1.1 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247867 | 3626 | 1 | F | Correction of SA FR1 event-triggered reporting on PCC without gaps under DRX test case 11.5.1.2 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247879 | 3615 | 1 | F | Addition beam failure and link recovery TC 14.4.2.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247880 | 3616 | 1 | F | Addition beam failure and link recovery TC 14.4.2.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247881 | 3617 | 1 | F | Addition beam failure and link recovery TC 14.4.2.3 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247882 | 3624 | 1 | F | Annex F update including TT analysis for NR-NTN BFR test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-247885 | 3649 | 1 | F | Correction of EN-DC FR2 Addition and Release Delay of NR PSCell test case 5.5.7.1 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247886 | 3650 | 1 | F | Annex F correction for RRM enh TC 5.5.7.1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247901 | 3576 | 1 | F | Completion of FR1 intra-frequency handover for less than 5MHz test case including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247904 | 3579 | 1 | F | Completion of NR SA FR2 PCell uplink TCI state switch for two known TCI states test case including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247907 | 3471 | 1 | F | Correction of FR2 Event Triggered test cases including TT for PC1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247908 | 3613 | 1 | F | Annex F correction for RRM FR2 PC1 test cases including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247920 | 3563 | 1 | F | Addition of new test case 6.3.3.7 NR FR1 inter-frequency NES-based CHO | 18.5.0 |
| 2024-12 | RAN#106 | R5-247921 | 3564 | 1 | F | Addition of new test case 6.6.1.13 under Cell DTX | 18.5.0 |
| 2024-12 | RAN#106 | R5-247933 | 3572 | 1 | F | Addition of three TDD UL DL configurations in A.1.5 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247934 | 3573 | 1 | F | TCs titles alignment with RAN4 specification | 18.5.0 |
| 2024-12 | RAN#106 | R5-247943 | 3501 | 1 | F | Update of RRM TC titles for RedCap UE | 18.5.0 |
| 2024-12 | RAN#106 | R5-247945 | 3618 | 1 | F | Addition beam failure and link recovery TC 14.4.2.4 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247946 | 3542 | 1 | F | Update to NR-U SS-RSRQ test 13.4.2.1 including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247947 | 3600 | 1 | F | Corrections to NRU SS-RSRQ measurement accuracy test cases including TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-247948 | 3627 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with CCA without SSB time index detection when DRX is not used test case 11.5.2.3 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247949 | 3628 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with CCA without SSB time index detection when DRX is used test case 11.5.2.4 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247950 | 3629 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with CCA with SSB time index detection when DRX is not used test case 11.5.2.5 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247951 | 3630 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with CCA with SSB time index detection when DRX is used test case 11.5.2.6 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247952 | 3631 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 without SSB time index detection when DRX is not used test case 11.5.2.7 including Test Tolerance | 18.5.0 |

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| 2024-12 | RAN#106 | R5-247953 | 3632 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 without SSB time index detection when DRX is used test case 11.5.2.8 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247954 | 3633 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with SSB time index detection when DRX is not used test case 11.5.2.9 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247955 | 3634 | 1 | F | Correction of NR SA FR1 Event triggered reporting for FR1 with SSB time index detection when DRX is used test case 11.5.2.10 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247956 | 3635 | 1 | F | Correction of NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX test case 11.5.3.1 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247957 | 3636 | 1 | F | Correction of NR SA FR1 - E-UTRAN event-triggered reporting in DRX test case 11.5.3.2 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247958 | 3637 | 1 | F | Correction of NR SA FR1 SSB based L1-RSRP measurement when DRX is not used test case 11.5.4.1 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247959 | 3638 | 1 | F | Correction of NR SA FR1 SSB based L1-RSRP measurement when DRX is used test case 11.5.4.2 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247960 | 3639 | 1 | F | Correction of NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is not used test case 11.5.4.3 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247961 | 3640 | 1 | F | Correction of NR SA FR1 SSB based L1-RSRP measurement on SCC under CCA when DRX is used test case 11.5.4.4 including Test Tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247962 | 3641 | 1 | F | Correction of Annex F for SA NRU measurement test cases including test tolerance | 18.5.0 |
| 2024-12 | RAN#106 | R5-247976 | 3612 | 1 | F | Correction of FR2 re-selection test case 7.1.1.1 including TT for PC1 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247980 | 3473 | 1 | F | Update TT value to LTM inter TC 6.3.2.4.2 | 18.5.0 |
| 2024-12 | RAN#106 | R5-247984 | 3582 | 1 | F | Addition of EN-DC FR1 Inter-band SSB-less SCell activation using A-TRS test case | 18.5.0 |
| 2024-12 | RAN#106 | R5-247985 | 3523 | 1 | F | Test Tolerance update to NR-U FR1 cell reselection with both NR carrier under CCA | 18.5.0 |
| 2024-12 | RAN#106 | R5-247986 | 3524 | 1 | F | Test Tolerance update to NR-U FR1 cell reselection with source NR carrier under CCA | 18.5.0 |
| 2024-12 | RAN#106 | R5-247987 | 3525 | 1 | F | Test Tolerance update to NR-U FR1 cell reselection with target NR carrier under CCA | 18.5.0 |
| 2024-12 | RAN#106 | R5-247988 | 3526 | 1 | F | Test Tolerance update to NR-U FR1 cell reselection to E-UTRAN target cell tests | 18.5.0 |
| 2024-12 | RAN#106 | R5-247998 | 3512 | 1 | F | Correction to FR1 EN-DC 2-step RACH RRM test cases 4.3.2.2.3 & 4.3.2.2.4 with TT | 18.5.0 |
| 2024-12 | RAN#106 | R5-248001 | 3514 | 1 | F | Correction to Annex A for Rel-16 2-step RACH RRM test cases | 18.5.0 |
| 2024-12 | RAN#106 | R5-248002 | 3516 | 1 | F | Correction to FR1 RedCap 2-step RACH RRM test cases 16.3.2.2.X with TT | 18.5.0 |
| 2025-03 | RAN#107 | R5-250047 | 3653 | - | F | Addition of minimum requirements for FR2 LTM intra L1-RSRP measurement | 18.6.0 |
| 2024-03 | RAN#107 | R5-250048 | 3654 | - | F | Addition of new test case 7.6.20.1 for FR2 LTM intra L1-RSRP measurement | 18.6.0 |
| 2024-03 | RAN#107 | R5-250049 | 3655 | - | F | Addition of minimum requirements for FR2 LTM inter L1-RSRP measurement with gap | 18.6.0 |

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| 2024-03 | RAN#107 | R5-250051 | 3657 | - | F | Addition of minimum requirements for FR2 LTM inter L1-RSRP measurement accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250052 | 3658 | - | F | Addition of new test case 7.7.15.1 for FR1 LTM inter L1-RSRP measurement accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250053 | 3659 | - | F | Addition of cell mapping for FR2 LTM L1-RSRP test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250054 | 3660 | - | F | Deletion of 6.7.17.1.2 from cell mapping table | 18.6.0 |
| 2024-03 | RAN#107 | R5-250055 | 3661 | - | F | Editorial corrections of FR1 LTM test cases title | 18.6.0 |
| 2024-03 | RAN#107 | R5-250058 | 3662 | - | F | Addition of minimum requirements for E-UTRAN event-triggered without measurement gaps | 18.6.0 |
| 2024-03 | RAN#107 | R5-250059 | 3663 | - | F | Addition of new test case 6.6.25.1 for E-UTRAN event-triggered without gap without interruption | 18.6.0 |
| 2024-03 | RAN#107 | R5-250060 | 3664 | - | F | Editorial corrections of 7.6.4.1 and 7.6.4.2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250061 | 3665 | - | F | Editorial corrections of 7.7.1.2 and 7.7.4.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250161 | 3666 | - | F | Update to RRC IEs of Further NR mobility enhancements | 18.6.0 |
| 2024-03 | RAN#107 | R5-250166 | 3667 | - | F | Update to LTM RRM Clause 6.3.2.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250264 | 3670 | - | F | Addition of minimum requirements for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250265 | 3671 | - | F | Addition of new test case 6.6.24.1 for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250266 | 3672 | - | F | Addition of new test case 6.6.24.2 for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250267 | 3673 | - | F | Addition of new test case 6.6.24.3 for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250269 | 3675 | - | F | Addition of new test case 6.6.24.5 for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250271 | 3676 | - | F | Addition of cell mapping for measurement gap enhancements test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250397 | 3677 | - | F | Update RRC message content for Further NR mobility enhancements | 18.6.0 |
| 2024-03 | RAN#107 | R5-250398 | 3678 | - | F | Update to LTM TC 6.3.4.4 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-250403 | 3679 | - | F | Correction to FR1 LTM PCell Switch test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250406 | 3680 | - | F | Update the cell configuration mapping for FR1 LTM test case 6.3.4.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250480 | 3683 | - | F | Update to Annexure to address less than 5 MHz test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250486 | 3688 | - | F | Annex F changes to include test tolerance for A-TRS based SSB-less SCell activation test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250489 | 3689 | - | F | Addition of NR-DC SA FR1 conditional handover including target MCG and target SCG test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250490 | 3690 | - | F | Addition of NR-DC SA FR1 conditional handover including target MCG and candidate SCG test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250496 | 3696 | - | F | Addition of multiple AoA test setups for multiRx test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250531 | 3701 | - | F | Addition of new test case 6.6.2.15 for inter-frequency event triggered reporting without SSB index detection in DRX mode with less than 5MHz bandwidth | 18.6.0 |
| 2024-03 | RAN#107 | R5-250596 | 3705 | - | F | Correction to TC4.5.6.4.1 with TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-250600 | 3707 | - | F | Modification to Annex F for test cases 4.5.3.4, 4.5.6.3.1, 4.5.6.4.1, 4.6.6.1 | 18.6.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#107 | R5-250668 | 3708 | - | F | Clarification to Non-Contention Based Random Access TCs | 18.6.0 |
| 2024-03 | RAN#107 | R5-250670 | 3709 | - | F | Correction to RRC_connection release with redirection for RedCap TC 18.2.2.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250671 | 3710 | - | F | Clarification on NCD-SSB absolute frequency definition | 18.6.0 |
| 2024-03 | RAN#107 | R5-250687 | 3713 | - | F | Addition of ATG RRM test case 19.6.1.1.2 - intra freq SS RSRP relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250688 | 3714 | - | F | Addition of ATG RRM test case 19.6.1.2.1 - inter freq SS RSRP absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250689 | 3715 | - | F | Addition of ATG RRM test case 19.6.1.2.2 - inter freq SS RSRP relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250690 | 3716 | - | F | Addition of ATG RRM test case 19.6.2.1 - intra freq SS RSRQ absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250691 | 3717 | - | F | Addition of ATG RRM test case 19.6.2.2.1 - inter freq SS RSRQ absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250692 | 3718 | - | F | Addition of ATG RRM test case 19.6.2.2.2 - inter freq SS RSRQ relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250693 | 3719 | - | F | Addition of ATG RRM test case 19.6.3.1 - intra freq SS SINR absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250694 | 3720 | - | F | Addition of ATG RRM test case 19.6.3.2.1 - inter freq SS SINR absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250695 | 3721 | - | F | Addition of ATG RRM test case 19.6.3.2.2 - inter freq SS SINR relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250696 | 3722 | - | F | Addition of ATG RRM test case 19.6.4.1.1 - SSB L1 RSRP absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250697 | 3723 | - | F | Addition of ATG RRM test case 19.6.4.1.2 - SSB L1 RSRP relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250698 | 3724 | - | F | Addition of ATG RRM test case 19.6.4.2.1 - CSIRS L1 RSRP absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250699 | 3725 | - | F | Addition of ATG RRM test case 19.6.4.2.2 - CSIRS L1 RSRP relative accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-250700 | 3726 | - | F | Addition of ATG RRM test case 19.6.5.1.1 - CSIRS L1 SINR absolute accuracy no dedicated IMR | 18.6.0 |
| 2024-03 | RAN#107 | R5-250701 | 3727 | - | F | Addition of ATG RRM test case 19.6.5.1.2 - CSIRS L1 SINR relative accuracy no dedicated IMR | 18.6.0 |
| 2024-03 | RAN#107 | R5-250702 | 3728 | - | F | Addition of ATG RRM test case 19.6.5.2 - SSB L1 SINR absolute accuracy dedicated IMR | 18.6.0 |
| 2024-03 | RAN#107 | R5-250703 | 3729 | - | F | Addition of ATG RRM test case 19.6.5.3.1 - CSIRS L1 SINR absolute accuracy dedicated IMR | 18.6.0 |
| 2024-03 | RAN#107 | R5-250704 | 3730 | - | F | Addition of ATG RRM test case 19.6.5.3.2 - CSIRS L1 SINR relative accuracy dedicated IMR | 18.6.0 |
| 2024-03 | RAN#107 | R5-250706 | 3732 | - | F | Correction to Rel-18 UL Tx switching RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250711 | 3735 | - | F | Correction to Rel-16 UL Tx switching RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250712 | 3736 | - | F | Correction to Annex H for UL Tx switching RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250715 | 3739 | - | F | Correction to RedCap RRM test cases 16.1.1.1 and 16.1.1.5 with TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-250716 | 3740 | - | F | Correction to RedCap RRM test cases 16.3.1.1 with TT | 18.6.0 |

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| 2024-03 | RAN#107 | R5-250717 | 3741 | - | F | Correction to Annex F for RedCap RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250725 | 3742 | - | F | Editorial Correction to NR SA FR1-FR1 Handover Test Case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250726 | 3743 | - | F | Editorial Correction to NR SA FR1 handover | 18.6.0 |
| 2024-03 | RAN#107 | R5-250727 | 3744 | - | F | Editorial Correction to NR SA FR1 NES handover | 18.6.0 |
| 2024-03 | RAN#107 | R5-250767 | 3749 | - | F | Correction to NR SA FR1 event triggered reporting with MUSIM gap configured test case 6.6.1.9 with Message contents | 18.6.0 |
| 2024-03 | RAN#107 | R5-250768 | 3750 | - | F | Correction to NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority test case 6.6.2.13 with message contents | 18.6.0 |
| 2024-03 | RAN#107 | R5-250769 | 3751 | - | F | Addition of NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP test case 6.6.2.14 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250770 | 3752 | - | F | Addition of NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority test case 7.6.2.20 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250771 | 3753 | - | F | Addition of NR SA FR2-FR2 event triggered reporting using MUSIM gap with shorter MGRP test case 7.6.2.21 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250772 | 3754 | - | F | Correction to Cell configuration mapping for MUSIM gap test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250773 | 3755 | - | F | Correction of minimum conformance requirements for MUSIM gap configured | 18.6.0 |
| 2024-03 | RAN#107 | R5-250778 | 3758 | - | F | Addition of TDCP amplitude measurement accuracy EN-DC test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250779 | 3759 | - | F | Addition of TDCP amplitude measurement accuracy SA test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250810 | 3760 | - | F | Addition of new test case 4.5.3.11 SCell activation of SSB-less Cell | 18.6.0 |
| 2024-03 | RAN#107 | R5-250812 | 3762 | - | F | Addition of new test case 6.3.3.7 NES-based conditional handover | 18.6.0 |
| 2024-03 | RAN#107 | R5-250825 | 3764 | - | F | Correction to Annex E for MCE RRM test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-250921 | 3770 | - | F | Addition of new test cases for CSI-RS based L1-RSRP measurement for Satellite Access | 18.6.0 |
| 2024-03 | RAN#107 | R5-250922 | 3771 | - | F | Applicability update for L1-RSRP and L3 measurement accuracy test cases for SAN | 18.6.0 |
| 2024-03 | RAN#107 | R5-250923 | 3772 | - | F | Message content alignment for RRM FR2 Rel-15 test case 7.6.1.1. | 18.6.0 |
| 2024-03 | RAN#107 | R5-250925 | 3774 | - | F | Editorial corrections to measurement procedures minimum conformance requirements | 18.6.0 |
| 2024-03 | RAN#107 | R5-250927 | 3776 | - | F | Completion of RRM NRU channel occupancy measurement accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250928 | 3777 | - | F | Update of RRM NRU inter-frequency measurement accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250929 | 3778 | - | F | Completion of RRM NRU RSSI measurement accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-250959 | 3780 | - | F | Correction to message exception of RLM 1Rx test cases for RedCap | 18.6.0 |
| 2024-03 | RAN#107 | R5-250961 | 3782 | - | F | Correction to test requirements for RedCap random access test cases in Annex F | 18.6.0 |
| 2024-03 | RAN#107 | R5-250962 | 3783 | - | F | Core spec alignment for SMTC config of TC 16.6.1.10 | 18.6.0 |
| 2024-03 | RAN#107 | R5-250997 | 3784 | - | F | Modification of Annex H.3.1 to include a new table for RACH-ConfigCommon to be used for BFR TCs | 18.6.0 |
| 2024-03 | RAN#107 | R5-250998 | 3785 | - | F | Correction to Beam Failure detection and link recovery TCs | 18.6.0 |

| Change history | | | | | | | |
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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#107 | R5-251001 | 3786 | - | F | Cell configuration mapping for MG enhancement test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251002 | 3787 | - | F | Addition of Minimum conformance requirements for event-triggered reporting test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251003 | 3788 | - | F | Addition of NR SA FR2 and FR2-FR2 event-triggered reporting with concurrent Type-2 measurement gap and Pre-MG test case 7.6.17.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251004 | 3789 | - | F | Addition of NR SA FR2-FR2 event-triggered reporting with two concurrent Pre-MGs test case 7.6.17.2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251007 | 3792 | - | F | Addition of NR SA FR2-FR2 SA event triggered reporting test without gap without interruption test case 7.6.19.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251008 | 3793 | - | F | Addition of NR SA FR2-event triggered reporting test without gap without interruption under non-DRX test case 7.6.19.2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251009 | 3794 | - | F | Addition of E-UTRAN - NR SA FR2 event-triggered reporting without gap with interruption test case 7.6.19.3 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251012 | 3795 | - | F | Correction of NR SA FR2 Inter-frequency SSB based L1-RSRP measurement without measurement gap test case 7.6.22.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251020 | 3802 | - | F | Minimum conformance requirements correction for NR SA FR2 NES triggering conditional handover test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251032 | 3805 | - | F | Addition of E-UTRAN - NR SA FR2 event-triggered reporting without gap with interruption test case 8.4.3.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251040 | 3806 | - | F | Correction of RRM propagation conditions for RLM RedCap FR2 test cases with fading | 18.6.0 |
| 2024-03 | RAN#107 | R5-251041 | 3807 | - | F | Corrections of RRM propagation conditions for RLM Rel-15 FR2 test cases with fading | 18.6.0 |
| 2024-03 | RAN#107 | R5-251042 | 3808 | - | F | Completion of RRM NRU L1-RSRP test case 11.6.4.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251105 | 3810 | - | F | Corrections in 16.7.1.3 and 16.7.1.4 on derived parameters | 18.6.0 |
| 2024-03 | RAN#107 | R5-251106 | 3811 | - | F | Corrections in TCs 4.7.1.2 and 6.7.1.2 on derived parameters | 18.6.0 |
| 2024-03 | RAN#107 | R5-251154 | 3815 | - | F | Update to NR-NTN SSB based L1-RSRP Measurement Accuracy test cases 14.6.4.1 and 14.6.4.2 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251155 | 3816 | - | F | Update to NR-NTN SS-SINR Measurement Accuracy test cases 14.6.3.1 and 14.6.3.2 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251156 | 3817 | - | F | Correction in RedCap CSI-RS based L1-RSRP measurement test case 16.6.4.5 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251158 | 3819 | - | F | Update to TE connection diagram for RedCap 2RX PRACH test cases 16.3.2.2.x | 18.6.0 |
| 2024-03 | RAN#107 | R5-251159 | 3820 | - | F | Update to TE and UE connection diagram for PRACH test cases 6.3.2.2.x | 18.6.0 |
| 2024-03 | RAN#107 | R5-251160 | 3821 | - | F | Update to RedCap 4-step RA type PRACH test cases 16.3.2.2.x | 18.6.0 |
| 2024-03 | RAN#107 | R5-251163 | 3822 | - | F | Addition of NR-NTN DCI-based BWP switch test case 14.4.3.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251164 | 3823 | - | F | Addition of NR-NTN RRC-based BWP switch test case 14.4.3.2.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251165 | 3824 | - | F | Addition of NR-NTN CBW change test case 14.4.4.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251167 | 3826 | - | F | Update to NR-NTN two-gap inter-frequency test cases 14.5.2.4 and 14.5.2.6 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251170 | 3829 | - | F | Addition of NR-NTN intra-frequency Handover test case 14.2.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251174 | 3833 | - | F | Update to NR-NTN intra-frequency test cases 14.5.1.x | 18.6.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#107 | R5-251175 | 3834 | - | F | Update to NR-NTN two-gap intra-frequency test cases 14.5.1.5 and 14.5.1.6 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251177 | 3836 | - | F | General corrections for NR-U RRM | 18.6.0 |
| 2024-03 | RAN#107 | R5-251178 | 3837 | - | F | Addition of NR-U SFTD measurement test 12.4.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251179 | 3838 | - | F | Addition of NR-U SFTD measurement test 12.5.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251180 | 3839 | - | F | Update to RSSI and Channel Occupancy tests | 18.6.0 |
| 2024-03 | RAN#107 | R5-251181 | 3840 | - | F | Update to Annex E for NR-U test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251186 | 3845 | - | F | Update to applicability statement of RRM tests 16.6.2.9 and 16.6.2.10 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251187 | 3846 | - | F | Correction to RedCap test cases configuring NCD-SSB 16.6.1.x | 18.6.0 |
| 2024-03 | RAN#107 | R5-251437 | 3681 | 2 | F | Update of TBD parameters RLM OOS in DRX and non-DRX mode for UE operating on a cell with less than 5MHz bandwidth test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251438 | 3682 | 2 | F | Addition of RLM IS in DRX mode for UE operating on a cell with less than 5MHz bandwidth test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251562 | 3768 | 1 | F | Core Spec Alignment for Test Configuration ID for NR-NTN test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251563 | 3769 | 1 | F | Addition of new Inter-frequency event triggered test cases for SAN | 18.6.0 |
| 2024-03 | RAN#107 | R5-251564 | 3841 | 1 | F | Addition of r18 NR-NTN RACH-based hard satellite switching test case 14.2.2.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251565 | 3842 | 1 | F | Addition of r18 NR-NTN RACH-less soft satellite switching test case 14.2.2.5 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251582 | 3761 | 1 | F | Update of minimum requirements for NES-based conditional handover | 18.6.0 |
| 2024-03 | RAN#107 | R5-251583 | 3803 | 1 | F | Correction of NR SA FR2 intra-frequency NES triggering conditional handover test case 7.3.3.3 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251584 | 3804 | 1 | F | Correction of NR SA FR2-FR1 inter-frequency NES triggering conditional handover test case 7.3.3.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251585 | 3712 | 1 | F | Addition of ATG RRM test case 19.6.1.1.1 - intra freq SS RSRP absolute accuracy | 18.6.0 |
| 2024-03 | RAN#107 | R5-251586 | 3731 | 1 | F | Correction to Annex E for ATG RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251587 | 3745 | 1 | F | Addition of Intra-frequency handover from FR1 to FR1 for ATG | 18.6.0 |
| 2024-03 | RAN#107 | R5-251588 | 3746 | 1 | F | Addition of Inter-frequency handover from FR1 to FR1 for ATG | 18.6.0 |
| 2024-03 | RAN#107 | R5-251589 | 3747 | 1 | F | Addition of Intra-frequency distance-based conditional handover from FR1 to FR1 for ATG | 18.6.0 |
| 2024-03 | RAN#107 | R5-251590 | 3748 | 1 | F | Addition of Inter-frequency distance-based conditional handover from FR1 to FR1 for ATG | 18.6.0 |
| 2024-03 | RAN#107 | R5-251591 | 3797 | 1 | F | Addition of Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode test case 19.4.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251592 | 3798 | 1 | F | Addition of Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM-RS in non-DRX mode test case 19.4.1.2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251593 | 3799 | 1 | F | Addition of Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode test case 19.4.1.3 | 18.6.0 |

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| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#107 | R5-251594 | 3800 | 1 | F | Addition of Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode test case 19.4.1.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251595 | 3700 | 1 | F | Addition of new test case 6.6.1.12 for intra-frequency event triggered reporting without gap with less than 5MHz bandwidth | 18.6.0 |
| 2024-03 | RAN#107 | R5-251596 | 3692 | 1 | F | Addition of SSB based L1-RSRP measurement for group-based beam reporting test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251597 | 3693 | 1 | F | Addition of CSI-RS based L1-RSRP measurement for group-based beam reporting test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251598 | 3695 | 1 | F | Addition of NR SA FR2 single DCI based active TCI state switch test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251599 | 3843 | 1 | F | Addition of FR2 multi-Rx RLM test case 5.5.1.11 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251600 | 3844 | 1 | F | Addition of FR2 multi-Rx RLM test case 7.5.1.10 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251601 | 3763 | 1 | F | Addition of MCE RRM test case 6.5.7D.4 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251602 | 3765 | 1 | F | Correction to MCE RRM test cases 6.5.7D.1, 6.5.7D.2 and 6.5.7D.3 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251603 | 3674 | 1 | F | Addition of new test case 6.6.24.4 for FR1 NR needforgap | 18.6.0 |
| 2024-03 | RAN#107 | R5-251604 | 3790 | 1 | F | Addition of NR SA FR2 event-triggered reporting with concurrent Type-2 measurement gap and NCSG test case 7.6.18.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251605 | 3812 | 1 | F | Update to NR-U FR1 IRAT test cases 12.1.1.1 and 12.2.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251606 | 3813 | 1 | F | Test Tolerance update in Annex F for NR-U cell reselection test cases 12.1.1.1 and 12.2.1.1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251611 | 3656 | 1 | F | Addition of new test case 7.6.21.1 for FR2 LTM inter L1-RSRP measurement with gap | 18.6.0 |
| 2024-03 | RAN#107 | R5-251612 | 3697 | 1 | F | Addition of minimum requirements and new test case 7.3.4.1 for FR2 LTM PCell switch from FR2 to FR2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251613 | 3698 | 1 | F | Addition of new test case 7.3.4.2 for FR2 LTM PCell switch from FR2 to FR2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251614 | 3699 | 1 | F | Addition of new test case 7.3.4.3 for FR2 LTM PCell switch from FR2 to FR2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251615 | 3691 | 1 | F | Addition of NR-DC SA FR2 conditional handover including target MCG and target SCG test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251616 | 3668 | 1 | F | Update of RRM TC titles for RedCap UE | 18.6.0 |
| 2024-03 | RAN#107 | R5-251617 | 3733 | 1 | F | Correction to EN-DC SS-RSRP measurement absolute accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251618 | 3779 | 1 | F | Correction to q-OffsetCell in NR cell re-selection test cases for RedCap | 18.6.0 |
| 2024-03 | RAN#107 | R5-251619 | 3781 | 1 | F | Correction to titles of RedCap test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251620 | 3702 | 1 | F | Update to RedCap SS-SINR and SS-RSRQ test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251621 | 3734 | 1 | F | Correction to NR SA SS-RSRP measurement absolute accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251622 | 3738 | 1 | F | Correction to RedCap SS-RSRP measurement absolute accuracy test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251644 | 3686 | 1 | F | Correction and update to TRS and A-TRS based SSB-less SCell Activation test cases including TT | 18.6.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2024-03 | RAN#107 | R5-251645 | 3687 | 1 | F | Update to SA FR1 A-TRS based SSB-less SCell Activation test cases including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251646 | 3756 | 1 | F | Addition of test case for NR UE Transmit Timing Test | 18.6.0 |
| 2024-03 | RAN#107 | R5-251648 | 3703 | 1 | F | Correction to TC4.5.3.4 with TT analysis | 18.6.0 |
| 2024-03 | RAN#107 | R5-251649 | 3704 | 1 | F | Correction to TC4.5.6.3.1 with TT analysis | 18.6.0 |
| 2024-03 | RAN#107 | R5-251651 | 3827 | 1 | F | Update to NR-NTN SSB-based RLM test cases 14.4.1.1, 14.4.1.2, 14.4.1.3 and 14.4.1.4 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251652 | 3828 | 1 | F | Update to NR-NTN CSI-RS-based RLM test cases 14.4.1.5, 14.4.1.6, 14.4.1.7 and 14.4.1.8 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251653 | 3830 | 1 | F | Addition of NR-NTN inter-frequency Handover test case 14.2.1.2 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251654 | 3825 | 1 | F | Update to NR-NTN inter-frequency test cases 14.5.2.x including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251655 | 3767 | 1 | F | Correction of FR2 Rel-15 Random Access Test Cases Including TT for PC1 | 18.6.0 |
| 2024-03 | RAN#107 | R5-251657 | 3814 | 1 | F | Update to NR-NTN cell reselection test cases 14.1.9 and 14.1.10 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251658 | 3835 | 1 | F | Update to Annex F for NR-NTN test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251691 | 3684 | 1 | F | Completion of message contents in SA FR2 UE transmit timing test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251741 | 3831 | 1 | F | Update to NR-NTN intra-frequency time-based CHO test case 14.2.1.3 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251742 | 3832 | 1 | F | Update to NR-NTN inter-frequency time-based CHO test case 14.2.1.4 including TT | 18.6.0 |
| 2024-03 | RAN#107 | R5-251744 | 3706 | 1 | F | Correction to TC4.6.6.1 with TT analysis | 18.6.0 |
| 2024-03 | RAN#107 | R5-251748 | 3737 | 1 | F | Correction to Rel-17 UL Tx switching RRM test cases | 18.6.0 |
| 2024-03 | RAN#107 | R5-251751 | 3685 | 1 | F | Correction of clause number for the 3 AoA setup in TCI state switch test case | 18.6.0 |
| 2024-03 | RAN#107 | R5-251752 | 3694 | 1 | F | Addition of NR SA FR2 DCI based active TCI state switch with m-DCI test case | 18.6.0 |
| 2025-03 | RAN#107 | - | - | - | - | accept ed revision marks in clause 1-4 | 18.6.1 |
| 2025-06 | RAN#108 | R5-251819 | 3847 | - | F | Update LTM TC 7.6.20.1 including TTs | 18.7.0 |
| 2025-06 | RAN#108 | R5-251820 | 3848 | - | F | Update LTM TC 7.6.21.1 including TTs | 18.7.0 |
| 2025-06 | RAN#108 | R5-251821 | 3849 | - | F | Update LTM TC 7.7.15.1 including TTs | 18.7.0 |
| 2025-06 | RAN#108 | R5-251822 | 3850 | - | F | Update Annex F for FR2 LTM L1-RSRP test cases including TTs | 18.7.0 |
| 2025-06 | RAN#108 | R5-251823 | 3851 | - | F | Addition of new test case 6.6.25.2 and 6.6.25.3 for E-UTRAN event-triggered reporting | 18.7.0 |
| 2025-06 | RAN#108 | R5-251830 | 3854 | - | F | Update of test parameters and requirements for LTM L1-RSRP test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-251832 | 3855 | - | F | Correction to R18 Less than 5M test cases 6.6.1.12 and 6.6.2.15 | 18.7.0 |
| 2025-06 | RAN#108 | R5-251833 | 3856 | - | F | Update to R18 Less than 5M test cases TC 6.6.1.12 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-251834 | 3857 | - | F | Update to R18 Less than 5M test cases TC 6.6.2.15 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-251837 | 3858 | - | F | Correction to R18 LTM FR2 test cases 7.3.4.1, 7.3.4.2 and 7.3.4.3 | 18.7.0 |
| 2025-06 | RAN#108 | R5-251841 | 3859 | - | F | Update to R18 LTM FR2 test case 7.3.4.1 including TT | 18.7.0 |

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| 2025-06 | RAN#108 | R5-251842 | 3860 | - | F | Update to R18 LTM FR2 test case 7.3.4.2 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-251843 | 3861 | - | F | Update to R18 LTM FR2 test case 7.3.4.3 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-251847 | 3863 | - | F | Completion of SSB-based RLM IS 6.5.1.16 test case including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-251849 | 3865 | - | F | Addition of test tolerance and measurement uncertainty for less than 5 MHz test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-251854 | 3866 | - | F | Addition of MU values for RRM FR2 PC6 | 18.7.0 |
| 2025-06 | RAN#108 | R5-251860 | 3869 | - | F | Update message contents for LTM L1-RSRP test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-251861 | 3870 | - | F | Update of SMTC config for concurrent gap TC 6.6.18.2 | 18.7.0 |
| 2025-06 | RAN#108 | R5-251868 | 3873 | - | F | Addition of cell configuration for ATG RRM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-251990 | 3877 | - | F | Update to needforgap test cases 6.6.24.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-251994 | 3879 | - | F | Core spec alignment for UL TX switching 6.5.7.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252172 | 3881 | - | F | Correction of RMSI CORESET configuration for less than 5 MHz test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252178 | 3885 | - | F | Correction of test requirements of SA FR2 CHO and PSCell change | 18.7.0 |
| 2025-06 | RAN#108 | R5-252179 | 3886 | - | F | Addition of NR-DC SA FR2 CHO with candidate SCG test case | 18.7.0 |
| 2025-06 | RAN#108 | R5-252375 | 3892 | - | F | Correction to TC5.5.3.6 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-252378 | 3894 | - | F | Correction to TC7.5.6.5.1 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-252382 | 3896 | - | F | Correction to TC6.5.6.3.1 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-252384 | 3897 | - | F | Correction to TC6.5.6.5.1 with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252386 | 3898 | - | F | Correction to TC6.6.7.1 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-252388 | 3899 | - | F | Correction to TC6.6.7.2 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-252444 | 3904 | - | F | Addition of new test case 6.5.13.1 unified TCI for mDCI mTRP | 18.7.0 |
| 2025-06 | RAN#108 | R5-252445 | 3905 | - | F | Addition of new test case 7.5.13.4 joint TCI for sDCI mTRP | 18.7.0 |
| 2025-06 | RAN#108 | R5-252446 | 3906 | - | F | Addition of new test case 7.5.13.5 separate TCI for sDCI mTRP | 18.7.0 |
| 2025-06 | RAN#108 | R5-252488 | 3908 | - | F | Editorial Correction to Clause numbers for RRM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252573 | 3910 | - | F | Addition of new FR1 RRM TC 6.3.3.5 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252574 | 3911 | - | F | Addition of new FR1 RRM TC 6.5.12.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252693 | 3924 | - | F | Correction to ATG SS-RSRP accuracy test cases 19.6.1.X with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252694 | 3925 | - | F | Correction to ATG SS-RSRQ accuracy test cases 19.6.2.X with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252695 | 3926 | - | F | Correction to ATG SS-SINR accuracy test cases 19.6.3.X with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252696 | 3927 | - | F | Removal of duplications in ATG L1-SINR accuracy test cases 19.6.5.X | 18.7.0 |
| 2025-06 | RAN#108 | R5-252697 | 3928 | - | F | Correction to Annex E for ATG RRM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252698 | 3929 | - | F | Correction to Annex F for ATG RRM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252710 | 3930 | - | F | Addition of MG_enh2 RRM test case 8.4.3.2 FR1 inter-RAT without gap | 18.7.0 |
| 2025-06 | RAN#108 | R5-252711 | 3931 | - | F | Addition of MG_enh2 RRM test cases 6.6.22.X concurrent gap including Pre-MG | 18.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2025-06 | RAN#108 | R5-252712 | 3932 | - | F | Addition of MG_enh2 RRM test cases 6.6.23.X concurrent gap including NCSG | 18.7.0 |
| 2025-06 | RAN#108 | R5-252713 | 3933 | - | F | Correction to Annex E for MG_enh2 test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252715 | 3934 | - | F | Correction to 2-step RACH RMCs in Annex A | 18.7.0 |
| 2025-06 | RAN#108 | R5-252716 | 3935 | - | F | Correction to 2-step RACH RMCs for NR-U in Annex A | 18.7.0 |
| 2025-06 | RAN#108 | R5-252723 | 3941 | - | F | Specification quality improvement for 38.533 clause 9 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252724 | 3942 | - | F | Correction to FR1 EN-DC L1 and L3 RSRP absolute accuracy test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252725 | 3943 | - | F | Correction to FR1 NR SA L1 and L3 RSRP absolute accuracy test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252726 | 3944 | - | F | Correction to Inter-RAT FR1 NR RSRP absolute accuracy test case | 18.7.0 |
| 2025-06 | RAN#108 | R5-252776 | 3950 | - | F | Correction of NR SA NES triggering conditional handover test cases including test tolerance | 18.7.0 |
| 2025-06 | RAN#108 | R5-252779 | 3951 | - | F | Addition of new CADC fast measurement test cases 6.6.9.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-252782 | 3952 | - | F | Correction of NR SA FR2 Inter-frequency SSB based L1-RSRP measurement without measurement gap test case 7.6.22.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252783 | 3953 | - | F | Annex H correction for LTM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252785 | 3955 | - | F | Addition of new NR SA FR2 PDCCH-order RACH test cases 7.3.2.4.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-252804 | 3960 | - | F | Test Tolerance update for intra-frequency NR cell reselection for Satellite Access test 14.1.1 and 14.1.2. | 18.7.0 |
| 2025-06 | RAN#108 | R5-252806 | 3962 | - | F | Test Tolerance update for inter-frequency NR cell reselection for Satellite Access test 14.1.5. | 18.7.0 |
| 2025-06 | RAN#108 | R5-252807 | 3963 | - | F | Test Tolerance update for inter-frequency NR cell reselection for Satellite Access test 14.1.6. | 18.7.0 |
| 2025-06 | RAN#108 | R5-252829 | 3968 | - | F | Addition of NR NTN 14.2.2.3.1 test case | 18.7.0 |
| 2025-06 | RAN#108 | R5-252877 | 3970 | - | F | Correction to NR SA SS-RSRP measurement accuracy for Satellite Access TCs | 18.7.0 |
| 2025-06 | RAN#108 | R5-252887 | 3976 | - | F | Correction of Connection Diagram for RedCap RA test case with CSI-RS | 18.7.0 |
| 2025-06 | RAN#108 | R5-252938 | 3982 | - | F | Update to r18 NR-NTN satellite switching tests 14.2.2.4 and 14.2.2.5 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252939 | 3983 | - | F | Addition of r18 NR-NTN RACH-less Handover test 14.2.1.8 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252940 | 3984 | - | F | Update to Annex E for r18 NR-NTN test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252941 | 3985 | - | F | Update to NR-NTN measurement reporting tests | 18.7.0 |
| 2025-06 | RAN#108 | R5-252942 | 3986 | - | F | Addition of NR-NTN MAC-CE based pathloss RS switch test 14.4.5.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-252944 | 3988 | - | F | Update to general section of NR-NTN | 18.7.0 |
| 2025-06 | RAN#108 | R5-252945 | 3989 | - | F | Update to NR-NTN intra-frequency re-establishment test 14.2.2.1.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252946 | 3990 | - | F | Update to NR-NTN inter-frequency re-establishment test 14.2.2.1.2 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252947 | 3991 | - | F | Update to NR-NTN DCI-based BWP switch test 14.4.3.1.1 including TT | 18.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2025-06 | RAN#108 | R5-252948 | 3992 | - | F | Update to NR-NTN RRC-based BWP switch test 14.4.3.2.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252949 | 3993 | - | F | Update to NR-NTN UE-specific CBW change test 14.4.4.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252950 | 3994 | - | F | Update to NR-NTN Transmit Timing test 14.3.1.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252951 | 3995 | - | F | Update to NR-NTN Timing Advance test 14.3.2.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252952 | 3996 | - | F | Update to Annex F for NR-NTN test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252953 | 3997 | - | F | Addition of Annex H common message contents for NR-NTN | 18.7.0 |
| 2025-06 | RAN#108 | R5-252954 | 3998 | - | F | Update to NR-NTN Handover test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-252956 | 4000 | - | F | Addition of FR1-NTN timing measurement MU | 18.7.0 |
| 2025-06 | RAN#108 | R5-252957 | 4001 | - | F | Update to NR-U SFTD test case 12.4.1.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-252961 | 4005 | - | F | Correction for L1-RSRP reporting tests in FR2 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253476 | 3889 | 1 | F | Addition of new test case 14.2.2.2.1 and 14.2.2.2.2 for NR NTN | 18.7.0 |
| 2025-06 | RAN#108 | R5-253477 | 3902 | 1 | F | Addition of NR SA FR1 inter-RAT Cell reselection with NTN Carrier for Satellite Access in 14.1.11 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253478 | 3903 | 1 | F | Addition of NR SA FR1-FR1 Cell re-selection with TN carrier for Satellite Access in 14.1.12 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253492 | 3878 | 1 | F | Update of RRM distance-based conditional Handover test cases in FR1 for ATG | 18.7.0 |
| 2025-06 | RAN#108 | R5-253493 | 3921 | 1 | F | Addition of ATG intra-frequency CSI-RSRP accuracy test cases 19.6.6.1.1 and 19.6.6.1.2 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253494 | 3922 | 1 | F | Addition of ATG intra-frequency CSI-RSRQ accuracy test case 19.6.7.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253495 | 3923 | 1 | F | Addition of ATG intra-frequency CSI-SINR accuracy test case 19.6.8.1 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253496 | 3958 | 1 | F | Addition of ATG SA event triggered reporting test cases 19.5.1.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-253497 | 3957 | 1 | F | Correction of ATG Radio Link Monitoring test cases 19.4.1.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-253498 | 3864 | 1 | F | Addition of RLM IS non DRX less than 5 MHz test case | 18.7.0 |
| 2025-06 | RAN#108 | R5-253499 | 3909 | 1 | F | Addition of test requirement for L1-RSRP measurement for group-based beam reporting test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253500 | 3980 | 1 | F | Addition of multi-Rx TRP-specific BFR test 7.5.5.14 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253501 | 3965 | 1 | F | Update of NR operating band configuration table for band n13 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253502 | 3890 | 1 | F | Update to 6.3.2.4 and add abbreviation for LTM | 18.7.0 |
| 2025-06 | RAN#108 | R5-253503 | 3956 | 1 | F | Correction of event-triggered reporting test cases 7.6.19.x | 18.7.0 |
| 2025-06 | RAN#108 | R5-253504 | 3913 | 1 | F | Correction to RRC messages and IEs in H.3.12 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253505 | 3974 | 1 | F | Removal of p-max from message content exceptions for FR2 PRACH tests | 18.7.0 |
| 2025-06 | RAN#108 | R5-253506 | 4004 | 1 | F | Update to FR2 BFR tests | 18.7.0 |
| 2025-06 | RAN#108 | R5-253507 | 3936 | 1 | F | Correction to Tx switching RRM test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253508 | 3959 | 1 | F | Correction for NR SA FR1 even triggered reporting with gap in DRX TC 6.6.1.4 | 18.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2025-06 | RAN#108 | R5-253509 | 3945 | 1 | F | Correction to FR1 RedCap L1 and L3 RSRP absolute accuracy test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253510 | 3912 | 1 | F | Addition of new FR1 RRM TC 6.5.12.2 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253511 | 3888 | 1 | F | RRM Spec Quality Improvement clause 7 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253512 | 3901 | 1 | F | Spec quality improvement - clauses 1-4 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253513 | 3972 | 1 | F | RRM Spec quality improvement draft CR for clause 5 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253514 | 3937 | 1 | F | Specification quality improvement for 38.533 clause 6.1 to 6.3 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253515 | 3938 | 1 | F | Specification quality improvement for 38.533 clause 6.4 and 6.5 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253516 | 3939 | 1 | F | Specification quality improvement for 38.533 clause 6.6 and 6.7 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253517 | 3940 | 1 | F | Specification quality improvement for 38.533 clause 8 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253518 | 3947 | 1 | F | RRM Spec quality improvement draft CR clause 10 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253519 | 3948 | 1 | F | RRM Spec quality improvement draft CR clause 11 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253520 | 3949 | 1 | F | RRM Spec quality improvement draft CR clause 12 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253521 | 3971 | 1 | F | RRM Spec quality improvement draft CR for clause 13 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253522 | 3914 | 1 | F | RRM Spec quality improvement CR for clause 16 FR1 RedCap | 18.7.0 |
| 2025-06 | RAN#108 | R5-253523 | 3915 | 1 | F | RRM Spec quality improvement CR for clause 17 FR2 RedCap | 18.7.0 |
| 2025-06 | RAN#108 | R5-253524 | 3967 | 1 | F | RRM Spec quality improvement for clause 18 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253525 | 3973 | 1 | F | RRM Spec quality improvement draft CR for Annexes | 18.7.0 |
| 2025-06 | RAN#108 | R5-253526 | 3966 | 1 | F | RRM Spec quality improvement for clause 14 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253529 | 3919 | 1 | F | Correction of NR SA FR2-FR2 event triggered reporting using MUSIM gap with higher priority test case 7.6.2.20 with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253537 | 3874 | 1 | F | Update to RRM Intra-frequency handover test case in FR1 for ATG including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253538 | 3875 | 1 | F | Update to RRM Inter-frequency handover test cases in FR1 for ATG including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253542 | 3961 | 1 | F | Test Tolerance update for Measurement Initiation based intra-frequency NR cell reselection for Satellite Access test 14.1.3 and 14.1.4. | 18.7.0 |
| 2025-06 | RAN#108 | R5-253546 | 3893 | 1 | F | Correction to TC5.5.6.5.1 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-253547 | 3895 | 1 | F | Correction to TC7.5.6.3.1 with TT analysis | 18.7.0 |
| 2025-06 | RAN#108 | R5-253548 | 3900 | 1 | F | Annex F modification for some TCs | 18.7.0 |
| 2025-06 | RAN#108 | R5-253554 | 3876 | 1 | F | Test Tolerance Update in Annex F for RRM Intra-Frequency and Inter-Frequency handover test case in FR1 for ATG | 18.7.0 |
| 2025-06 | RAN#108 | R5-253560 | 3916 | 1 | F | Correction to NR SA FR1 event triggered reporting with MUSIM gap configured test case 6.6.1.9 with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253561 | 3917 | 1 | F | Correction to NR SA FR1-FR1 event triggered reporting using MUSIM gap with lower and higher priority test case 6.6.2.13 with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253562 | 3918 | 1 | F | Correction to NR SA FR1-FR1 event triggered reporting using MUSIM gap with shorter MGRP test case 6.6.2.14 with TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253565 | 3891 | 1 | F | Update to 4.5.3.11 SCell activation of SSB-less Cell including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253569 | 3852 | 1 | F | Update FR1 NR needforgap 6.6.24.1 and 6.6.24.5 including TTs | 18.7.0 |

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2025-06 | RAN#108 | R5-253570 | 3853 | 1 | F | Update FR1 NR needforgap 6.6.24.2, 6.6.24.3 and 6.6.24.4 including TTs | 18.7.0 |
| 2025-06 | RAN#108 | R5-253571 | 4002 | 1 | F | Update to NR-U SFTD test case 12.5.1.1 including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253572 | 4003 | 1 | F | Update to Annex F for NR-U test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253589 | 3981 | 1 | F | Addition of multi-RX L1-RSRP with scheduling restrictions test 7.5.16 | 18.7.0 |
| 2025-06 | RAN#108 | R5-253597 | 3880 | 1 | F | Introduction of new test case 19.2.3.3 SA RRC Connection Release with Redirection for ATG | 18.7.0 |
| 2025-06 | RAN#108 | R5-253598 | 3871 | 1 | F | Addition of Intra-frequency RRC Re-establishment in FR1 for ATG | 18.7.0 |
| 2025-06 | RAN#108 | R5-253599 | 3872 | 1 | F | Addition of Inter-frequency RRC Re-establishment in FR1 with unknown target cell without serving cell timing for ATG | 18.7.0 |
| 2025-06 | RAN#108 | R5-253617 | 3969 | 1 | F | Test Tolerance update in NR NTN Beam Failure Detection and link recovery test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253623 | 3964 | 1 | F | Test Tolerance update for Time based and Location based Measurement Initiation inter-frequency NR cell reselection for Satellite Access test 14.1.7 and 14.1.8. | 18.7.0 |
| 2025-06 | RAN#108 | R5-253624 | 3987 | 1 | F | Update to NR-NTN measurement accuracy tests | 18.7.0 |
| 2025-06 | RAN#108 | R5-253625 | 3999 | 1 | F | Update to SMTC profiles for NR-NTN | 18.7.0 |
| 2025-06 | RAN#108 | R5-253630 | 3862 | 1 | F | Completion of RLM OOS for less than 5MHz bandwidth test cases including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253633 | 3887 | 1 | F | Missing AoA configuration for different TRPs in SA FR2 UE transmit timing test case | 18.7.0 |
| 2025-06 | RAN#108 | R5-253634 | 3882 | 1 | F | Completion of NR-DC SA FR1 CHO test case including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253635 | 3883 | 1 | F | Update to NR-DC SA FR1 CHO with target MCG and candidate SCG test case including TT | 18.7.0 |
| 2025-06 | RAN#108 | R5-253636 | 3884 | 1 | F | Addition of test tolerance and measurement uncertainty for NR-DC SA FR1 CHO test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253639 | 3867 | 1 | F | Addition of test tolerance analysis for DCI based TCI switch multi-Rx test cases | 18.7.0 |
| 2025-06 | RAN#108 | R5-253644 | 3946 | 1 | F | FR1 and EUTRA - FR2 testability issue CR | 18.7.0 |

# History

| Version | Date | Status |
|---|---|---|
| V18.2.1 | June 2024 | Publication |
| V18.3.0 | August 2024 | Publication |
| V18.4.0 | November 2024 | Publication |
| V18.5.0 | February 2025 | Publication |
| V18.6.1 | May 2025 | Publication |
| V18.7.0 | August 2025 | Publication |